

Proceedings

12th WORLD CONGRESS OF THE RSAI

29 MAY – 1 JUNE, 2018 | GOA, INDIA

*Spatial Systems:
Social Integration,
Regional
Development
and
Sustainability*

Celebrating 50 years of Regional Science in India

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12th World Congress of the RSAI

The 12th Regional Science World Congress welcomes you to Goa, in India, a coastal location with breathtaking landscapes sculpted by the Konkan Coast and the Western Ghats.

On behalf of the Regional Science Association International and the Regional Science Association of India, we extend our warm greetings and cordially invite you to participate in the 12th Regional Science World Congress from May 29 to June 01, 2018, at Goa.

The conference is open to regional scientists, practitioners and researchers in the field of regional science. The Congress will include Keynote Lectures, Scientific Sessions, Poster Sessions, Workshops and Themed Sessions. Field trips will be organized in and around Goa. The theme of the 12th RSAI World Congress is Spatial Systems: Social Integration, Regional Development and Sustainability. The theme has been chosen to focus upon the development needs of regions as spatial entities, which is the subject matter of spatial science. We hope to provide an encouraging environment for researchers across the globe, to interact and learn from one another, and create a network that will be attractive and inspiring for young students and scholars. We hope to strengthen the community of regional scientists and achieve a better understanding of our future needs.

We wish you a good Conference!



Sumana Bandyopadhyay
Chair, Local Organising Committee
President, Regional Science Association, India



Budy Resosudarmo
President,
Regional Science Association International



Tomaz Dentinho
Executive Director,
Regional Science Association International

Conference Collaborators



Jadavpur University



DEPARTMENT OF GEOGRAPHY
UNIVERSITY OF CALICUT



INDIAN COUNCIL OF SOCIAL SCIENCE RESEARCH



Indian Council of
Social Science Research



Programme Overview

Tuesday 29 May 2018		Wednesday 30 May 2018		
Registration desk 14:00-18:00		Registration desk 09:00-16:00		
<p style="text-align: center;">Workshops</p> <p>“Introduction to Spatial Agent-Based Modeling” [09:00-13:00 | Room A605]</p> <p>“How to Publish a Paper in Regional Science” [11:00-13:00 | Room A604]</p> <p>“Urban Planning: Blueprints for Small Towns of India” [09:00-13:00 | Room A603]</p>	<p style="text-align: center;">Advanced Brainstorm Carrefour (ABC) [09:00-15:00 | Room A602]</p>	<p style="text-align: center;">Sessions of RSPP on <i>Forty under Forty</i> (1) [09:00-10:30]</p>		
		COFFEE BREAK [10:30-11:00]		
		<p style="text-align: center;">SEMI PLENARY SESSION <i>Goa Government</i> Chair: Tapati Banerjee Keynote Presentations: S.T. Puttaraju Seetharam Babu [11:00-12:30-Lecture theatres A3]</p>	<p style="text-align: center;">Parallel Sessions (2) and Poster Session [11:00-12:30]</p>	
		LUNCH [12:30-14:00]		
		<p style="text-align: center;">Parallel Sessions (3) [14:00-15:30]</p>	<p style="text-align: center;">PRSCO Council Meeting (by invitation only) [14:00-15:30 | Room C405]</p>	<p style="text-align: center;">IRSA AGM (by invitation only) [14:00-15:30 | Lecture theatres A3]</p>
<p>OPENING CEREMONY S. T. Puttaraju, Government of Goa Budy Resosudarmo, RSAI G. Raghurama, Director, BITS Chitta Ranjan Pathak, IRSA Lakshmi Sivaramakrishnan, IRSA Debasis Patnaik, BITS Guest of Honour, Bibek Debroy, Government of India Chief Guest, Governor of Goa, Her Excellency Smt Mridula Sinha Sumana Bandyopadhyay, IRSA [15:30-16:30 | Auditorium]</p>		COFFEE BREAK [15:30-16:00]		
<p>PLENARY SESSION <i>Spatial Systems: Social Integration, Regional Development and Sustainability</i> Chair: Budy Resosudarmo Keynote Presentations: Janet E. Kohlhase Andrés Rodriguez Pose [16:30-18:00 | Auditorium]</p>		<p>PLENARY SESSION <i>Regional Cooperation Policy</i> Chair: Kingsley Haynes Keynote Presentations: Iwan Azis Steven G. Craig Sachidanand Sinha Xue Ling [16:00-18:00 | Lecture theatres A3]</p>		
<p>Welcome Reception [18:30-22:00 | BITS Guest House Lawns]</p>				

Thursday 31 May 2018		Friday 1 June 2018	
Registration desk 09:00-16:00		Registration desk 09:00-14:00	
Parallel Sessions (4) [09:00-10:30]		Parallel Sessions (7) [09:00-10:30]	
COFFEE BREAK [10:30-11:00]		COFFEE BREAK [10:30-11:00]	
<p>SEMI PLENARY SESSION <i>Regional Science Policy and Practice & The Regional Science Academy (TRSA)</i> Keynote Presentation: Luc-Normand Tellier [11:00-12:30] | Lecture theatres A3]</p>	Parallel Sessions (5) [11:00-12:30]	<p>ROUND TABLE <i>Social and Spatial Integration and Global Citizenship</i> Chair: Andrés Rodríguez Pose Keynote Presentations: Abdul Shaban Saraswati Raju Anindita Dutta Armida Alisjahbana [11:00-12:30] | Lecture theatres A3]</p>	
LUNCH [12:30-14:00]	LRPC Meeting (by invitation only) [12:30-14:00] | Room C405]	LUNCH [12:30-14:00]	RSAI Council Meeting (by invitation only) [12:30-14:00] | Room C405]
<p>MAIN SCHOOLS OF REGIONAL SCIENCE Chair: Mark Partridge Henri de Groot, Vicente Royuela Mora, Jouke van Dijk, Eduardo Haddad, Helmut Yabar, Takeshi Mizunoya, Andrés Rodríguez-Pose, Kieran Donaghy [14:00-15:30] | Lecture theatres A3]</p>		Parallel Sessions (8) [14:00-15:30]	
COFFEE BREAK [15:30-16:00]		PLENARY SESSION <i>Space Programme and Geoinformatics: Policy and Practice</i> Chair: Debapriya Dutta Keynote Presentations: J.S. Rawat Marco Alves [15:30-16:30] | Lecture theatres A3]	
<p>SEMI PLENARY SESSION <i>Inclusive City Planning</i> Chair: M. Satish Kumar Keynote Presentations: P. Jayapal Banasree Banerjee R. B. Bhagat [16:00-18:00] | Lecture theatres A3]</p>	Parallel Sessions (6) [16:00-17:30]	<p>Closing Session Chair: Lakshmi Sivaramakrishnan Valedictory Address by Amitabh Kundu End note by Budy Resosudarmo [16:30-17:30] | Lecture theatres A3]</p>	
		<p>Gala Dinner Departure to Gala Dinner - 17:30 [18:00-22:00] | Panjim]</p>	

Themes

Umbrella Theme

Spatial Systems: Social Integration, Regional Development and Sustainability

Across the world, communities are striving to achieve an ecologically and socially secure future. The intricately linked ideas of sustainability and integration are the key to achieving our development goals. As regional scientists, our common pursuit of a sustainable future may be attained with more efficient understanding of the 'region' as a spatial unit. Keeping this objective in mind, the theme of the 2018 Congress highlights the importance of analyzing spatial systems as not just physical space or social space, but shared space. The sub-themes will be aimed at providing a platform for debates and discussions around the key issues of contemporary regional science and carve out the way to future research agenda.

General Themes

RS02 - Cooperation and Development
RS03 - Environmental Issues
RS04 - Infrastructure, Transportation and Accessibility
RS06 - Location of Economic Activity
RS07 - Methods in Regional Science and Urban Economics
RS08 - Migration and Labor Markets

RS09 - Real Estate and Housing
RS10 - Regional and Urban Policy and Governance
RS11 - Regional Finance, Investment or Capital Markets
RS12 - Rural Development
RS13 - Social Integration
RS14 - Spatial Planning
RS16 - Tourism

Special Sessions' Themes

SS00 – Sessions of RSPP on Forty under Forty
Editorial Team of RSPP (Chairs)
SS01 – Water management in South Asia: From conflict to cooperation
Paulo Casaca
SS02 – Smart Cities Initiatives for the 21st Century: Myth or Reality
Peter Nijkamp, Vijay Pandey and Sumana Bandyopadhyay
SS03 – Territorial Governance and Local Development in Developing Countries
Andre Torre and Habibullah Magsi
SS04 – Spatial Econometric Interaction Modelling
Manfred M. Fischer and Yee Leung
SS05 – Spatial Analysis: From Neural Computing to Deep Learning
Yee Leung and Manfred M. Fischer
SS07 – Economic Corridors, Development and Regional Cooperation in South Asia and Beyond
Siegfried O. Wolf
SS08 – Metropolitan Governance in a conflict, competition and cooperation contexts
Jorge Gonçalves
SS09 – Analytical Approaches to Climate Change at Multiple Scales
Gerrit-Jan Knaap
SS10 – Rural Transformation
Subrata Dutta

SS11 – The future of leisure: tourism, mobility and transportation
João Romão, Peter Nijkamp and Luca Zamparini
SS12 – Transforming Metropolitan Regions: Ideas and Examples
Amit Chatterjee
SS13 – Citizenry and Regional Planning
Subhra Chattopadhyay
SS14 - Revisiting rural-urban dichotomy for integrated regional development
Manisha Jain and Artem Korzhenevych
SS15 - Conflict, Migration, and Diaspora
Manas Chatterji
SS17 - Regional Science and Peace Science
Manas Chatterji
SS18 - Natural and Man-Made Disaster Management
Manas Chatterji
SS19 - Globalization and Regional Science
Manas Chatterji
SS20 - Gender and Social Justice
Saraswati Raju
SS21 - Innovation and Entrepreneurship
Rudra P. Pradhan
SS24 - Regional Issues in Economic growth and Development
Debasis Patnaik
SS 25 - Braille Mapping by NATMO & Its Utility to Visually Impaired People
Tapati Banerje

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G.)

Joint Conveners (Goa):



S. T. Puttaraju
*Chief Town Planner,
Government of Goa*



Debasis Patnaik
*Department of
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ABSTRACTS & PAPERS

INCLUDES ALL ABSTRACTS AND COMMUNICATIONS THAT WERE EFFECTIVELY PRESENTED AT THE CONGRESS.

Plenary Sessions

Spatial Systems: Social Integration, Regional Development and Sustainability

PLENARY SESSION **16:30-18:00** **Tue_ Auditorium**

Chair: Budy Resosudarmo, Australian National University, Australia

Keynote Presentations

Labor Force Diversity and Firm Survival

Janet E. Kohlhase, University of Houston, USA



The revenge of the places that don't matter

Andrés Rodríguez Pose, London School of Economics, UK

Regional Cooperation Policy

PLENARY SESSION **16:00-18:00** **Wed_ Lecture theatres A3**

Chair: Kingsley Haynes, George Mason University, USA

Keynote Presentations

Regional Integration and Cooperation: Quo Vadis?

Iwan Azis, Cornell University, USA and University of Indonesia, Indonesia



The Role of Government Behavior in Understanding the Relevance of Regions

Steven G. Craig, University of Houston, USA

Sachidanand Sinha, Centre for Studies in Regional Development at Jawaharlal Nehru University, India



Xue Ling (Paul Snow), School of Government, Peking University, China

Space Programm, Geoinformatics: Policy and Practice

PLENARY SESSION **15:00-16:30** **Fri_ Lecture theatres A3**

Chair: Debapriya Dutta, Department of Science and Technology, Government of India

Keynote Presentations

J. S. Rawat, Centre of Excellence for NRDMS in Uttarakhand Dept. of Geography, Kumaun University Almora, Uttarakhand

Marco Alves, WavEC Offshore Renewables, Portugal



Semi Plenary Sessions

Goa Government

SEMI PLENARY SESSION

11:00-12:30

Wed_ Lecture theatres A3

Chair: Tapati Banerjee, Director National Atlas & Thematic Mapping Organisation, India

Keynote Presentations

Evolution of the Regional Plan of Goa

S.T. Puttaraju, Chief Town Planner of Goa, India

Water-based Sports and Leisure Tourism in Goa

Seetharam Babu, Ministry of Tourism, Goa, India

Regional Science Policy and Practice (RSPP) & The Regional Science Academy (TRSA)

SEMI PLENARY SESSION

11:00-12:45

Thu_ Lecture theatres A3

Regional Science Academy Lecture Series: "The Voice of the Regional Science Academy"

Luc-Normand Tellier (University of Quebec, Canada) on:

Attraction, Repulsion and Gravity Fields: From Alfred Weber to an Urban Metric System



Inclusive City Planning

SEMI PLENARY SESSION

16:00-18:00

Thu_ Lecture theatres A3

Chair: M. Satish Kumar, Director Internationalisation, Queens University, Belfast and Faculty

Keynote Presentations

P. Jayapal, Executive Director of HUDCO, India

Banasree Banerjee, Urban Planner and Professor, IHS
Erasmus University Rotterdam

R. B. Bhagat, Indian Institute of Population Studies,
India



Round Table

Social and Spatial Integration and Global Citizenship

ROUND TABLE

11:00-12:30

Fri_Lecture theatres A3

Chair: Andrés Rodríguez Pose, London School of Economics, UK

Keynote Presentations

Ethnic Diversities and Social Integration in India

Abdul Shaban, Tata Institute of Social Sciences, India

Revisiting Gender Empowerment in India

Saraswati Raju, Jawaharlal Nehru University, India

Anindita Dutta, University of Delhi, India

Armida Alisjahbana, Padjadjaran University, Indonesia



Main Schools of Regional Science

MAIN SCHOOLS SESSION

14:00-15:30

Thu_Lecture theatres A3

Discussions about nature of Regional Science Academic Programs around the world

Chair: Roger R. Stough, George Mason University, Schar School of Policy and Government

Presenters and Programs

Henri de Groot, Department of Spatial Economics, Free University of Amsterdam, Netherlands

Vicente Royuela Mora, Department of Economics, University of Barcelona, Spain

Jouke van Dijk, Regional Science Program, Rijks University of Groningen, Netherlands

Eduardo Haddad, Department of Economics, University of Sao Paulo, Brazil

Helmut Yabar and Takeshi Mizunoya, Japan Section of the Regional Science Association International, University of Tsukuba, Japan

Andrés Rodríguez-Pose, London School of Economics and Political Science, UK

Kieran Donaghy, Cornell University College of Architecture, Art, and Planning, USA

Poster Session

1212 MOBILITY PLANNING FOR AN INDIAN PILGRIMAGE CITY- A CASE OF UJJAIN CITY, MADHYA PRADESH, INDIA

Kakoli Saha, N.R. Mandal

Department of Planning, School of Planning and Architecture, Bhopal, M.P. -462030, kakolisaha@spabhopal.ac.in

ABSTRACT

Home to one of the twelve Jyotirlinga shrines to the god "Shiva" (Mahakaleshwar), Ujjain (also historically known as Ujjayini) is one of the seven sacred cities of the Hinduism (Sapta Puri - seven holy pilgrimage centres in India). About 3 million annual tourist visits, Ujjain is a prominent Pilgrimage Destination in India. Also, the city is one of the four locations of Kumbh Mela (the mass Hindu pilgrimage of faith in which Hindus gather to bathe in a sacred river), which is held once in every 12 years. During the last Kumbh in 2016 Ujjain registered visit of 80 million tourists. Since the city witness such huge flux of tourists, it requires to have an efficient mobility plan. Also, Since Ujjain is one of the identified cities for development as a Smart City under Smart City Mission launched by Government of India in 2015, it requires a sustainable mobility plan that promotes health and well-being of the city residents. Though a Comprehensive Mobility Plan (CMP) exist for Ujjain City, it fails to connect personal health and safety of residents of Ujjain City with its mobility pattern. This paper proposes an environment friendly transportation strategy, including enhancement of active mass public transit network and development of cycle routes. For the purpose of the study, the road network of Ujjain City is digitized in the GIS platform. Detailed door to door survey was conducted to gather information about modal choice, willingness to shift to bicycle for local travel. Integrity, level of preference and connectivity of each road is analyzed using the space syntax analysis tool. On the basis of the above analyses, proposals including the introduction of new bus routes, cycle track were formulated to enhance mobility of pilgrims within Ujjain City.

Key words: Pilgrimage city, mobility plan, bicycle

1. INTRODUCTION

Most of the Indian cities have developed organically and earlier the process of city planning was never given priority in most of the development agendas. But however this random one sided demand, supply approach has disrupted the sequence of equitable development. The capitalistic nature of growth has so far addressed only the existing demand foregoing the actual need which is the basic right of every citizen within a democratic set up. Ujjain City of Madhya Pradesh is no exception to this.

In the Indian community, traditions are deeply rooted despite modern lifestyle. One such traditional practice is pilgrimage that almost all religions follow, in one form or the other. The ancient city of central India, Ujjain is situated in the Malwa region of Madhya Pradesh, on the eastern bank of river Kshipra. The religious importance of the town has made it one of the most prominent pilgrimage sites for Hindus with the divine presence of Mahakaleshwara Jyotirlinga and auspicious Mahakumbha mela that is held after every twelve years. With an annual pilgrimage volume of 75 million Ujjain needs a sustainable mobility plan for religious tourists.

For that purpose the study aims to explore the existing city transport network and propose sustainable, accessible and equitable movement strategies to enhance the living condition of the city.

2. BACKGROUND STUDY

Mobility forms one of the key functionalities in any urban area. Attempts to address mobility in Ujjain have been restricted to increasing capacity of existing roads (new flyover) and traffic management (one-way system). A holistic view to address the issue of mobility is lacking in the urban transport planning process in Ujjain. Ujjain has so far not formalized a comprehensive urban transport planning strategy, linked to an urban development strategy. What underlies the ensemble of actions, plans and proposals appears to be: negligent of pedestrians, non-motorized and local area travel; (lacking in engineering) supply-driven; overly accommodating to individual motor vehicles; severely lacking in provision & regulation of public transport services. This has led to a lack of comprehensive information on the issue of the different facets of mobility in the City.

To address the above mentioned issues, Ujjain Municipal Corporation took the initiative to formulate a Comprehensive Mobility Plan (CMP) for the city of Ujjain. Through this mobility plan, Ujjain Municipal Corporation and the supporting authorities aim to develop Ujjain as knowledge and pilgrim centre - maintaining its great religious, ancient and cultural image providing a better and sustainable environment & transport Infrastructure to all its citizens and visiting pilgrims.

Though the CMP proposed Traffic and Transportation plan for Ujjain, it's not linked with the environment and the health of the city. To fill the gap, this research proposed environment friendly transportation strategy, including enhancement of active mass public transit network and development of cycle routes.

3. STUDY AREA AND DATA USED

Ujjain city of Madhya Pradesh is selected as case study area because with more than 5000 years old history, Ujjain is one of the renowned Hindu places of pilgrimage in India (fig1A).

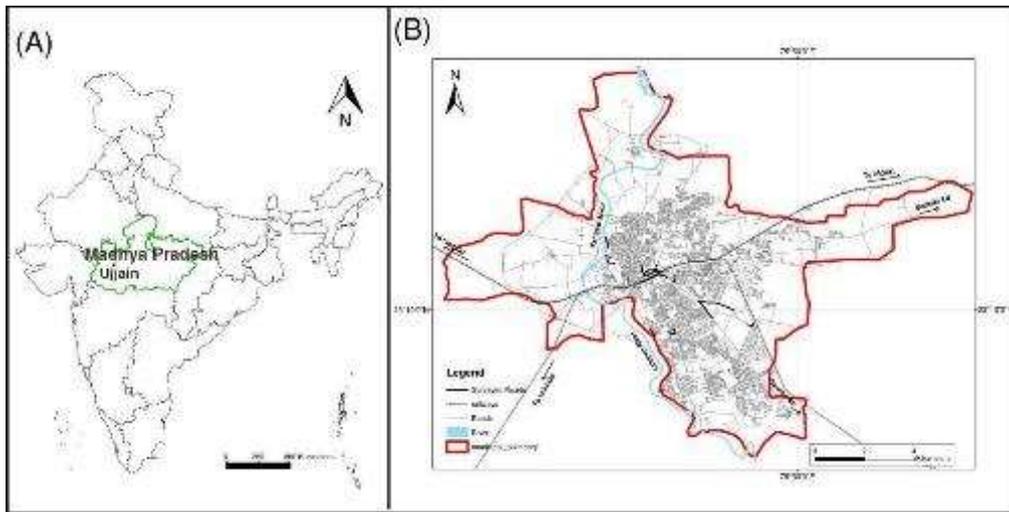


Figure 1: A. location of Ujjain city in India, B. Ujjain Municipal Boundary representing Ujjain city

For this study, data are collected through both primary and secondary sources. The road network of Ujjain City is digitized in the GIS platform. Information about modal choice, willingness to shift to bicycle for local travel was gathered through door to door survey.

4. METHODOLOGY

To propose sustainable, accessible and equitable movement strategies within Ujjain City, three steps were taken which are 1) Understanding existing city transport network, 2) To perform Travel Behaviour Assessment of Ujjain City residents, 3) City wide axial network analysis through Space Syntax.

4.1 Understanding existing city transport network

Information about existing city transport network was obtained through secondary data collection from concerned departments of Ujjain City. Table 1 summarizes the detail of the transport network of Ujjain City.

Table1: Existing City Transport Network

Total Municipal Area	102 sqkm
Total Road Length	883.80km
Public Transport Modes	Bus, Magic (ITP), Auto –rickshaw (three wheeler)
Total Bus within the City	36
Total no. of IPTs	7450

In Ujjain, the length of the road network is nearly 350 Km and there are maximum number of tar roads (86% of the total roads). Concrete road is almost 12% of total road. The per capita road length of Ujjain city comes out 0.81 meters.

4.2 To perform Travel Behaviour Assessment of Ujjain City residents

To perform Travel Behaviour Assessment of Ujjain City residents a detailed household level survey was conducted consisted of about 500 personal interviews within the delineated study area. The questionnaire format included components like modal choice, vehicle ownership and various other socio-economic detail that influences travel behavior. A willingness survey was also conducted along with the travel behavior questionnaire for deriving opinion regarding the preference to adopt bicycle as the major mode of transit within the city.

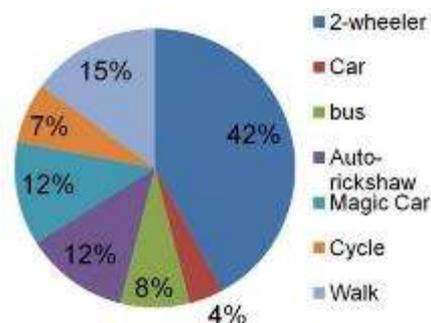


Figure2. Modal share of residents of Ujjain

The house hold data obtained from the primary survey exhibit that almost 22 percent of Ujjain traffic mix comprises of slow moving traffic among which 7 percent of people chose to cycle and 15 percent prefer walking over any other available mode of service. Hence a potential user group can be easily identified for the visionary goal of city health promotion through low carbon, equitable and accessible transport modes.

Figure 2 also shows that the majority of mobility demands are catered by two-wheelers especially among the higher income groups. The lower income population group uses magic and walk as their main mode of communication. The modal share of public transport within the city remains alarmingly low.

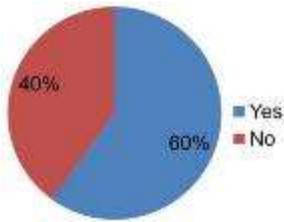


Figure3: willingness of people to accept bicycle as the major mode of travel

The household survey data in terms of acknowledging willingness of the urban residents summarized 60% positive inclination towards using cycle as an alternative modal choice over other motorized transport considering that supporting infrastructural needs are taken care of (fig.3). Also a large dominance of cycle users was identified for work related and education related trips. In addition to these, location that witnessed high slum population and chooses non-motorized systems for making their daily trips has the highest number cycle users.

4.3 City Wide Axial Network Analysis (Space Syntax)

Software based ‘Space Syntax’ is a technique which can help to analyze spatial layouts and network layouts in urban areas. Space Syntax makes us understand how people move, which the preferred routes are and how people adapt to city’s growth. Spatial form analysis is done by angular analysis. The method of angular analysis is applied on axial segment map. Analyzing axial map tells us the flow of movement in a given network. The most popular way to analyze an axial network is through Integration, Choice and Connectivity. In this research Space Syntax has been used to understand levels of ‘Choice’, ‘Integration’ and ‘connectivity’ of individual road stretches in the overall road layout pattern of Ujjain.

Choice measures movement flows through spaces. Spaces that record high global choice are located on the shortest paths from all origins to all destinations. Choice is a powerful measure at forecasting pedestrian and vehicular movement potentials. It literally shows how often a street happens to be on a shortest path between an origin and a destination.

Integration measures how many turns have to be made from a street segment to reach all other street segments using shortest paths. Integration is inversely related with depth. Depth tells how far away an element is from all the other elements.

Connectivity is a local property. It measures the number of nodes that are directly connected to a given node.

To perform Space Syntax analysis the road network of the Ujjain City is fed into depthmapX software. The software performed analysis and produced three separate maps for choice, integration and connectivity (fig.) in those maps, hotter colors (orange/red) represents higher values.

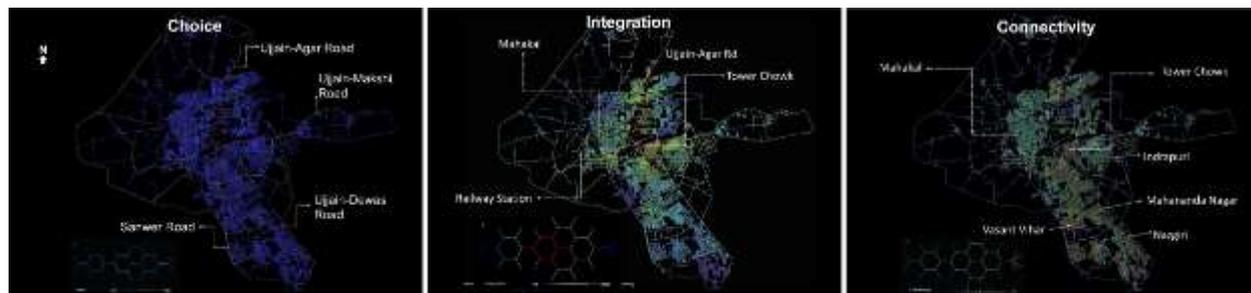


Figure 4. Maps showing results of Space Syntax Analysis.

According to choice analysis (fig.4), Ujjain-Agar road, Ujjain-Dewas road, Ujjain-Maksi road and the Sanwer road have the highest total values of accumulated flow resulting the highest choice values in Space Syntax. These roads also carry the highest through movement in Ujjain. According to “Integration” analysis (fig.4), Tower Chowk area, Mahakal temple area and the stretch along Ujjain Agar road up to the railway station are the most popular commercial and recreation areas in the city having nodes of highest integration levels. According to “Connectivity” analysis (fig.4), Vasant Vihar, Mahananda Nagar, Nazgiri and Indrapuri areas of the newer part of Ujjain have the most connected area. Because the newer part of Ujjain has planned road network, connectivity between roads is also high. From older part of Ujjain, Roads of Tower Chawk (fig.4) area show high connectivity.

Roads identified by space syntax analysis were further used to propose mass public transit network and development of bicycle routes.

5. DISCUSSION AND CONCLUSION

Detailed analysis of the city shows a greater opportunity to be evolved as a green, equitable, pedestrian friendly healthy city. Information gathered from detailed survey and space syntax analysis were used to formulate proposals related to bus and Magic services (Intermediate Para Transit or IPT).

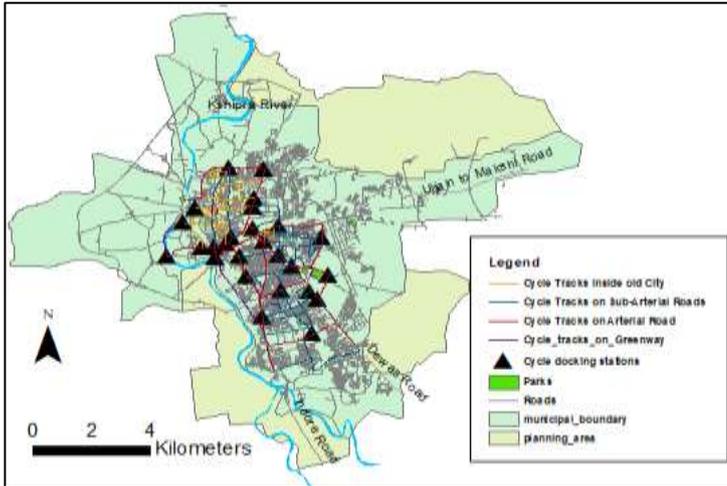


Figure 6. Proposed bicycle network

Table 2. Length of proposed bicycle routes

Proposed routes	lengths
Cycle tracks on Arterial roads	33km
Cycle tracks on Sub arterial roads	28.3km
Cycle tracks inside old city	15km
Cycle tracks on greenways	8km

The Proposed cycle route covers 10% of total road network promoting healthy city vision. Cycle docking stations are proposed in selected areas, according to the level of demand. The proposed docking system should accommodate automated locking systems with smart cards or QR codes. An automated system would ensure more security and would provide a better user experience. Twenty Five such Docking stations in Ujjain are placed near important origin and destinations, which includes heritage areas (Mahakal, Ram Ghat, Chakra Teerth ghat and Kothi palace) Commercial Areas (VK market, Freeganj, Tower Chowk) public transport hub (Ujjain railway station, Nanakheda Bus Stand) and residential areas. The uniqueness of these docking stations are that any user can lock their cycle using the smart cards.

To ensure user friendliness of the proposed cycle tracks and in order to maintain overall green cover of the city, high canopy trees like (Gulmohar, Neem, Maltus) will be planted along the major routes (fig.7).

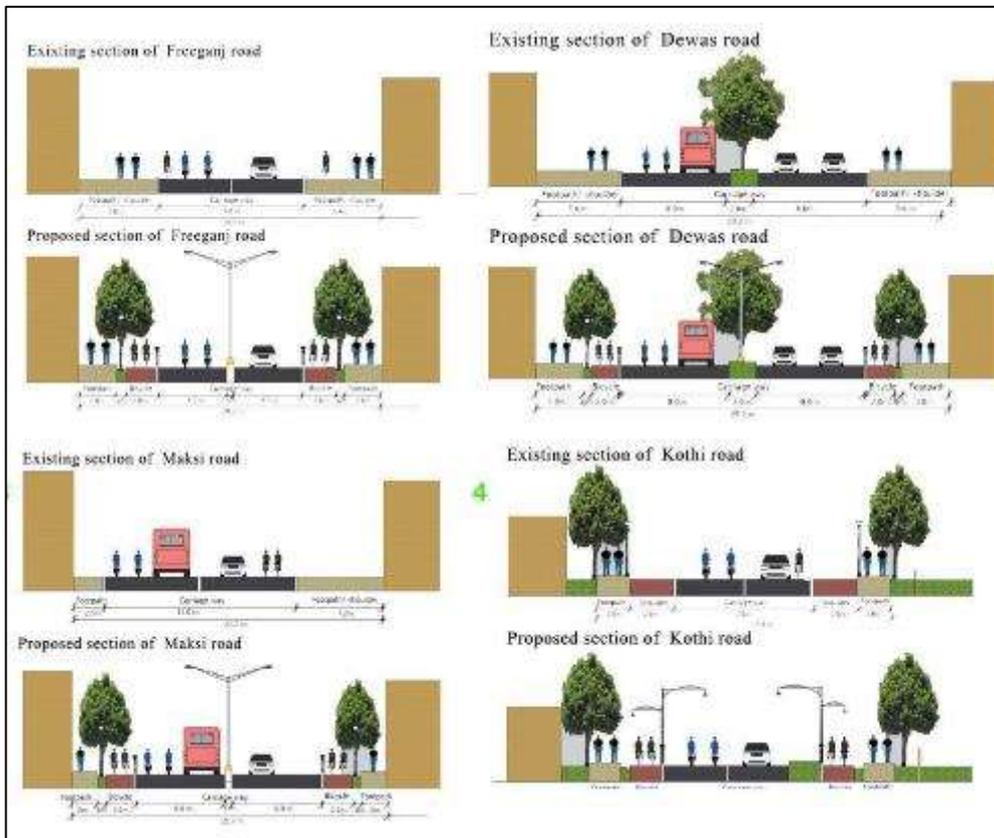


Figure 7. Proposed planned road cross sections

Since Ujjain is one of the identified cities for development as a Smart City under Smart City Mission launched by Government of India in 2015, substantial major urban investment in Ujjain City will happen through the Smart City

Mission (Smart City, 2015). As a result, the infrastructure proposed in this research for sustainable mobility may be implemented quickly and efficiently.

The proposed mobility plan would help local authorities to make Ujjain City more attractive to religious and other tourists ultimately increasing its revenue from tourism. Sustainable transport infrastructure will also improve the quality of life of the residents of the city. The proposed plan may be adopted by other such cities endowed with religious destinations.

ACKNOWLEDGEMENTS

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REFERENCES

Comprehensive Mobility Plan: Ujjain City (2008), Ujjain Municipal Corporation.
Smart City Mission Statement and Guidelines, Government of India, Ministry of Urban Development, June 2015.

1257 A STUDY ON THE METROPOLITAN CITIES IN INDIA: PROCESSES, GROWTH AND INFRASTRUCTURAL FACILITIES

ABSTRACT

There has been a significant increase in the number of metropolitan (million plus) cities in India from one in 1901 to fifty three in 2011. The process of metropolitanization is a product of intense interaction between cities, and integration of the national economy and urban centres into a viable independent system (Ramachandran, 1989). The objectives of the study are: (i) to determine the various historical, economic, geographic, demographic, social, political factors that have played an extensive role in the metropolitanization of the cities, (ii) to analyze the status of infrastructural facilities in the metropolitan cities (iii) to capture the variation in growth, specifically the population growth and areal expansion of these cities. The study adopts a qualitative and quantitative measure to address the aforementioned objectives. The analysis has been made based on the data collected from The Census of India (District Census Handbook, All India Town Directory; H Series: Table on Houses, Household Amenities and Assets). A Composite Index has been developed to determine the urban infrastructural facilities (like the road density, banks, number of beds in the hospital, educational institutions, etc). Subsequently, the metropolitan cities were broadly categorized as high, medium and low level of urban infrastructural facilities. A descriptive statistical framework has been used to determine the variation in growth of the metropolitan cities. The analysis shows that there has been an incredible increase in the number of metropolitan cities from 23 in 1991 to 53 in 2011.

Historical factors have played an imperative role in the evolution of cities like Delhi, Kolkata, Varanasi, Madurai, Mumbai, Patna and Hyderabad. Additionally, in cities like Kanpur, Lucknow, Surat, Asansol, Dhanbad, Jamshedpur, Jabalpur, Kozhikode, Thrissur, Malappuram, Thiruvananthapuram, etc., economic factors played a vital role in its growth. Cities like Vasai-Virar, Meerut and Ghaziabad have grown under the ambit of the megacities of Mumbai and Delhi. Adoption of the development plan by Kerala has been one of the reasons for an increase in the number of metropolitan cities in the state. An observation on the status of the infrastructural facilities calls for its future development especially in the improvement of the road, industries, increase in the number of beds in the hospital, educational institutions, street lighting. Keywords: Metropolitan Cities, Composite Index, Urbanization, Infrastructural facilities.

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1286 UNDERSTANDING THE PRESENT SOCIAL STATUS OF THE ANGLO-INDIAN COMMUNITY OF KOLKATA

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ABSTRACT

The fusion of diverse cultures and races lead to a formation of unique socio-cultural community, of which Anglo-Indians are the best example. The Anglo-Indians are the mixed descendants of the cross-cultural union between Indian and British. The largest numbers of Anglo-Indians are found in different parts of Kolkata among all the cities of India, who still reflects their unique imprint of cultural traditions. But from Independence, the community started losing their grip in the multi-cultured society of the city. Though their presence can still be observed when one visit Bow Barrack and Park Street during Christmas or Halloween yet they are getting socially intermingled with other communities and thus are unable to retain their own specific identity with the help of unique cultural imprints, unlike the earlier days in Kolkata. This research paper has dealt with some Anglo-Indians from different parts of the city where they are considered as the dominant residents. The results from structured questionnaire surveys with open-ended questions as well as close-ended questions and in-depth interviews revealed that not only their numbers are diminishing but also in terms of social status the structure of the community has undergone modifications and changes, their occupational distinctness (the first generation of Anglo-Indians were mainly involved in jobs of railway departments) is eventually getting extinct and their indifference to retain their society through cultural and social activities result in the intermingling of the community to a great extent with the other communities residing in Kolkata. Further they were also asked to comment on their social status as a cultural group and it was found from the survey, where they were asked to ascertain a scale of their opinion in 1-5, the results reflects that in spite of their responsiveness of being a faint cultural group most of them are not that much involved in reclamation of their social entity and that is a very pertinent reason which in future will result in acculturation of Anglo-Indians and socially integrating themselves with other communities which will make their cultural imprints merely a history.

Keywords: Anglo-Indian, Cultural group, Social status, Acculturation, Bow Barrack, Kolkata

1. INTRODUCTION

The intermingling of diverse culture and racial background has often led to acculturation, of which Anglo-Indian is a perfect example. British in the hope of indigenous support encouraged the growth of the community of Anglo Indian, who was the mixed descendant of the cross-cultural union between Indian mother and European father ([Bhowmick 2009](#)). Anglo-Indian community gradually developed its distinct culture and unique lifestyle which were the blended version of both Indian and European traditions, but the prevalence of latter one is remarkable ([Procida 2002](#)). British were the dominant contributor to form such assimilated community rather than any other Europeans like Portuguese and French ([Debi and Nandan 2006](#)).

In the nineteenth century, Anglo-Indians numbering 100,000 represents a small minority group having a sound authoritative knowledge of Indian cultures and complete believe in British Raj ([Walsh 2006](#)). During the freedom movements in India, many Anglo-Indians were found to be with the British and thus, it resulted in a deep feeling of distrust among the then Indian people which in turn reduced the potential acceptance from the native country people in favor of them ([Masters 2012](#)). Most of the Anglo Indians had already left India during its independence in 1947 intending to settle down in UK, Australia, New Zealand and Canada. The exodus continued till late nineteenth century when most of the Anglo-Indians left the country and those who could not, still aspire to leave ([Anthony 1969](#); [Mills 1997](#)). They followed British customs and tradition and thought themselves as British. Melvyn Brown, known as the “chronicler of Anglo-Indian community” says that most Anglo-Indian who left for western shores were affluent enough but those who left behind could not afford to move. Since 1961 Anglo-Indians have not been counted separately in the census ([Caplan 2003](#)). Presently as per as the Indian constitution, Anglo-Indians forms the only minority group in the arena of the social, cultural and political level, with English as their mother tongue and are most urbanized in terms of residence. Though being a marginalized community, the socio-cultural uniqueness of the community has a noteworthy impact in India and in Kolkata as well, where they constitute the largest number of the population compared to the other place of residence.

The Anglo-Indian community after 1970 faced a challenging phase of their existence. The job reservations in certain public sectors like railways, post and telegraphs and customs for the community ceased to exist, the social survival situation becomes difficult (Dhavle, 2010 & Sen, 2014). The separation of the community from the mainstream society forces them in the formation of their own association, incorporated themselves into a new avenue of work and developments of the schools. The community lacks the solidarity and collaborative power which have created political backwardness for themselves which has impinged upon the educational backwardness as well, as exemplified in the study by Lobo in 1996. The Anglo-Indians soon after independence faced identity crisis and their social position and existence become endangered which has forced the community into endogamous marriage. The women who go out of this tradition and marry non-Anglo-Indian men are excluded from being a member of the community (Sen, 2014). This leads more to the decrement of the Anglo-Indians population also.

The paper specifically deals with the cultural and social aspect of Anglo-Indians of Kolkata city. It also attempts to find out the imprints of remarkable cultural aspects of the community and at the same time, the work analyses the social

entity and status of such cultural group in Kolkata city, especially in those places which are significantly characterized by their habitat and working environment. The work is very pertinent from the social dimension as in different studies of society it has been found that culture really matters in the society. The culture of a group helps to shape its social process and this is why culture is considered as work; and work itself is a social process ([Smith 2000](#)).

2. OBJECTIVES AND RESEARCH QUESTIONS

The objectives of the research work are:

1. To understand the remarkable cultural imprint of the Anglo-Indians in Kolkata

Research questions:

- What are the unique cultural traits they follow?
- How are they different from rest of the community in terms of housing, food style, eating habit and dress code?

2. To unveil the present social entity and status of the Anglo-Indian community.

Research questions:

- What is the present social crisis that the community is undergoing?
- How is the community overcoming the crisis?

3. METHODOLOGY

The research work is based on literature studies and primary survey via interviews and questionnaire survey. The work has undergone through reviews of literature which are available in different texts, libraries and some exclusive sources in Kolkata city, like National Library, Asiatic Society and Young Men Christian Association. The literature background analysis through bibliographic research, provide the base for the understanding of the cultural traits of the community. The Map has been prepared under the GIS environment which demonstrates the evolution of the habitat of Anglo-Indian in West Bengal and it is self-explanatory in the study of socio-cultural dimensions of a particular cultural group. The map is important in the socio-cultural evolutionary studies as it helps us to understand the spatial and temporal pattern of the community and its location along with tracing of its migration paths ([Calkins 2012](#); [Edelson 2012](#)). Primary data has been collected by conducting the survey which includes interviewing of Anglo-Indians in Kolkata, questionnaire survey with open-ended as well as option based questions. Such questionnaires have been framed on the basis of perception which is guided by the detailed literature studies about cultural and social aspects of Anglo-Indians. The sample size of seventy Anglo-Indian persons is considered keeping in mind the time constraints and research objectives and moreover, such sample has been chosen very carefully so that it can represent the whole community and different aspects under study. In addition, the respondents are chosen through snowball sampling as their population counting was stopped recorded in the census since 1961.

4. CULTURAL IMPRINTS OF ANGLO-INDIANS IN KOLKATA

Kolkata can be considered as the habitat of a considerably largest number of Anglo-Indians in the world ([Andrews 2014](#)). They have a lasting impact on the culture and tradition of Kolkata city and have developed their own cultural uniqueness. In all dimensions from distinct Churches like St. Andrew's, St. Mary's to vibrant educational institutes like St. Xavier's College, Assembly of God Church to typical cake shops like Flurys, Saldanhas bakery Anglo-Indians have a strong cultural imprint. Their clothing, foods, traditions, customs highly resemble their significant inclination towards the European culture ([Bönisch-Brednich and Trundle 2012](#)) and their reluctant nature to adopt Indian culture that lacks western essence ([Procida 2002](#)). Their cultural attributes such as following Christianity and western style and considering English as their mother tongue resulted in a cultural gap between them and other Indian cultures ([Gist and Wright 1973](#)). Thus, Anglo-Indians are considered as an amalgamation of two cultures and two races ([Padua 2005](#)).

4.1 Habitat imprints in the city

In the earlier times the city was divided into two main sections: "the Black Town" for natives and "the White Town" for the British administrators, businessmen and Anglo-Indians. The central Kolkata is largely influenced by British as reflected from its architecture than any other part of the city. This is the area where Anglo-Indians first made their home ([Andrews 2005](#)). They mainly avoided the wards that were dominated by the then Hindu population. Since the Anglo-Indians were the result of the mixed union between British and Hindu, they were denied of a recognizable status within Hindu caste system and thus were excluded from the Hindu society. But to the contrary, European community welcomed them wholeheartedly as the addition to their numbers ([Dover 1943](#); [Glorney 1935](#); [Stark 1987](#)). It was in the late eighteenth century when they got recognized as a separate cultural group ([Grimshaw 1959](#)) and by 1750 in Kolkata Fort Williams, St. Anne's church, freemason's society were built and the first theater was opened. After the Mutiny in 1857, the gap between Anglo-Indian and Indians became wider due to their assistance and support to British for controlling the transport and communication means ([Grimshaw 1959](#)). Later in the last decades of the nineteenth century, under the pressure of 'Indianization' the British started to seclude them and denied their preferential right ([Craddock 1930](#)). Thus, the social contact between the British and Anglo-Indian community started declining. Such decline caused a strong unity among the Anglo-Indian members and they started acting in a group as an exclusive community and ultimately acquired a cultural identity which is a blended version of both East and West. They started considering India as their Motherland and British as their Fatherland ([Blunt 2002](#); [Grimshaw 1959](#)).

Basically, the Anglo-Indians indigenously settled in small railway colonies (Figure 1) like Kharagpur, Santragachi and Asansol ([Roychowdhury 2000](#); [Schermerhorn 1975](#)). They were mostly engaged in the jobs offered by the then railway departments ([Cressey 1935](#)). Slowly the second generation of Anglo-Indian started moving towards Kolkata (Figure 2); mostly settling in areas around Elliot Road, Bow Barrack, Rippon Street, Park Street, the area between Circular Road and Chowringhee, Park Circus in their own mansions ([Sen and Goswami 1988](#)). But the scenario in case of the Bow Barrack (oldest building of central Kolkata) is completely different. The Anglo-Indians of Barracks are born and brought up in Kolkata. They at heart are Kolkatans. This has also been revealed from the interviews. Now Anglo- Indians are known for their typical big families. Later on, when India got independence, they had a choice either to leave or stay in India. Frank Anthony, their political leader and historian made a decision to stay on ([Anthony 1969](#)). Since then they have imbibed the Indian culture into their lifestyle.

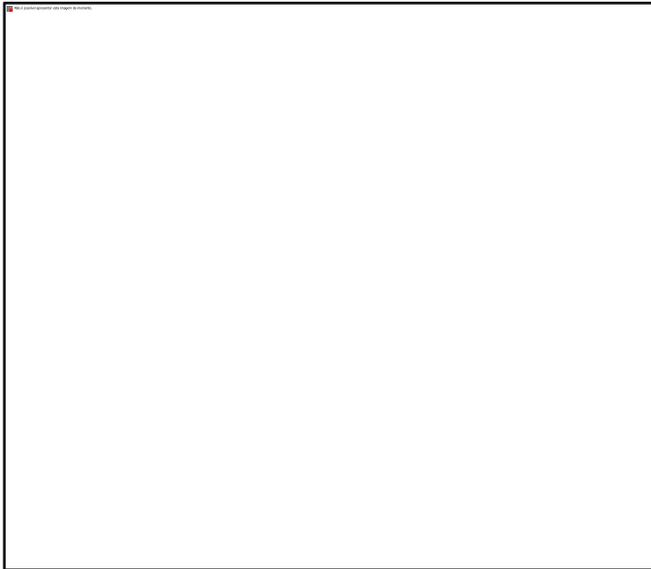


Figure 1. Railway Colonies of West Bengal from where the Anglo-Indians migrated to Kolkata

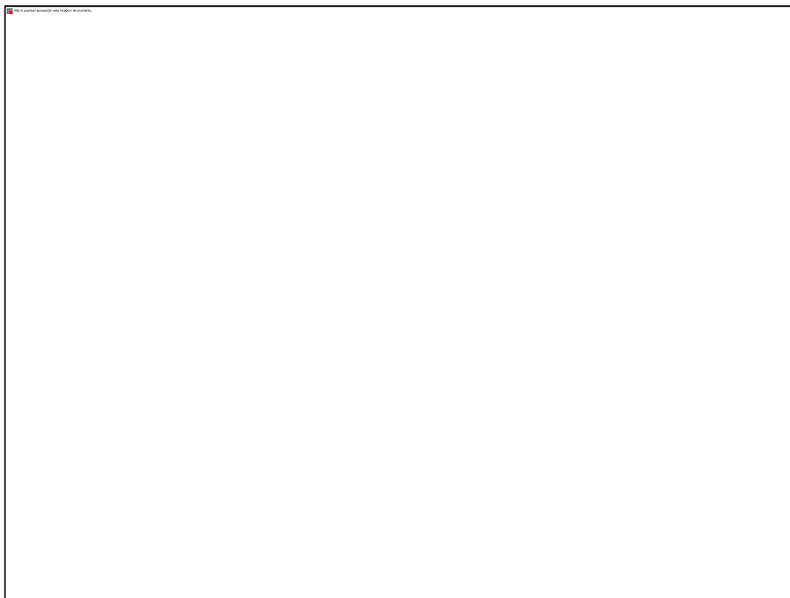


Figure 2. Places in Kolkata city where to the Anglo-Indians migrated

4.2 Anglo-Indian Associations

Anglo-Indians have formed an association known as All-India Anglo-Indian Association (AIAIA). It is the direct progeny of Eurasian and Anglo-Indian Association, founded in 1876 in Calcutta ([Moreno 1923](#)). The Association has over 62 branches in India. In Kolkata, the Anglo-Indians have developed the club culture where there are clubs like the Ranger Club, Grail Club, Calcutta Anglo Indian service society (CAISS), Dalhousie Institute and Anglo-Indian Catholic federation. In Bow Barack, they have formed their own Bow Barack Association where they take initiatives to organize special days for sports, Easters, New Year and Christmas (revealed through interviews). They get together mostly on Sundays and whenever they are free to have a drink or play some pool and party. Mostly the club members come together and celebrate the day by playing guitar and singing a country song. All together, they consider themselves as socially well-coordinated community and certainly love to have parties and also need lots of get-togethers which may be exemplified by the IXth International Anglo-Indian that was held in Kolkata from 6th to 12th January 2013 where the Anglo-Indians all over the world gathered at the same place.

4.3 Anglo-Indians' typical cultural imprint on Kolkata

Anglo-Indians' cultural identity in terms of their customs and traditions are more of the European type. They have adopted English as their mother tongue and attire as of western kind. Their family planning, house structure, housing furniture, lifestyle, food habits and accepting Christianity as their religion, associate them more with the Western culture rather than of East. They have put a little effort in understanding of other Indian cultures like Hinduism, Islam or any other else. They also have a faint knowledge about Indian mythological heroes, Indian's art, dance forms and literature than that of the British's form of society, western folk protagonist and literature. It is highly evident that the Anglo-Indian members of India belong mainly to two most powerful and conservative Christian sects ([Hedin 1934](#)). Most of the Anglo-Indians are Roman Catholic and so, in every church like St. Thomas in Middleton Row or St. Mary's in Rippon Street they can be mostly found, though one-third is Anglican and remaining are of Protestant faith ([Cressey 1935](#)). Anglo-Indians with Catholic and Protestant beliefs differ from each other in the services they do and prayer they perform. Protestants believe they can directly pray to Jesus instead of praying to the saints' intercession while the Catholics believe in the saints. Catholics have an Order of Mass while Protestants just have Sermons, Protestants have Pastors who can marry but Catholics have Priests and Nuns who completely devote their lives to Jesus. Anglo-Indians have a convention of visiting churches on every Sunday. Christ with the sacred heart is the common image that is present in almost every Anglo Indian's house in Kolkata. Apart from the holy images and idols, the altar and showcase are common too. Most of them don't know the reason but they believe that the altar and showcase have to be there. And this tradition is passed through every generation. The altar and the showcase are mainly present in the living room but those who have large mansion they have them in a separate room ([Andrews 2005](#)).

At a very scheduled time at 7.15 in every evening, the Roman Catholics of Bow Barracks recite the rosary at a grotto, built in 1999, against the wall separating two blocks of Barrack. Held once a year is the Feast day of Lady of Lourdes (title given to Blessed Virgin Mary) in Barrack which is the celebration of the anniversary of the grotto with a rosary, procession, supper, drink and merriment ([Andrews 2005](#)). Anglo-Indians are the culturally rich community with members having a sound knowledge about their customs and traditions. Anglo-Indian culture is completely different than that of the Converted Christian. They have a sense of superiority over the Converted Christian ([Caplan 2003](#)). Moreover, in Kolkata, the Anglo-Indian Christianity is the milieu of Hinduism. Thus it is termed as "Hindu Christianity". This is reflected through the change in the seating arrangements in the church that is made on the floor, use of agarbatti (incense sticks), garland and arti (prayer with candle), which enlighten the shift of expression or the assimilation of culture ([Robinson 2003](#)). The seating arrangements are made on the floor especially during a marriage.

Among the festivals celebrated by Anglo-Indians, Ash Wednesday marked as the beginning of the season of lent where they burn the Palms of the previous years' Sunday Palm for ash which is blessed. They considered ash as the symbol of the transience of life; it is from dust humans are created and to dust, they shall return. After forty days of lent which is the period of prayer, fasting and self- introspection they celebrate Maundy Thursday. Maundy Thursday is the ceremony of washing the feet and reciting the story of Jesus' last supper ([Bower 2003](#)). Maundy Thursday is followed by Good Friday, which commemorates the final hours of Jesus life which is in turn followed by the celebration of Easter, which is the resurrection of Jesus Christ, the old and most important Christian feast ([Trawicky 2009](#)). Christmas is their main festival of merriment when they celebrate the birth of Jesus. They have a tradition of making their own Christmas cake which is the distinct Anglo-Indian custom. Each family has a secret cake recipe, handed down by their grandmother. During Christmas Anglo-Indians as well as other community of Kolkata celebrate the day by eating cakes. They mostly buy cakes from Flurys, famous Anglo-Indian cake shop and others include Nahoums and Saldanhas Bakery. Nearly three weeks prior to the holy eve of Christmas every church like St. Paul's cathedral, St. Mary's, Auxillium, St. Anthony's , St. Thomas, St. Anne's including the whole Park Street and Bow Barracks get dressed with lights. And on the eve the whole Kolkata along with the people from neighboring districts gathered around Park Street, St. Paul's cathedral and other notable places to enjoy the Christmas celebration, which is celebrated with singing carols, bursting of crackers and all people wear Christmas caps. And the Anglo-Indians of Barracks donate and help the poor Anglo-Indians' as well as other communities' children on the Eve of Christmas. Next to Christmas, Baptism, first Holy Communion is celebrated by the community with a big bash. They consider Baptism as a bond which binds the community together. Marriages, engagements and birthdays are the other celebrations which they are heavily into.

Anglo Indians are highly gregarious and convivial community who love to feast. They are a connoisseur in eating and drinking and are crazily into sports and music lovers. Music, movies and socializing were high on their agenda. From jazz to tango; from swings, cabaret songs to Hollywood film songs, their styles in music are varied. Sheet music i.e. handwritten or printed form of musical notations was first organized out of Kolkata which was later available throughout most cities of India ([Shope 2004](#)). The famous jazz singer of Kolkata Pam Crain, on whose song the whole Park Street swings, is the Anglo Indian whose contribution is widely known. She is India's first and only jazz diva. She was the voice of the legendary Blue Fox in Calcutta. In 1971 Pam Crain, saxophonist Braz Gonsalves and Louis Banks together form a band known as "The Louis Banks Brotherhood". They began performing at the Hindustan Hotel which led to an invitation to play at the famous nightclub of the then Calcutta, The Blue Fox Restaurant ([Atkins 2003](#)). Among Anglo-Indian bands, Sonny Lobo's band and Don Saigal's band are the well-known bands of 1930s Calcutta. They love to dance. Jam attracts mostly the Anglo Indian teenagers while all other loved jive, jitterbug, foxtrot, waltz, swing dance which embellishes on the two-step pattern and frequently incorporates acrobatic style swing steps. Annual Christmas dance, wedding dance, regular club dance; they would find excuses for music and dance ([Brown 2010](#)). All the Anglo-Indians are crazily into sports. Leslie Claudius and Vece Paes are the recognized personnel who have made a huge contribution in the Indian Hockey; Jennifer Paes in volleyball and Leander Paes, the son of Vece Paes and Jennifer Paes, in lawn tennis are the Anglo-

Indians of Kolkata, nowadays here lies huge difference between the new generation Anglo-Indian and Kolkata's Anglo-Indian. Today Anglo-Indian refers them more towards India than towards Kolkata of which the best examples will be of Leander Paes and Derek O'Brien whose own excellences gave them the limelight in India.

4.4 Culinary imprint of Anglo-Indian community

Anglo-Indians have adopted a unique cuisine style which is a mixer of both East and West, combination of the European and Indian percent. The intermingling of the two cultures has resulted in an assimilated food recipes in the Anglo-Indian kitchen. They are non-vegetarians and thus have a strong affection towards the western dishes for meats and eggs and Indian dishes for rice, vegetables, curds, papads, pickles and chutney. Anglo-Indian cuisines have a great deal of innovation and variety in soups, entrees, side dishes, sauces, salads and desserts. They liberally use coconut, yogurt and almonds in their recipes with a tinge of Indian spices ([Brown 1998](#)). Of all the cuisines "mulligatawny" is the world-renowned soup, which is the anglicized version of the Tamil word for "pepper broth". Even though their food resembles the amalgamation of British and Indian, the Christmas dinner is uncompromisingly the British. For Christmas dinner, Anglo-Indian of Kolkata consume mostly chicken roast, pork vindaloo, mashed potatoes and spiced ribs and for lunch, pulao chicken curry is commonly preferred. And the dessert includes Palm cake, Apple pie and pudding. They normally consume yellow rice and ball curry which is actually pulao and kofta. Most of them cooked yellow rice and ball curry on Sundays. Other Anglo-Indian recipes include boiled eggs and capsicum curry; devilled beef mince balls, caramel custard, pork or lamb chops, chicken jalfrezi, kushka rice, pea's pulao and others. Anglo-Indians in Kolkata have opened their own cake shops known as Flurys and Saldanhas bakery which are famous for cakes and desserts. At the time of Christmas, the hotels and restaurants at Park Street mainly serve Anglo Indian cuisines. They are frequent visitors of Nahuoms and Trincas. Fairlawn is the only Anglo-Indian hotel in the heart of Kolkata established at 1783, stood on the junction of Madge Lane and Sudder Street. Six National awards were awarded to the Hotel by The Ministry of Tourism which contributed to the pride of the hotel itself and to the city, Kolkata. Famous actors like Sashi Kapoor and Jennifer Kendall have stayed in the hotel, whose pictures are still hanging on the wall of Fairlawn Hotel ([Bhattacharya 2014](#)).

4.5 Exclusive dress code

During pre-Independence, the apparel styles included organza, taffeta and fluffy skirts. It was till the 1970s when women wear only western attires- dresses, skirts and pan-suits and gowns; both at works and houses. Anglo-Indians have clothes for different occasions ([Vimala 2013](#)). Usually, twelve dresses they have in total besides four wrappers, which include two afternoon dresses, two plain white dresses, one cold weather wear, one ball dress, two dinner dresses, one waterproof dress, two evening dresses, one black silk, with two skirts and two bodices ([Anglo-Indian 1882](#)). But in recent times, to blend with others they wear salwar and kameez at work. Clothing for men includes long tailored trousers and open-necked business shirts ([Andrews 2005](#)). Even now during marriages, engagements and funerals they prefer to wear dresses and suits. Anglo-Indian women could be identified by the Holy Cross on a necklace they wore with any clothing. English is the mother tongue of all Anglo-Indians in Kolkata. The language which they use is quite unique. They have funny phrases like "Chutney Mary", for a girl who dresses up a lot; when aunties wear dresses and petticoat shows, they call it "Sunday is longer than Monday"; they call a girl "Wallflower" when she is without a partner at a dance.

4.6 Community imprint in educational sector

In the first half of nineteenth century in the urge to provide education to their children many educational institutes were established with the aid of influential men and societies La Martiniere College was established in 1836, St. Xavier's College in 1834 and the other institutions include St. Thomas, Calcutta Boys', St. Paul's' Mission School, St. Michael Anglo-Indian School, Frank Anthony Junior School, Pratt Memorial, Scottish Church, St. Bernabas' High School ([Kaminsky and Long 2011](#)). The Anglo-Indian organization in Kolkata by taking subscription fee from their members which varies from 15-45 rupees a month provides scholarship to students in every year. And they have an educational institution like Frank Anthony Public School which provides free education for Anglo-Indians. In fact the ICSE board (Indian Certificate of Secondary Examination) is an Anglo-Indian board for education. In fact in Kolkata during recent post Independent era for proper pronunciation and accent of English, the English Missionary Schools appointed Anglo "Miss". They have contributed a lot to the educational system of which mention could be made of Miss O'Connor, Mrs. Brackstar, Miss White and Miss Martindale who were the teachers of Loreto Day School, Sealdah. Other includes the principal of Calcutta Boys' Mr. Hicks and Prof. Pinto of St. Xavier's College ([Bhattacharya 2014](#)).

4.7 Typical occupational pattern

Anglo-Indians have never adopted the traditional joint family system of India. They are believer of equalitarianism of nuclear family. They never imposed any restrictions upon their women in fields of marriage, education and work unlike caste system in Hinduism, which they regard as undemocratic System ([Gist and Wright 1973](#)). In Kolkata, Anglo-Indian women play the dominant role in service sectors during the British Rule, as Hindu women due to their orthodox traditions and customs forbid them to work outside. During British Rule, in occupations like nursing, teaching and secretarial work, mostly the Anglo-Indian women were involved. Eventually, after Independence such involvement was replaced by Indian Christians as Indian Christians have fluency in local languages other than English whereas Anglo-Indians only have proficiency in English on as they were reluctant to learn other local languages. But slowly due to their command upon English they were appointed in number of office works likes airhostess, receptionist, sales personnel, nightclub entertainers, models. So unlike other Hindu women, Anglo-Indian women are independent, self-reliant, hard worker, who have the ability to support themselves and their family ([Schermerhorn 1975](#)). By virtue of the lifestyle, the Anglo-

Indian women were quite habituated in attending nightclubs, drinking liquors and the dresses they wore were considered indecent by the Indian women. Their free and liberated western style of living was considered cheap by other people (Lyons 2005). Very significantly in the present day situation, their lifestyle has a strong imprint upon the women of Kolkata for which they were neglected and considered indecent and cheap before.

The twentieth century was the modern period of Anglo-Indians when they were able to make a rapid progress in every direction. The availability of well standard educational institutes helps them to hold post in different departments of Government. Various Bills and Reforms of the Government like Morley-Minto Reform in 1909, the Montague- Chelmsford in 1919, and the Indian Bill in 1935 recognized Anglo-Indian as a minority group and provided separate electorate for them, where two seats were reserved for them in Lok Sabha. In Kolkata also one seat is reserved for them in the Vidhan Sabha (legislative assembly) (Gangopadhyay 2012).

5. PRESENT CRISIS OF UNIQUENESS IN THE COMMUNITY

The primary survey exemplifies the changing character of the three hundred years old community. The structure of the community has undergone modifications and changes not only in terms of number but also in terms of the social entity.

5.1 Change in habitat distinctness

It is evident that groups of the Anglo-Indian population who are living in the Bow Barrack area are original habitants of Kolkata city and other groups who have migrated into the city are living in some other specific places like Rippon Street, Park Street, Picnic Garden and Behala (Figure 2). Still now, internal migration within the Kolkata city is taking place. The Anglo-Indians from Bow Barracks, Rippon and Park Street are migrating to Picnic Garden and Behala (Andrews 2005). The reasons of migration when asked, they replied in favor of wider place, less congested area. Few among most of the Anglo-Indians of Barracks are still willing to migrate to the other parts of the city. In the context of migration from India, most of the Anglo-Indian surveyed are aspire to go and settle down abroad if they would get chance in the future. Though they the love city and the place they live yet they have the desire to move to places outside India specifically to European, American and Australian countries. But however, their wish to migrate is more imaginative than physical (Gangopadhyay 2012). As revealed from the survey, the Anglo-Indians staying in Kolkata have social communication, links and network with the Anglo-Indian staying in abroad. This is the reason for keeping the flame of desire alive to migrate out (Kandel and Massey 2002).

5.2 Changing occupational uniqueness

Changes have taken place in the family occupation of the individual household when it is compared with the present generation occupation. A Negative correlation (-0.09) exists between the past and present occupational pattern (Table 1). The present generation is not motivated enough to stick with the occupation in which their predecessors were engaged. This highlights the transformation and change in the occupational pattern of the household which in turn reflects the unwillingness to carry on the traditionally typical Anglo-Indian occupations by the present generation. Thus the occupational distinctness is also getting extinct eventually which is quite inevitable.

Table 1. Correlation matrix for family occupation history and present occupation trend

	Family Occupation history	Present Occupation trend
Family Occupation history	1	
Present Occupation trend	-0.097590007	1

5.3 Change in ancestral exclusiveness

In context to the relationship with other community members as revealed from the survey throw light on the fact that they are very sociable and friendly. They have got assimilated with different other communities of Kolkata. In fact, in Bow Barracks they exist side by side with other communities like Muslims, Bengalis, Chinese and Goans. When asked about the relationship and whether they face any discrimination in the city of Kolkata, their reply was like – “No, we work with them, celebrate with them and stay with them within the same compound”, but another aspect has also come out of the survey that within the community there is a little bit of lack of co-operation, mainly among the high and low class Anglo-Indian people. This difference is subdued within their mental set up and generally is not reflected outwardly. The customs, traditions and rituals of this community are the essence of binding the whole community together, otherwise, the sense of commonness and feeling of togetherness would have been lacking among the Anglo-Indians (Cressey 1935).

As far as the inter-community marriage is concerned it is found that once believing in extreme endogamy this community in the present day is characterized by some exogamous marriage practices. It generally leads to acculturation at the cost of exclusive and conspicuous cultural traits. Therefore, the Anglo-Indians who are accepting the exogamy practices are basically accelerating the process of acculturation. The community encourages its people not to accept the exogamy. The analysis of primary data represents that the correlation between ‘intercommunity marriage’ and ‘financial assistance from Associations’ (Table 2) is a little bit positive (0.22) there is a relationship between these two components. It is because of the fact that the persons, who have done inter-community marriage, are not getting financial incentives provided by the Anglo-Indian Associations, even the children of those parents do not get any scholarship for their study. Inter-community marriage is the only eligibility criteria to avail the financial support from such Associations. This is why the community people are encouraged to get married not only with the Christians but also within their community to keep their cultural entity intact in the form of a typical social group.

Table 2. Correlation matrix for inter-community marriage and financial assistance from Associations

	Inter-community marriage	Financial assistance from Associations
Inter-community marriage	1	
Financial assistance from Associations	0.224345482	1

5.4 Inactiveness in reclamation of entity

Positive correlation between awareness of Anglo-Indian about social entity and ‘feeling of getting socially faint’ is coming out with a value of 0.25 (Table 3). A five point scale has been effectively used during the survey to assess the awareness of the Anglo-Indian about their social entity (Table 4). The result represents that about 87% respondents (considering point 4 and 5) are well aware of the gradual faintness of their entity in society, but when they were asked about their involvement in the social activities to revive and to improve their social status, the replies mostly represent their inactiveness. That is why a negative correlation is found (-0.12) between awareness of Anglo-Indian about their social entity and ‘activity to reclaim social status’ (Table 3) which means there is no link between awareness and activeness. The turmoil of association between their fatherland (Europe) and motherland (India) created a dichotomy in their mind; physically they are in their motherland but their mind wants to be in their fatherland. This duality resulted in the loss of their identity ([Gangopadhyay 2012](#)). The value of 0.15 in the correlation matrix (Table 3) between ‘Anglo-Indian Associations involved in’ and ‘aware of their social entity’ depicts that few of the Anglo-Indians are attached with some Anglo-Indian Associations because of their strong feelings of keeping their society intact. A moderately strong correlation (0.42) has been found (Table 3) among the two components viz. ‘performing cultural activity to reclaim the society’ and ‘activity to reclaim social status’. The value is indicating the fact that those Anglo-Indians who are involved in reclaiming the community entity in the society have focused on reviving the cultural aspects of the community. The associations are trying to bring back their former social entity into the present era of cultural assimilation and acculturation.

Table 3. Correlation matrix showing relationships between awareness and activeness of Anglo-Indians

	Aware of their social entity	Activity to reclaim social status	Feeling of getting socially faint	Anglo-Indian Associations involved in	Performing cultural activity to reclaim society
Aware of their social entity	1				
Activity to reclaim social status	-0.126523004	1			
Feeling of getting socially faint	0.25361705	-0.137620471	1		
Anglo-Indian Associations involved in	0.150750041	-0.578444773	-0.029368607	1	
Performing cultural activity to reclaim society	-0.378991874	0.429772247	-0.032530002	-0.2766475	1

Table 4. Individual's community awareness in 5 point scale

Points	No. of respondents	% of respondents
1 (No idea)	1	1.42857143
2 (Not aware)	0	0
3 (Neutral)	8	11.4285714
4 (Aware to some extent)	16	22.8571429
5 (Fully aware)	45	64.2857143

This glimpse of getting socially pale and their unwillingness to retain their society through cultural and social activity results in the break in their cultural solidarity. They lack strong leadership who may amalgamate the whole community into one. This leads to the cessation of the autochthonous Anglo-Indian institutions. Social work is mainly done by the Anglo-Indians of the outside country, they on an annual basis send fund to the Institutions in the hope of keeping the community alive as a unique social group ([Cressey 1935](#)).

CONCLUSION

This study of Anglo-Indian community is done to assess their strong cultural imprint and eventual faint social entity in Kolkata city. The study reveals that culturally, the community has a distinct and unique position in Kolkata city since its inception. The celebration of Christmas, the birth of Jesus is as grandeur as the celebration of Durga Puja (worship of Goddess Durga) of Bengali community which is a dominant one in the city. The Christmas without Anglo-Indian would not have been so lively. The Park Street Cemetery and St. Paul’s Cathedral occupy important historical positions in Kolkata. These places are being promoted as the tourist destinations as large number of people are visiting regularly. The present day Kolkata is significantly experiencing the Anglo-Indian imprints in different dimensions of the city life like dress codes, cakes and educational institutions.

In spite of holding a strong cultural position, this community is at the verge of getting faint. The population of Anglo-Indian, which was estimated to be the largest in Kolkata, is presently decreasing day by day. People are migrating out from the city to other countries to settle down permanently. Thus is rightly termed by Caplan ([1995](#)) as “culture of

"emigration" visualizing the stream of out flow of Anglo-Indians from India. The Primary Survey discloses the fact that the community is well aware of their faint social entity, but the magnitude of socio-cultural activities to reclaim that by them is not significant. The Associations to some extent are trying to revive their social entity. A small percentage of people who are associated with the society are involved in cultural activities to rekindle their social existence. Though they have feeling social faintness yet their unwillingness to retain their social status will slowly result into the break in their cultural flow.

The decreasing number of people, weak social entity and gaining more importance of western culture will lead to their migration outside Kolkata as well as India. Andrew (2008) has thrown some light on the situation that though the Anglo-Indian political leaders are trying to persuade these people to stay in India they are willing to migrate out because of their strong belief that they will get more social benefits outside India. There is an increasing trend of inter-community marriage and their awareness of becoming socially faint have created little or no stir in the society which points out the fact that as a whole the community is not that much interested to carry on their cultural distinctness with faint social status and thus in the span of time the community will disappear from the heart of Kolkata. Younger (1987) thus has significantly stated –

"After twenty or thirty years, one will not hear of an Anglo-Indian as such. The few that are left in India will marry Indians and become Indians. The Community that was born 300 years ago will eventually disintegrate"

REFERENCES

- Andrews, R. (2008) *Quiting India: the Anglo-Indian culture of migration, Sites: a journal of social anthropology and cultural studies* 4: 49.
- Andrews, R. (2014) *Christmas in Calcutta: Anglo-Indian Stories and Essays*. SAGE Publications.
- Andrews, R. A. (2005) *Being Anglo-Indian: Practices and Stories from Calcutta: a Thesis Presented in Partial Fulfilment of the Requirements for the Degree of Doctor of Philosophy in Social Anthropology at Massey University*. Massey University, Palmerston North.
- Anglo-Indian. (1882) *Indian Outfits & Establishments: A Practical Guide for Persons about to Reside in India; Detailing the Articles which Should be Taken Out, and the Requirements of Home Life and Management There*. L. Upcott Gill.
- Anthony, F. (1969) *Britain's Betrayal in India: The Story of the Anglo-Indian Community*. Allied Publishers.
- Atkins, E. T. (2003) *Jazz planet*. Univ. Press of Mississippi, p. 64.
- Bhattacharya, S. (2014) Krishnapaksher Anglo pa'ra', *Anandabazar Patrika*, 8th March.
- Bhowmick, N. (2009) *The Brown Chronicles, Little India*, New Delhi.
- Blunt, A. (2002) 'Land of our Mothers': Home, Identity, and Nationality for Anglo-Indians in British India, 1919–1947, *History Workshop Journal*. Oxford Univ Press, pp. 49-72.
- Bönisch-Brednich, P. B. and Trundle, C. (2012) *Local Lives: Migration and the Politics of Place*. Ashgate Publishing, Limited, p. 119.
- Bower, P. C. (2003) *The Companion to the Book of Common Worship*. Geneva Press.
- Brown, P. (1998) *Anglo-Indian Food and Customs*. Penguin Books India.
- Brown, W. (2010) *The Secret Race: Anglo-Indians*. Lulu. com.
- Calkins, J. (2012) *The Power of the Map, Essay On Geography And GIS* 5: 3.
- Caplan, L. (1995) 'Life is only abroad, not here' the culture of emigration among Anglo-Indians in Madras, *Immigrants & Minorities* 14: 26-46.
- Caplan, L. (2003) *Children of Colonialism: Anglo-Indians in a Postcolonial World*. Bloomsbury Academic.
- Craddock, R. H. (1930) *The dilemma in India*. R.R. Smith Inc.
- Cressey, P. F. (1935) Anglo-Indians: A Disorganized Marginal Group, *The, Soc. F.* 14: 263-8.
- Debi, B. and Nandan, A. P. (2006) *The Anglo-Indians of Calcutta: a community of communities*. Prashik, p. 14.
- Dhavle, S. (2010). ANGLo-INDIANS AND ECONOMIC ACTIVITY. *International Journal of anglo-Indian Studies*, 10(2): 4-24.
- Dover, C. (1943) *Hell in the Sunshine*. Secker and Warburg.
- Edelson, D. C. (2012) Break-the-Mold Approaches to Geography Learning, *Essay On Geography And GIS* 5: 65.
- Gangopadhyay, M. (2012) "This is my home": Reading Migration in Anjan Dutt's Bow Barracks Forever, *COLDNOON: TRAVEL POETICS*: 58-9.
- Gist, N. P. and Wright, R. D. (1973) *Marginality and Identity: Anglo-Indians as a Racially-Mixed Minority in India*. E. J. Brill.
- Glorney, J. R. B. (1935) The future of the Anglo-Indians, *The Spectator*, 13th December.
- Grimshaw, A. D. (1959) The Anglo-Indian Community: The Integration of a Marginal Group, *The Journal of Asian Studies* 18: 227-40.
- Hedin, E. L. (1934) The Anglo-Indian Community, *American Journal of Sociology*: 165-79.
- Kaminsky, A. P. and Long, R. D. (2011) *India Today: An Encyclopedia of Life in the Republic [volume 1]: An Encyclopedia of Life in the Republic*. ABC-CLIO, p. 39.
- Kandel, W. and Massey, D. S. (2002) The culture of Mexican migration: A theoretical and empirical analysis, *Social forces* 80: 981-1004.
- Lobo, Ann. (1996) ANGLo-INDIAN SCHOOLS AND ANGLo-INDIAN EDUCATIONAL DISADVANTAGE PART 2, *International Journal of Anglo-Indian Studies*, 1(2): 13-34.
- Lyons, E. M. (2005) *Unwanted!: Memoirs of an Anglo-Indian Daughter of Rev. Michael DeLisle Lyons of Detroit, Michigan: an Autobiography*. Ctr, p. 91.
- Masters, J. (2012) *Bhowani Junction*. Souvenir Press Limited.
- Mills, M. S. (1997) *Ethnic Myth and Ethnic Survival: The Case of India's Anglo-Indian (Eurasian) Minority*. Thesis (Ph.D.)--York University.
- Moreno, H. (1923) Some Anglo-Indian Terms and Origins, *Indian Historical Records Commission* 5: 76-82.
- Padua, S. (2005) *Threads of Continuity, Cochin*, p. 112.
- Procidia, M. A. (2002) *Married To The Empire: Gender, Politics and Imperialism in India, 1883-1947*. Manchester University Press, pp. 61-2.
- Robinson, R. (2003) Fluid boundaries: Christian communities in India, *Communal Identity in India*: 287-305.
- Roychowdhury, L. (2000) *The Jadu House: Travels in Anglo-India*. Black Swan.
- Schermerhorn, R. A. (1975) Socio-cultural History and Sex Roles in an Urban Minority of India, *Sociological Focus* 8: 176.
- Sen, J. and Goswami, B. (1988) Marriage among the Catholic Anglo-Indian in Calcutta, *Marriage in India (Tribes, Muslims and Anglo-*

Indians).

Sen, S. (2014). Living Stories of Anglo-Indian Women in Kolkata. *International Journal of Anglo-Indian Studies*, 14: 31-40.

Shope, B. (2004) Anglo-Indian Identity, Knowledge, and Power: Western Ballroom Music in Lucknow, *TDR/The Drama Review* 48: 167-82.

Smith, N. (2000) Socializing culture, radicalizing the social, *Social & Cultural Geography* 1: 25-8.

Stark, H. A. (1987) Hostages to India, Or, The Life Story of the Anglo-Indian Race. Chameleon Press, p. 142.

Trawicky, B. (2009) *Anniversaries and holidays*. American Library Association.

Vimala, S. (2013) The "Politically Correct Memsahib": Performing Englishness in Select Anglo-Indian Advice Manuals, *Special Issue on Performance Studies*: 291-2.

Walsh, J. E. (2006) A Brief History of India. Facts On File, Incorporated, p. 118.

Younger, C. (1987) *Anglo-Indians, neglected children of the Raj*. BR Publishing Corporation.

1411 INDIA'S URBAN GROWTH WITH SOCIO-DEMOGRAPHIC ASPECTS ON GENDER SCANNER



IIT Bombay

**India's Urban Growth With Socio-demographic Aspects
On Gender Scanner**

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Centre for Urban Science and
Engineering
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RSAI 2018, GOA
Abstract ID: 01411

MOTIVATION

- Population is the primary component for any urban expansion. So demographic analysis can help us to prepare for societal issue.
- Demographics insights may help in planning and development

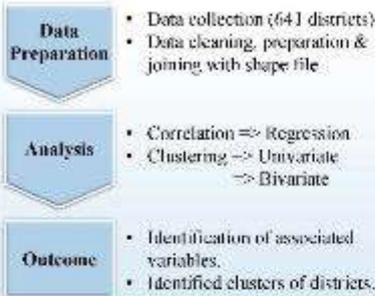
GOAL

- To find out the nexus among socio-demographic variables in India mostly on gender-point of view.

OBJECTIVES

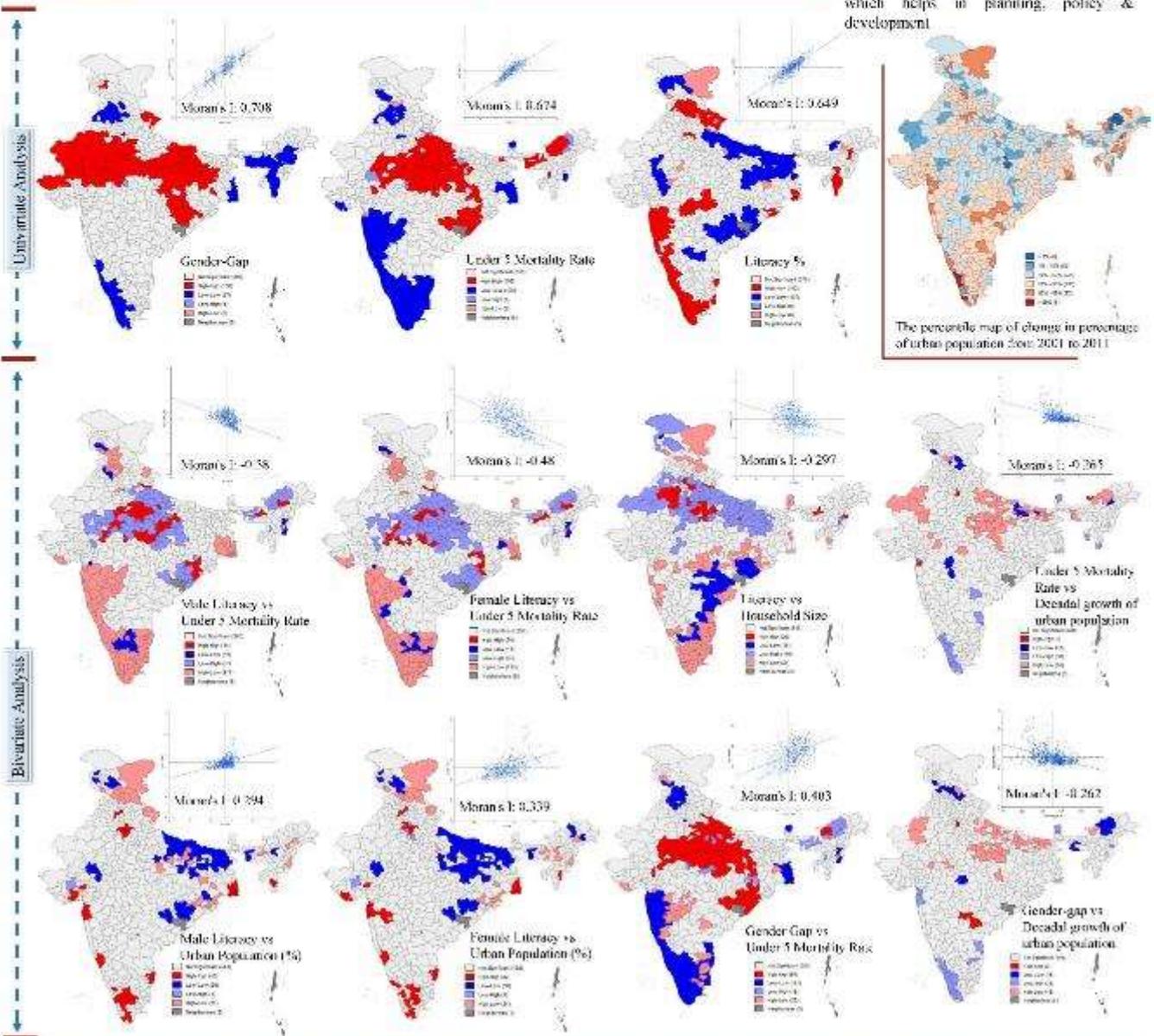
- To find out the correlated variables with Urban population growth
- To identify the clusters of districts for associated socio-demographic concerns (Under 5 Mortality Rate, Gender Gap, Literacy, etc.)

APPROACH



OUTCOMES

- Literacy-Percentage, Infant-Death, and Gender-Gap, are strongly associated with decadal growth of urban population [R^2 (0.551140), Adjusted R^2 (0.547317), Multi-Collinearity Number (10.832944)]
- High Gender-Gap with high Under-5-Mortality-Rate, are clustered mostly in Rajasthan, Uttar Pradesh, Madhya Pradesh & Chhattisgarh.
- As compared to "Male-Literacy", "Female-Literacy" has strong negative association with "Under-5-Mortality-Rate".
- This analysis shows which districts need to improve in certain demographic profiles, which helps in planning, policy & development



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1528 ALLOTING LAND FOR PUBLIC PROJECTS USING LAND-USE SUITABILITY MATRIX: CASE STUDY OF MULTI-MODAL LOGISTICS HUB PROJECT IN THE CITY OF ROURKELA

ABSTRACT

Complex decisions in land use planning include the feasibility of a portion of land to tolerate the allocated activities in a sustainable way. Objective of this study is to forecast the land-use suitability of all vacant, reclaimed and waste land parcels in the administrative area of Rourkela city. This required devising a simple analytical relationship between the land-use suitability and land use influencing factors, like terrain, landscape, land price, residential density, accessibility (to CBD, major roads), existing infrastructure (water supply, drain age, sewerage, solid waste management, public utilities and functions). This allows quantification of spatial units of land available for development, in strategic order of priority. Once analytical relationship factors are established, this matrix can be upgraded as a decision-making tool for strategic allocation of infrastructure and other services. Results from this matrix in our study also show overlaps of different land-use suitability in same land parcels. Prioritization of the development order is done by incorporating public opinion, thereby making the planning process inclusive. This analytical relationship matrix is then used to allocate space for a much-required logistics hub. This strategic model functions as a tool for land-use planning and setting development control and guidelines.

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1624 EVALUATING THE ECONOMIC RATIONALES OF VEGETABLE FARMING AFTER THE IMPLEMENTATION OF COMMUNITY-BASED FOREST MANAGEMENT (CBFM) CASE STUDY: CBFM COFFEE IN SIMPANG VILLAGE, GARUT REGENCY, INDONESIA

Evaluating the Economic Rationales of Vegetable Farming after the Implementation of Community-based Forest Management (CBFM) Case study: CBFM Coffee in Simpang Village, Garut Regency, Indonesia

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BACKGROUND

- CBFM with a land sharing and simple coffee cultivation scheme (CBFM Coffee) has been implemented in Simpang Village, Garut Regency, Indonesia since year 2001 and takes place of several plots of protection forest (Hutan Lindung) under Peraturan KPM Garut (please refer to Figure 1). This scheme re-enables the community to utilize forest land through coffee cultivation and helps Perhutani to reforest their area since the community should also participate in rehabilitating the forest. Thus, it is predicted that more sustainable uses of forest resources as well as more improved livelihood of the community will be obtained [5].
- Community-based Forest Management (CBFM) or Pengelolaan Hutan Bersama Masyarakat (PHBM) is shown as:
 - forest-based poverty alleviation strategy in Indonesia, especially in Java Island [1].
 - solution to solve deforestation, illegal logging and agricultural invasion to forest, particularly after the Reformation Era [1].
 - forest conflict resolution since it was implemented to reduce conflicts between forest manager and surrounding forest farmers that happened due to the shift of forest status from production forest (Hutan Produksi) to protection forest [5].
- However, after years of implementation, CBFM Coffee in Simpang Village is sought fail to reforest the protection forest either to deliver economic benefits for the adjacent community.
 - deforestation has been worse,
 - surrounding villagers keep continuing their vegetable farming on their CBFM Coffee area,
 - community (forest farmers) remain categorized as poor households.
- From the environmental perspective, this has been a growing concern, especially after a devastating flood in urban area of Garut year 2016.
 - Agricultural activities done on the CBFM plots that should be planted by coffee, lead to more expensive forest clearing which are assumed as the cause of erosion and landslides in the upstream area.
- Simpang Village is located at the upstream of Cimanuk Watershed, one of prioritized critical watershed in Indonesia, especially in West Java Province [6] has a significant role as catchment area. However, this village is also potential for its vegetable production.
- Based on a SWAT analysis in 2014, conducted by BRDAS Cimanuk, Simpang is part of the sub-basin areas identified delivers highest proportion of sediments to Cimanuk [2].

OBJECTIVES

- To evaluate implementation of CBFM Coffee in Simpang Village, with focus on:
 - rationales of the shift continue vegetable farming or protection from economic perspectives through analyzing the profit earned from either coffee or vegetable farming
 - contribution of income from coffee to the annual household expenditure of the forest farmer.
- To define problems have been encountered during CBFM Coffee implementation to then follow up with several policy recommendation.

RESEARCH QUESTIONS

- From the community perspective, what are the economic rationales on keep continuing vegetable farming activity on forest land after implementing CBFM Coffee?
 - How coming from coffee differs from that of vegetable farming?
 - How income from coffee covers farmer's household expenditure?
- How CBFM Coffee been carried out in Simpang Village? What has been the problems of CBFM Coffee's implementation?

HYPOTHESES

- Income from coffee is noticeably lower than from vegetable farming.
- Income generated from CBFM is not sufficient to sustain farmer's living because it could not cover the main household expenditures of farmers.
- There are some issues has been faced on the management of CBFM Coffee.

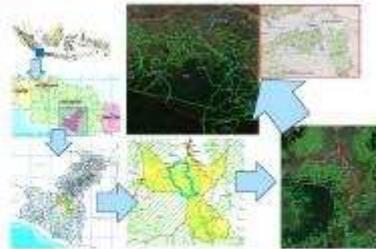


Figure 1. Area of CBFM Coffee in Simpang Village, Garut Regency, Indonesia
Source: Peraturan KPM Garut, 2014; Laporan of Garut Regency, 2017; Google Earth, 2016

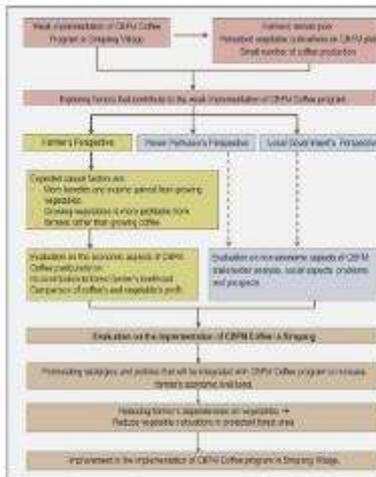


Figure 2. Conceptual Framework
Source: Author, 2014

METHODOLOGY

To present a comprehensive evaluation about the implementation of CBFM Coffee, both quantitative and qualitative approach are utilized in this study.

- **Quantitative analysis:** to analyze the economic rationales as farmer's income, expenditure and profit of both coffee and vegetable cultivation. (105 respondents from four forest farmer groups namely Ciba-Laksono, Giri Wana Lestari, Sumber Rezeki and Mulya Tani)
- **Qualitative approach:** to analyze the problems faced in the implementation of CBFM Coffee.

FINDINGS AND DISCUSSION

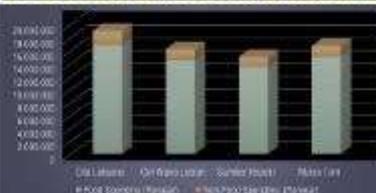


Figure 3. Comparison of Farmer's Household Spending and Revenue for Each Forest Group
Source: Author, 2014



Figure 4. Sample of Area of CBFM Coffee in Simpang Village
Source: Field Observations, 2014

Figure 5. Affected Area of 2016 Garut Flash Flood
Source: Laporan of Garut Regency, 2017

Table 1. Percentage of Household Expenditure covered by Income from Coffee

Household Expenditure (Rp/year)	Income from Coffee (Rp/year)	Percentage of Coverage %
Giri Wana Lestari	10.245.000	311.00
Sumber Rezeki	10.000.000	300.00
Mulya Tani	10.142.000	291.40

Source: Author, 2014

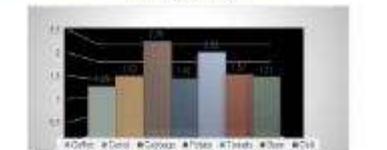


Figure 6. ROC (Revenue) Ratio of Coffee and Vegetable Farming
Source: Author, 2014

Table 2. Problems and Prospects of CBFM Coffee

Problems	Prospects
Limited skills and knowledge on coffee cultivation	Lack conflict between Perhutani as the forest manager with the forest adjacent community
Fluctuated price of coffee in local market	Increasing demand of coffee in local, national and global market
Problems with wild fires and crop collection (High dependency for farming inputs, high input/output)	Provisional government to support coffee farmers construction, coffee processing machinery support.
Vegetable farming as local culture. Use unconsolidated of related inputs/inputs	Successful stories of CBFM Coffee implementation at neighboring villages → motivate to improve coffee cultivation → better quality → higher price of coffee.
Low support and assistance from Perhutani to community	Weak coordination between Perhutani with other stakeholders, especially local (regency level) government.
Landlessness of adjacent community	

Source: Interview with Perhutani and Local Government of Garut Regency 2014

POLICY RECOMMENDATION

- Deliver more financial supports to improve coffee farming, so that farmers will confident enough to continue and increase their participation on CBFM Coffee
- Encourage more dialogue and communication between Perhutani and community as well as with other related stakeholders, especially local government [6].
- More economic attractive policies combined with CBFM Coffee, that will bring higher returns from coffee.
- Assigning certain parts of protection forest to fully utilize by the community for farming activity, that within this zone, community is allowed to conduct any farming activities even vegetable farming with as long as conservation principles are still be held.

REFERENCES

[1] Ahmad, M. & Kusti, R. (2013). Poverty alleviation efforts through a community forestry program in Java, Indonesia. *Journal of Sustainable Development*, 5(3), 43-53.
 [2] BRDAS Cimanuk-Cimanuk 2014. SWAT Analysis of Cimanuk Watershed.
 [3] Iskandar, D. & Harahap, P. (2006). Manajemen sumber daya komunitas (Perhutani) Garut, Jawa Barat: Penerbit Alfabeta.
 [4] Peraturan Menteri Perhutani No. 38/2014/Permen/PH/2014 tentang Pedoman DAB Perhutani Garut.
 [5] Peraturan KPM Garut, 2014 (unpublished).

Sessions of RSPP on *Forty* *under Forty*

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1105 GRADUATE MIGRATION IN GERMANY - NEW EVIDENCE FROM AN EVENT HISTORY ANALYSIS

ABSTRACT

Human capital is a key determinant of regional development and universities are supposed to play a crucial role for human capital accumulation in regions (Gennaioli et al. 2013). However, graduates of local universities will only increase the human capital endowment if they stay in the university region and especially for smaller regions out- migration of graduates might be an issue. Therefore, understanding the migration decision of graduates is of particular importance for less developed regions with institutions of higher education (Haapanen

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1131 WHY DO WOMEN EARN MORE THAN MEN IN SOME REGIONS?

ABSTRACT

It is a stylized fact that women earn less than men in Germany. Viewed from a regional perspective, however, large disparities in the gender pay gap (GPG) appear. Whereas women earn 60 percent less than men in some regions in Germany, their wages outweigh male wages by up to 16 percent in other regions. So far, the reasons for these regional differences and especially the question which role regional characteristics play in comparison to individual and job-related factors have not been fully resolved. Therefore, the aim of this paper is to shed light on the determinants that drive the regional differences in the GPG. Besides providing detailed descriptive evidence for the NUTS 3-regions, we quantify the impact of regional, individual and job-related factors. Our analysis rests on a comprehensive data set that encompasses all German employees liable to social security contributions in the year 2015. We combine the commonly used Blinder-Oaxaca decomposition with quantile regressions. This method allows us to decompose the GPG into an explained part related to differences in observed characteristics and another part related to differences in returns to these characteristics along the entire distribution of the GPG. First decomposition results hint towards a dominant role of individual and establishment factors. Their explanatory impact differs across quintiles, emphasizing personal endowments and the regional economic structure as important forces driving regional differences in the GPG. Results for the regions with a very large GPG highlight the prominent role of the local sectoral and plant size structure in providing well-paid jobs especially for men.

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1191 EFFECTS OF RESIDENTIAL MOBILITY AND MIGRATION ON STANDARDS OF LIVING IN DAR ES SALAAM, TANZANIA: A SEQUENCE ANALYSIS OF RESIDENTIAL HISTORY DATA

ABSTRACT

Intra-urban residential mobility and rural-to-urban migration could play an important role in improving standards of living for urban poor. This paper investigates the effects of both intra-urban residential mobility and rural-to-urban migration on standards of living for poor households in Dar es Salaam, Tanzania. We particularly examine the complete residential history of households using a representative sample of 2397 households. We measure various levels of five housing conditions, namely, access to water, access to sanitation, access to permanent structure, security of tenure, and sufficient living space, and use sequence analysis to find similarities and dissimilarities in evolution of households’ living conditions. We then use cluster analysis to establish patterns of pathways to improved housing conditions for each of the five housing elements described above. We then study how these patterns relate to household’s migration to the city and residential mobility within the city. We analyze and identify positive impacts that residential mobility have on housing conditions. The main objective of this study is to demonstrate how migration and residential mobility could work for improving living conditions for urban poor.

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1794 HOME EQUITY AND THE TIMING OF CLAIMING SOCIAL SECURITY RETIREMENT INCOME

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ABSTRACT

We examine how changes in house prices affect when eligible individuals start receiving Social Security Retirement Income (SSRI). Since changes in house prices and receipt of SSRI are likely to be correlated with unobservables, we employ an instrumental variables strategy using the land supply elasticity of an MSA interacted with changes in the national house price index as an instrument. We find that the elderly delay SSRI claiming when house prices increase during a boom period, but not during a bust. Our findings highlight that the cashing-out of home equity can be used to finance expenditures to delay SSRI receipt.

Key words: Social Security Retirement Income (SSRI); housing wealth shock; land supply elasticity

JEL Codes: D12, D14, J14, J26, R20

1. INTRODUCTION

It is widely recognized that the United States, like many other countries, is moving into an aged society. The proportion of individuals over the age of 65 in the U.S. rose from 8 percent in 1950 to 13 percent in 2010 and is expected to rise to over 20 percent by 2030 as the Baby Boomer generation ages (Lee, 2014). The rapid increase in the share of the elderly population is something policy makers are cognizant of, as it raises concerns about the financial readiness of the retirement system at all levels of government. Therefore, it is important to understand how elderly households draw upon different assets to finance retirement. Among the various financial assets of the elderly, Social Security Retirement Income (SSRI) and home equity are typically the two largest components of their balance sheet, especially for low-income households (Poterba, 2014). While many researchers have examined the role of Social Security in financing retirement,¹ little research thus far has considered the role of home equity, and, in particular, the extent to which it may substitute for SSRI in financing retirement expenses. Given the importance of home equity for the elderly and the recent fluctuations in house prices, studying how the elderly utilize this asset has become increasingly important.²

This paper examines how changes in house prices affect when elderly individuals decide to start receiving SSRI. We focus on the timing of receiving SSRI because once the Average Indexed Monthly Earnings (AIME)³ has been determined based on previous earnings, the amount received depends on when an individual starts claiming the benefits. Specifically, an elderly individual who starts receiving SSRI as soon as he or she is eligible will face a reduced monthly benefit versus if receipt is delayed.⁴ The reduced benefit amount is usually substantial and permanent.⁵ We examine the trade-off between home equity and SSRI, as elderly individuals may choose to draw upon their home equity when the value of their house increases in order to delay receiving SSRI benefits and avoid the reduction in monthly benefits. Studying this issue will allow us to gain a better understanding of the substitutability of these two assets as a source of income for the aged population.

When considering the interactions between housing wealth and the decision to receive SSRI, there are likely to be endogeneity issues present. First, house prices may respond inversely to SSRI receipt as homeowners may engage in more home maintenance and renovation efforts with the additional income. Second, there may be unobserved local demand shocks that are correlated with both changes in house prices and when an elderly individual decides to receive SSRI. For example, unobserved positive local demand shocks may contribute to higher house prices and, at the same time, overall price inflation in the area, which would increase the likelihood of receiving SSRI benefits early. Alternatively, if house prices decline in an area, it is likely that the local economy is also experiencing a negative demand shock in the labor market, which may cause individuals to claim SSRI earlier. Therefore, the failure to directly control for unobserved

1 For example, see Hurd and Boskin (1984), Burtless (1986), Gruber and Wise (1998), Samwick (1998), Gustman and Steinmeier (2005), Van der Klaauw and Wolpin (2008), Liebman, Luttmer, and Seif (2009), Mastrobuoni (2009), Laitner, and Silverman (2012).

2 Based on the Survey of Income and Program Participation (SIPP), the average ratio of home equity to total household net worth was 36.07% in 2005 for individuals under the age of 35 and this ratio increased to more than 45% as individuals reach 65 years old, as seen in Figure 1. Due to the fact that the elderly had a larger amount of home equity prior to the Great Recession, they suffered a more substantial decrease in total assets after the decline in real estate prices in 2007, as shown in Figure 1.

3 The AIME takes the top 35 highest earning years up to age 60 and indexes it for wage growth, and then averages it to get a monthly amount. The AIME approximates earnings over the beneficiary's lifetime at today's wages.

4 Individuals are eligible to receive SSRI at age 62. Sixty-five is the full retirement age (FRA) for cohorts born before 1938. The FRA increases gradually for cohorts born after 1938. If an individual delays receiving SSRI from 62 to the FRA, the benefit level as a percentage of the primary insurance amount rises. For example, suppose that an individual turns 62 in 2017, his or her full retirement age is 66 and 2 months, and his or her monthly benefit at the FRA is \$1,300. If the same person starts receiving benefits at age 62, the monthly benefit will be reduced by 25.8 percent to \$964. Examples can be found at <https://www.ssa.gov/pubs/EN-05-10147.pdf>. We will describe the specifics of the program later in the paper.

5 Most people receive monthly benefit for the rest of their lives after deciding when to claim. However, there are some exceptions. For more details, see <https://www.ssa.gov/planners/retire/withdrawal.html>.

local demand shocks would lead to an omitted variables problem that could bias OLS estimates either positively or negatively.

To address these endogeneity concerns, we utilize two different instrumental variables. First, we use MSA house price changes as an instrument for the change in individual house prices to alleviate concerns regarding reverse causality.⁶ We argue that this approach addresses individual level endogeneity issues that are unlikely to drive changes in the MSA house price index. Our results suggest that MSA house price changes are strong predictors of changes in individual house prices. However, the Wald test fails to reject the null of exogeneity of the instrument. This is likely because of the broader endogeneity induced by unobserved local demand shocks that are not accounted for with this instrument. To address this second endogeneity concern, we draw upon geographic variation in the land supply elasticity of an MSA, developed by Saiz (2010), as the topological characteristics of an area are unlikely to be correlated with local demand shocks. We interact the supply elasticity measure with the change in the national house price index and use this interaction as an instrument for the change in local house prices. Our identifying assumption is that the cross-sectional variation in local house prices is driven by the underlying exogenous differences in local land supply elasticities, which is not correlated with time-varying local economic activity.⁷

After using the second instrument, we find that larger increases in house prices caused elderly individuals to delay SSRI claiming during the boom period from 2002-2006. Specifically, we find that if house prices increased by 10 percent in the previous two years, the probability of claiming SSRI within one year of becoming eligible is reduced by 4 percentage points, and the probability of claiming SSRI within two years of becoming eligible is reduced by 5 percentage points. During the bust period from 2007-2009, we do not find a statistically significant effect on SSRI claiming, which is consistent with the idea that cashing-out home equity is only viable when house prices appreciate.

To examine the possible mechanism driving our results, specifically to see if what we are observing is due to cashing-out home equity, we consider the effect of house price appreciation on the total home loan amount. Using the same identification strategy, we find that elderly individuals are more likely to increase the amount of their home loan (the first mortgage, any additional mortgages, and any home equity lines of credit) when house prices appreciate. This result is consistent with the cashing-out of home equity, suggesting this could be a viable channel to obtain additional funds to finance expenses that allows elderly individuals to delay receipt of SSRI.

Our research contributes to the literature in several ways. First, we fill a gap in the literature by highlighting the trade-off that elderly households make when deciding which assets to utilize to finance consumption. For a typical elderly individual with an average level of wealth, SSRI is the main source of income and housing is the largest asset in their portfolio. The latter lends itself to the opportunity for liquidation and generates another substantial income source. These two income sources may substitute and affect each other in financing the consumption of the elderly. In particular, the timing of claiming SSRI will affect the amount of SSRI which not only contributes to individual life-cycle financial planning decisions but also aggregates to a dramatic shift in timing and amount claimed at the national level. Understanding how this cycles along with housing market fluctuations is important for policy makers to make the necessary adjustments in managing Social Security funds. To our knowledge, our paper is the first to examine the direct causal link between a change in home equity and if an eligible individual chooses to start receiving SSRI immediately.⁸

Second, we contribute to the literature that attempts to explain Social Security early claiming decisions. There is a large literature documenting large gains in lifetime wealth from delaying SSRI receipt.⁹ Yet, despite the large gains from delay many people still choose to claim SSRI soon after becoming eligible (Shoven et al., 2017). There are many potential explanations for this behavior, such as leaving the labor force, liquidity, poor health, and concerns about future benefit cuts due to policy changes (Card, Maestas and Purcell, 2014; Munnell and Soto, 2005; Hurd, Smith, and Zissimopoulos, 2004). This paper contributes to the literature by highlighting how home equity may affect the early claiming decisions. We show that when home equity is more likely to be a viable source of income due to house price appreciation, individuals are less likely to claim SSRI early.

Finally, we add to the literature on how home equity affects the consumption and saving behavior of the elderly.¹⁰ In particular, Mian et al (2013) and Aladangady (2017) suggested that the home equity based borrowing channel is a viable means for individuals to finance consumption. Bostic, Gabriel, and Painter (2009) found that fluctuations in housing wealth have a larger effect on changes in consumption than changes in stock market assets. Furthermore, Engelhardt (1996) and Jiang, Sun, and Webb (2011) found asymmetric effects of changes in housing wealth on savings and consumption behavior, specifically with regards to whether it is a housing boom or bust period. However, this research has not considered the elderly specifically and how they may use their home equity to cover expenses versus receiving SSRI benefits. We therefore contribute to the literature by highlighting the decision elderly households make when

6 Several papers have used variation in the house price index at the MSA level to proxy for the change in individual housing wealth, although they approached this as a reduced form regression instead of using the MSA specific house price index as an instrument. See, for example, Lovenheim (2011), Lovenheim and Mumford (2013), Lovenheim and Reynolds (2013), and Zhao and Burge (2017a, 2017b).

7 This instrument has been used previously in the literature by Mian and Sufi (2011, 2014), Chaney, Sraer, and Thesmar (2012), Mian, Rao, and Sufi (2013), Cvijanović (2014), Dettling and Kearney (2014), Aladangady (2017), and Chetty, Sándor and Szeidl (2017).

8 Shoven, Slavov, and Wise (2017) used survey evidence to gain insights into the reasons individuals choose to claim Social Security.

9 See, for example, Coile et al. (2002), Munnell and Soto (2005), Sass et al (2013), Mahaney and Carlson (2007), Meyer and Reichenstein (2010), and Shoven and Slavov (2014 a, b).

10 See Engelhardt (1996), Gan (2010), Campbell and Cocco (2007), Bostic, Gabriel and Painter (2009), Browning, Gørtz and Leth-Petersen (2013), Cooper (2013), Ong, Parkinson, Searle, Smith and Wood (2013), Aladangady (2017), Cooper, (2013), Burger et al., (2015), Mian and Sufi, (2011, 2014), Jiang, Sun, and Webb (2011), Mian, Rao and Sufi, (2013), Aladangady, (2017), and Cloyne et al. (2017).

choosing how to use their housing wealth to finance consumption and possibly delay receipt of SSRI to receive the higher monthly benefits.

The rest of the paper will proceed as follows. Section 2 discusses the key institutional details of the Social Security Retirement Income program in the U.S. Section 3 discusses the conceptual framework of our research. We discuss our identification strategy in Section 4 and data and summary statistics are provided in Section 5. Results are presented in Section 6. Section 7 concludes and discusses the policy implications of this research.

2 SOCIAL SECURITY RETIREMENT INCOME IN THE UNITED STATES

The Social Security Retirement program, adopted in 1935, is a form of social insurance that provides benefits to elderly individuals.¹¹ The program is progressive in that the benefits replace a greater percentage of wealth for low earners than for high earners. Working individuals contribute to the program, which pays for currently retired individuals, with the idea that the young will receive the benefits back when they retire. Social Security has become essential in the U.S., with over 50 million people receiving retirement benefits.¹²

SSRI benefits are determined based on an individual's lifetime earnings. The Social Security Administration adjusts actual earnings to account for changes in average wages since the year the income was received. Then, the Average Indexed Monthly Earnings (AIME) during the 35 years in which the person earned the most are calculated and a formula is applied to these earnings to arrive at the basic benefit or primary insurance amount. This is the amount that each individual can receive at the Full Retirement Age (FRA).

There have been three notable changes to the retirement age since the program's inception. First, the age at which all individuals are eligible for SSRI was lowered to 62 in 1961. However, the benefits received are lower the earlier the beneficiary begins claiming. The argument is that individuals will get a larger reduction if they claim earlier because they will receive benefits for a longer period. The government intends for this reduction to be actuarially fair, though there are questions as to whether this is true in reality (Munnell and Sass, 2012; Heiland and Yin, 2014). Second, in 1972, the government provided Delayed Retirement Credits (DRC) to increase benefits for people who delayed claiming past age 65, but the benefit increase is capped at age 70. Finally, in 1983, the FRA was increased for people born in 1938 or later,¹³ making the reduction in benefits birth-year cohort specific. For example, the reduction in benefits for claiming SSRI at age 62 is 20 percent for people born in 1937 or earlier, but is 20.8 percent for people born in 1938. The maximum reduction at age 62 is 30% for the cohort whose FRA is 67.¹⁴ The credit to delay claiming past the FRA is also cohort specific, with a larger benefit for people born later.¹⁵

Despite the penalty for early claiming, there is still a large claiming spike at age 62. According to the Social Security's *Annual Statistical Supplement*, 56% of eligible individuals claimed SSRI at age 62 in 2002 and 8% of eligible individuals claim within a year after becoming eligible.

3. CONCEPTUAL FRAMEWORK

For a large portion of the elderly population, Social Security is the main source of income and housing is the largest asset in their portfolio. The ability and the extent to which individuals can tap into either of the two sources will have significant impact on a set of decisions, including decisions regarding the labor market.¹⁶ Meanwhile, because SSRI can be claimed anytime between ages 62 and 70 with increasing monthly benefits if claiming is delayed until a later age, the timing of when to start receiving Social Security will affect the amount of SSRI received each month. In fact, the potential benefits associated with delaying when an individual claims SSRI has been established by many researchers in a conceptual framework.¹⁷

11 There are other retirement plans in the U.S., such as a 401k plan which is a voluntary retirement savings plan sponsored by employers. For more details, please visit <https://www.irs.gov/retirement-plans/401k-plans>. We do not consider these other retirement programs, only the Social Security program run by the federal government.

12 The original program only provided retirement benefits to the worker. Social Security changed from a retirement program for workers into a family-based economic security program in 1939 by adding payments to the spouse and minor children of a retired worker and survivor's benefits paid to the family in the event of the premature death of a covered worker. More information is available at <https://www.ssa.gov/history/briefhistory3.html>.

13 The FRA is 65 and 2 months for the cohort born in 1938, 65 and 4 months for the 1939 birth cohort, 65 and 6 months for the 1940 cohort, 65 and 8 months for the 1941 cohort, 65 and 10 months for the 1942 cohort, 66 for individuals born between 1943 and 1954, 66 and 2 months for cohort born in 1955, 66 and 4 months the 1956 cohort, 66 and 6 months for the 1957 cohort, 66 and 8 months for the 1958 cohort, 66 and 10 months for the 1959 cohort, and 67 for individuals born in 1960 and later.

14 For example, if a beneficiary born in 1938 starts receiving retirement benefits at age 62/63/64, he/she will get 79.2%/85.65%/92.2% of the FRA monthly benefit. The corresponding amount will be 78.3%/84.4%/91.1% for the 1939 birth cohort, 77.5%/83.3%/90.0% for the 1940 cohort, 76.7%/82.2%/88.9% for the 1941 cohort, 75.8%/81.1%/87.8% for the 1941 cohort, and 75.0%/80.0%/86.7% for people born between 1943 and 1954. For more details, please visit <https://www.ssa.gov/planners/retire/ageincrease.html>.

15 For example, the yearly rate of increase for delayed claiming is 3.0% for 1917-1924 birth cohort, 3.5% for 1925- 1926 cohort, and 8.0% for people born in 1943 and later. The monthly rate of increase is one-twelfth of the yearly rate of increase. For more details, please visit <https://www.ssa.gov/planners/retire/delayret.html> and https://www.ssa.gov/oact/quickcalc/early_late.html.

16 Zhao and Burge (2017a,b) considered this specifically with regards to the labor supply decisions of the elderly. This includes looking at the decision to retire and leave the labor force entirely, moving from full-time to part-time work, or even un-retiring.

17 Clark and Gohmann (1983) take into consideration of the delayed claiming after retirement for the life-cycle budget constraint. Mirer (1998) indicates that it is optimal in many context to delay claiming SSRI after reaching eligibility based on a model of life cycle behaviour with no bequest motive. Coile et al. (2002), in particular, have shown significant gains associated with claiming delays in a wide variety of cases based on financial calculations and simulations of an expected utility maximization model. Hubener, Maurer, and Mitchell (2016) further emphasize the claiming timing decided based on Social Security rules has strong influence on life-cycle financial decisions

Despite the theoretically calculated benefits of claiming at a later age, in reality delaying the receipt of SSRI is not as prevalent as expected given the large gains associated with delay.¹⁸ There are several explanations for this behavior. Card, Maestas and Purcell (2014) found that labor market shocks lead to current and future increases in the fraction of workers who initiate SSRI at the earliest claiming age. In other words, if individuals who are age eligible suddenly lose their job, they decide to leave the labor market and start receiving benefits early versus trying to find another job. Other research has shown that individuals who have a higher subjective mortality tend to claim early (Munnell and Soto, 2005; Hurd, Smith, and Zissimopoulos, 2004).¹⁹ Recent studies have shown that behavioral factors also affect the timing of SSRI claiming. For example, Behaghel and Blau (2012) found that individuals have a frame regarding when they will retire and choose to start claiming at that age, regardless of what may be the optimal strategy to maximize lifetime utility. Brown, Kapteyn, and Mitchell (2011) found that when an individual reports he/she will start claiming SSRI depends on the way in which the decision is framed, suggesting that how the benefits are explained may affect when individuals start receiving SSRI.

Another important factor that may contribute to early claiming is that individuals may want to leave the labor force at age 62 but lack the wealth and liquidity to fund their consumption.²⁰ If individuals are constrained financially and claim early to fund current expenditures, then an unexpected increase in wealth may allow individuals to delay receiving SSRI benefits.²¹ This increase in wealth could be in the form of financial or housing wealth. Therefore, individuals who want to delay claiming SSRI to receive the larger monthly benefits can draw upon their home equity to finance expenses. A large segment of the population is income-poor but house-rich (Mayer and Simons, 1994; Merrill, Finkel, and Kutty, 1994), making home equity an important source of wealth for many households. Older households have a larger fraction of home equity that they can use to fund home equity loans and obtain reverse mortgages (Sinai, 2007). However, there has been limited research thus far examining how changes in housing wealth affect if an individual chooses to claim SSRI.

While the relationship between housing wealth and SSRI claiming has not been studied directly yet, there is an extensive literature examining the relationship between housing wealth and consumption and savings decisions.²² Engelhardt (1996) examined the relationship between house price appreciation and savings, finding an asymmetry in savings behavior. Specifically, households that experience capital losses change savings behavior, but those that experience gains do not adjust savings. Jiang, Sun, and Webb (2011) looked at the recent housing boom to see if it affected consumption of the elderly, finding that when house prices increased there was a modest increase in consumption, but did not find an effect of a house price decline on consumption.²³ Bostic, Gabriel, and Painter (2009) found that housing wealth had a larger effect on consumption than changes in financial wealth through stock market fluctuations.

We expand upon the literature by exploring the substitutability between cashing-out home equity and receiving SSRI benefits earlier for the elderly. By focusing on the elderly population, we can provide insights for policy makers as to how these individuals trade-off between the two assets. Also, consistent with the literature that has found an asymmetric response to positive and negative changes in home equity, we compare the housing boom and bust periods separately to examine if there are heterogeneous effects with regards to how the elderly respond to house price appreciation versus depreciation.

4. EMPIRICAL STRATEGY

To determine the effect of changes in the value of a home on the decision of an elderly individual to begin receiving SSRI, we exploit the recent housing market fluctuations and conduct our analysis separately for the housing boom (2002 to 2006) and bust (2008 to 2010) periods.²⁴ We separate our sample into these two time periods because households may respond differently to house price growth versus decline. Specifically, households have the ability to withdraw home equity when house prices appreciate, but not when house prices decline (Mian and Sufi, 2011). Therefore, during bust periods, the elderly may need to consider other options if they want to delay receiving SSRI.

We consider the impact of a percentage change in housing values on the probability of claiming SSRI once individuals become eligible. To do so, we estimate the following Probit regression:

$$claim_t^{i,m} = \Phi(\beta_1 \Delta \% H_t^{i,m} + \beta_2 X_t^{i,m} + \gamma_{1s} + \delta_{1t} + \varepsilon_t^{i,m}) \quad (1)$$

18 Coile et al. (2002), for example, show that delays are empirically important for early retirees but are fairly unimportant for late retirees.

19 An extensive literature has also considered how health insurance, specifically Medicare, affects the timing of retirement, as most workers lose employer-provided health insurance upon retirement. Therefore, workers may delay leaving the labor force until age 65 to ensure ongoing health insurance coverage (Madrian, Burtless, and Gruber, 1994; Rust and Phelan, 1997; Blau and Gilleskie, 2006 and 2008; French and Jones, 2011).

20 Crawford and Lilien (1981) argued that individuals start receiving SSRI due to liquidity constraint, where low-income workers do not save enough while working and thus claim earlier to finance consumption.

21 Benitez-Silva, Garcia-Perez, and Jimenez-Martin (2015) found that negative wealth shocks increase early claiming and time in the labor market.

22 For the effect of housing wealth on consumption, see Gan (2010), Campbell and Cocco (2007), Bostic, Gabriel, and Painter (2009), Browning, Gørtz, and Leth-Petersen (2013), Cooper (2013), Ong, Parkinson, Searle, Smith, and Wood (2013), and Aladangady (2017). Several recent papers have examined the effect of changes in housing wealth on the labor supply decisions of the elderly, finding mixed results (Disney, Ratcliffe, and Smith, 2015; Goda, Shoven and Slavov, 2011; Farnham and Sevak, 2007; Zhao and Burge, 2017a, 2017b; Ondrich and Falevich, 2016).

23 Researchers are considering these issues in other countries as well. Campbell and Cocco (2007) found that the largest effect of changes in house prices on consumption for UK residents was among older individuals. Gan (2010) found a similar relationship between housing wealth and consumption in Hong Kong

24 Although house prices started to decrease before 2008, we focus on 2008 to 2010 because we use the house price change in the previous two years.

where $claim_t^{i,m}$ is an indicator variable equal to one if individual i , living in MSA m , began receiving Social Security benefits after becoming eligible in year t . We allow t to be within one or two years of reaching age 62, depending on the specification. Φ is a standard normal cumulative distribution, $\Delta\%H_t^{i,m}$ is the percentage change in house value in the previous two years for individual i , living in MSA m in year t . We use the two-year change in house prices because our data, the Health and Retirement Survey, is a biannual survey and thus we only observe house prices every other year. We control for individual attributes, $X_t^{i,m}$, including gender, race, marital status, tenure at last job, education, total non-housing wealth, self-assessed health status, and retirement status. We include state fixed effects, γ_{1s} , to control for unobservable state specific attributes and year fixed effects, δ_{1t} , to capture unobservable shocks that are specific to a given year.

As discussed earlier, a simple Probit model likely suffers from two confounding issues that would bias our estimates. The first is reverse causality. Individual house values may inversely respond to when an individual starts receiving Social Security because the additional income from SSRI could be used for home maintenance and renovations that increase property values. To address this concern, we use an MSA specific house price index as an instrumental variable for changes in individual house prices. A similar approach was used previously by Lovenheim (2011), Lovenheim and Mumford (2013), Lovenheim and Reynolds (2013), and Zhao and Burge (2017a, 2017b).²⁵

This approach entails estimating the following first-stage regression:

$$\Delta\%H_t^{i,m} = \rho_1\Delta\%P_t^m + \rho_2X_t^{i,m} + \gamma_{2s} + \delta_{2t} + v_t^{i,m} \quad (2)$$

where $\Delta\%P_t^m$ is the two-year percentage change in the MSA housing price index. v_t is the error term.

Our initial findings using this instrument suggest that using the MSA house price index as an IV is unlikely to fully resolve the endogeneity concerns. Specifically, we believe it is likely that unobserved local demand shocks may be correlated with local house price appreciation which may simultaneously affect when individuals choose to start receiving SSRI.

To address the omitted variable bias, we utilize an alternative instrument. We use the MSA housing supply elasticity, proposed by Saiz (2010), interacted with the change in the national house price index as an instrument for a change in individual house values within the MSA. We argue that this is a valid instrument because in response to a nation-wide positive demand shock, MSAs with more inelastic housing supply (i.e. areas with more mountains or near water such as New York City, NY or San Francisco, CA) will experience larger house price changes than MSAs with a more elastic housing supply (i.e. flat areas such as Houston, TX or Kansas City, MO). The housing supply elasticity is likely to be exogenous to local demand shocks, as this is a supply-side measure driven by exogenous topological factors and policy regulations. This instrument has been extensively used in the literature, including by Mian and Sufi (2011, 2014), Chaney, Sraer, and Thesmar (2012), Mian, Rao and Sufi (2013), Cvijanović (2014), Dettling and Kearney (2014), Akadabgadt (2017) and Chetty, Sándor and Szeidl (2017).

Using this instrument, we estimate the following for our first stage regression:

$$\Delta\%H_t^{i,m} = \theta_1\Delta\%P_t^{US} \times Elasticity^m + \theta_2X_t^{i,m} + \gamma_{3s} + \delta_{3t} + \epsilon_t^{i,m} \quad (3)$$

where $\Delta\%P_t^{US}$ is the two year percentage change in the national house price index, $Elasticity^m$ is the Saiz (2010) estimate of the housing supply elasticity in MSA m . ϵ_t is the error term.

5 DATA AND SUMMARY STATISTICS

Our analysis relies on three data sources. The primary data source is the Health and Retirement Study (HRS) with restricted-access geographic data. The HRS is a longitudinal household survey of more than 26,000 Americans over the age of 50 and is collected every two years. The public version provides detailed information on demographics, financial and housing wealth, health, labor market status, etc. The restricted geographic version adds additional details on the county in which the respondent lives. Given that the instrumental variable we employ is at the MSA level, we use the restricted data to have the necessary geographic detail to conduct our analysis. After a preliminary screening, our sample includes 19,027 individuals.²⁶

The second dataset we utilize is the national house price index and MSA house price indexes constructed by the Federal Housing Finance Agency (FHFA).²⁷ The FHFA index has been widely used to capture national and local price trends of housing markets (i.e. Himmelberg, Mayer, and Sinai 2005).

The third data source is the housing supply elasticities for 269 MSAs provided by Saiz (2010). He estimates land supply elasticities by processing satellite-generated data on elevation, the presence of bodies of water, and the Wharton

²⁵ These papers explored the variation in MSA housing price in a reduced form setting. They utilized a difference-in-differences strategy, comparing renters to homeowners. We do not use a differencing strategy as it is likely that there are unobservable differences between elderly individuals who choose to own versus rent. Instead, we use MSA housing price variation as an instrument initially but rely more on the exogenous source of the variation driven by MSA land supply elasticity later as our main identification strategy.

²⁶ Initially, the sample had 37,319 elderly individuals. We exclude the 5,729 individuals who report receiving Social Security benefits before becoming age eligible to receive SSRI. We also exclude the 706 respondents who report ever receiving disability retirement benefits. Further, we include only individuals whom we observe before they turn 60 (two years before the eligibility age), which causes us to lose 11,857 more respondents.

²⁷ <http://www.fhfa.gov/DataTools/Downloads/Pages/House-Price-Index-Datasets.aspx#qat>.

Regulation Index (WRI), which is a measure of the stringency of land use regulation. Land use regulations play a role in differences in the availability of land (Glaser and Gyourko, 2003; Glaser, Gyourko and Sakes, 2005), together with physical constraints. This supply elasticity measure has been widely used as an instrumental variable for house prices or housing wealth, as mentioned earlier.

We match MSAs and counties using the Geographic Correspondence Engine.²⁸ Given that we use the MSA-level housing supply elasticity as our main instrumental variable, in our primary specification we limit our sample to the counties located within the MSAs covered by the Saiz (2010) topography-based elasticity measure. We also drop households that experienced a percent change in house prices above the 99th percentile or below the 1st percentile, as well as individuals who moved in the previous two years to ensure that the change in home equity is due to price appreciation/depreciation of the same housing unit. This reduces the sample to 8,959 individuals within 1,235 counties in 215 MSAs.²⁹

Table 1 presents summary statistics for all variables included in our analysis. We present the mean and standard deviation of each variable for three periods: the full sample (2002 to 2010), the boom period (2002 to 2006), and the bust period (2008 to 2010). In the full sample, around 52% of the elderly claim SSRI within one year of becoming eligible, which is consistent with the number reported by Munnell and Chen (2015) who use data from the U.S. Social Security Administration. This number is higher in our sample during the boom period but decreases during the housing bust. The lower probability of claiming early during the bust period is likely driven by the deteriorated macroeconomy. This also highlights the importance of controlling for macroeconomic shocks in our model estimation.

Note that, although the HRS is conducted every two years, the respondents report the actual year and month when they started receiving SSRI. This information allows us to expand the biannual panel to an annual panel and record precisely the SSRI withdrawal timing. However, because we only have reported house values during the survey years, we still need to use the two-year change in house prices. For survey years, we take the difference in reported house prices between the two surveys. In non-survey years, we use the reported house prices in the adjacent two years and the MSA house price index to extrapolate the house value in the non-survey year. For example, for 2005 we use the reported house values in 2004 and 2006, as well as the MSA house price index in 2004, 2005, and 2006, to estimate the reported house value in 2005.

With regards to the change in house prices, we see in Table 1 that the two-year average percentage change in house values for our sample is 12% from 2002 to 2010. The national and MSA house price appreciation rate, however, are both approximately 10%. From 2002-2006, this number increased to approximately 19% for our sample and about 17% at the national and MSA level. However, during the bust period from 2008-2010, house prices declined in our sample by about 4%, nationwide by approximately 8%, and by approximately 8.5% in MSAs.³⁰

The average housing supply elasticity is around 1.73%. Approximately 57% of respondents are female, 86% are white, and 82% are married. Older workers with more than ten years of service at in their last job are 35% of our sample. Approximately 56% of the sample has completed high school and 28% have a college degree. The average non-housing wealth is about \$428,063. The average self-assessed health status is 2.48, which suggests that elderly individuals assess their health as “good” on average.³¹ Given the important role of retirement decisions in assessing SSRI claiming, we also control for retirement status. Approximately 38% of respondents are retired and no longer working. These averages are similar for both the boom and bust periods.

6 RESULTS

Effect of Changes in Home Values on Claiming SSRI Early

We begin our analysis by estimating Equation (1) using a simple Probit regression. Results are presented in Table 2. Columns (1) and (2) examine whether an individual claims SSRI within one year of becoming eligible during the housing boom (2002 to 2006). We control for state fixed effects in both columns and add year fixed effects in Column (2) to capture any unobserved time-varying, nation-wide shocks. Columns (3) and (4) examine whether an individual claims SSRI within two years of becoming eligible, with Column (3) including only state fixed effects and Column (4) adding year fixed effects. Columns (5) to (8) follow the same structure as Columns (1) to (4) but cover the bust period (2008 to 2010). All specifications include controls for gender, race, marital status, tenure at last job, education, non-housing wealth, self-assessed health, and retirement status. We report the coefficients from the Probit model in the upper panel and the corresponding marginal effects in the lower panel. T-statistics are reported in parentheses and are calculated using standard errors clustered at the MSA level.

28 <http://mcdc2.missouri.edu/websas/geocorr2k.html>.

29 This sample size is before we restrict observations to the boom and bust periods and to those with valid entries for all included control variables.
30 One explanation for why our reported house values are above the national and MSA house price changes is that we are only considering a select sample of the elderly while these indices are based on the entire population. An alternative explanation is that individuals tend to overestimate the value of their home. The evidence on what determines the possible reporting errors is mixed. Haurin, Moulton, and Shi (2017), who examined just the elderly population, found that the size of the error changes with income, credit score, and ethnicity. Goodman and Ittner (1992), however, found that this reporting error is uncorrelated with characteristics of the home, the local economy, and the homeowner. We include a variety of controls to try to minimize any bias in the error term. Other research has used self-reported house values in their analysis, given data constraints such as ours, including Corradin and Popov (2015) and Harding and Rosenthal (2017).

31 The variable “self-reported general health status” includes five values, with 1 for “excellent,” 2 for “very good,” 3 for “good,” 4 for “fair,” and 5 for “poor.”

Looking at the results in Table 2, we do not find consistent evidence of an effect of changes in house value on Social Security benefit claiming during either the boom or bust period. The only statistically significant effect we find is a negative effect in Column (3), which, while this is the anticipated sign, is only marginally significant at the 10% level.

However, as discussed previously, a simple Probit estimation is likely to suffer from endogeneity issues due to reverse causality at the household level and omitted variable bias at the local level. We address these concerns by using two different instrumental variables. First, we use the MSA house price index as an instrument for the change in house value. The corresponding results are presented in Table 3, where the columns follow the same structure as in Table 2. Panel A presents the second stage results, both the estimated coefficients and the marginal effects, and Panel B shows the first stage coefficients.

Looking at the first stage results in Panel B, we see that the change in the MSA house price index is a statistically significant predictor of individual house price changes. However, the Wald test of exogeneity generally fails to reject the null hypothesis, except in the specifications without year fixed effects in the boom period. This may suggest that the MSA house price index is not a valid instrument, possibly because of the presence of omitted variable bias. In the second stage results presented in Panel A, we again do not find that changes in home value have a statistically significant effect on the probability of claiming SSRI at an earlier age.

To address the potential endogeneity arising from both unobserved local demand shocks and household level reverse causality, we use the interaction of the housing supply elasticity and the change in the national house price index to instrument for changes in home value. Table 4 reports IV Probit regression results using this instrument variable. The structure is the same as Table 3. The first stage results presented in Panel B suggest that this instrument is valid, as the Wald test of the exogeneity of the instrumented variables rejects the null hypothesis.

Panel A of Table 4 presents the second stage coefficients from the IV regression. We find a negative and statistically significant effect of a change in house prices on the likelihood of claiming SSRI benefits early during the boom period. This negative coefficient suggests that when house prices increase, elderly individuals delay receiving SSRI. Specifically, our results indicate that when housing values increase by 10%, the probability of claiming SSRI within one year of becoming eligible is reduced by 4 percentage points and the probability of claiming SSRI within two years of becoming eligible is reduced by 5 percentage points. This translates into an 8% decrease in the probability of claiming within one year of eligibility and an 8.3% decrease in the probability of claiming within two years of eligibility. The negative coefficient indicates that when house prices increase, elderly individuals may draw upon their home equity to finance expenditures and hence delay receipt of SSRI to receive higher monthly benefits. However, we do not find a statistically significant effect during the housing bust period. This is also consistent with our expectations, as when house prices depreciate the decline in home equity takes away this alternative source of finances.

Gender Heterogeneity and the Role of Life Expectancy

Next, we consider the possible gender heterogeneity of the effects of changes in house prices on the timing of claiming SSRI. We believe that the SSRI claiming response to a change in house value will be different for males versus females. Previous research has found that with regards to labor supply decisions, females are more sensitive to policy changes, possibly because men are more likely to be the primary earner (Zhao and Burge, 2017a, 2017b). It has also been well documented that females on average have a longer life expectancy than males. Given these differences, it is plausible that men and women respond differently with regards to claiming SSRI.

Table 5 reports the IV Probit results stratified by gender using the interaction of changes in the national house price index and the housing supply elasticity as the instrument variable as this is our preferred specification.³² We focus on the boom period given the results from Table 4 that the effect of house price changes on SSRI claiming appears to only be present when house prices appreciate.³³ We do not find a statistically significant effect for males but we do find a strong, statistically significant negative effect for females.³⁴

Even though the gender difference in SSRI claiming in response to changes in home values could be due to other factors, we highlight the possible role of life expectancy in determining claiming decisions. A key trade-off in deciding when to claim SSRI is that when an individual claims earlier, he/she gets benefits for a longer period of time but the monthly benefit is lower. Females, who have a longer life expectancy, may be more inclined to delay SSRI claiming since they will benefit for longer from the increased monthly benefits.

To quantify and compare the benefits/losses for females and males based on claiming time, we calculate how the net present value of SSRI benefits differs if an elderly individual chooses to claim at all months from 62 to 70. For simplicity, we assume that the monthly benefit is \$1,000 at the Full Retirement Age (FRA) for each birth cohort and gender. We then apply the reduction for claiming before the FRA and the credit for delayed claiming past the FRA from the Social Security

32 We estimated the standard Probit model and IV Probit using the MSA house price index as an instrument. For both models, like the pooled sample we do not find consistent, statistically significant effects. These results are available from the authors upon request.

33 Like the pooled model, when examining the bust period, we do not find any statistically significant effects, and in the interest of brevity do not show them. These results are available from the authors upon request.

34 Zhao and Burge (2017a, 2017b) also find that females are more responsive than males to changes in housing wealth, but they focus on labor force participation. They find that in response to a doubling of housing wealth, labor force participation rates for females are more than twice as responsive as those for males.

Administration.³⁵ We use the Life Tables by birth cohort and gender provided by Poterba (2014), which gives the mortality rate based on Bell and Miller (2005). We then impute the survival rate from age 62.³⁶ The final imputed net present value of retirement benefits, assuming an annual discount rate of 3%,³⁷ are shown in Figure 3 and Figure 4.

The figures suggest that females have a higher present value than males to delaying SSRI receipt given their longer life expectancy. The net present value tends to peak at a later age for females, versus for men who the peak appears to be around 62. This indicates that females should claim SSRI later than males, all else equal. At the same time, because females achieve the maximum present value beyond the first two years of eligibility, they have an incentive to delay receiving SSRI, especially if they are able to find alternative income sources. For men, the present value of retirement benefits actually decreases after the first two years of eligibility. These net present value predictions are consistent with our findings in Table 5 that women are more likely to delay receiving SSRI when house prices appreciate.

Borrowing against Home Equity

Our results thus far suggest that elderly individuals tend to delay SSRI claiming when house prices appreciate. Theoretically, an increase in housing wealth could provide additional income for a household through the collateral borrowing channel (see Cooper, 2013; Mian and Sufi, 2011; 2014; Mian, Rao and Sufi, 2013; Akadabgadt, 2017). To provide evidence of the cashing-out of home equity, we examine whether the total amount of home loans (primary mortgage, additional mortgages, and all home equity loans) increases when houses appreciate in value. We present these results in Table 6. The first stage results suggest that the change in the national house price index interacted with the land supply elasticity are strong predictors of changes in individual house values, although the Wald test of exogeneity of our instrumental variable does not reject the null hypothesis except in the specification without year fixed effects in the boom period. The second stage regression indicates that when house prices appreciate, the likelihood that the total home loan amount increased in the previous two years becomes higher. The magnitude of the change is much higher during the boom period than the bust period.³⁸

We then directly examine whether the additional income from borrowing against home equity will affect the probability of claiming SSRI within one or two years of becoming eligible. These results, presented in Table 7, show that when the total home loan amount increases, the probability of claiming SSRI within one or two years become significantly lower. The Wald test of exogeneity of our instrumental variable rejects the null hypothesis, but the instrument is not a strong predictor of the housing loan amount, possibly due to missing the individual house price change as the bridging predictor for the probability of increased total home loan amount. In addition, consistent with previous results, we find a significant effect during the boom period but we do not find a statistically significant effect during the housing bust period.

Our results indicate that home equity affects the timing of claiming SSRI through the borrowing collateral channel, which is consistent with previous studies. Even though the results might suffer from weak IVs, which cannot be fully resolved in our setting, we do find consistent evidence in the second stage regressions. Together with the previous results on claiming SSRI early, the evidence seems to suggest that house price appreciation increases the possibility for elderly households to borrow against their housing equity which may substitute for SSRI in financing retirement expenses.

7 CONCLUSIONS AND POLICY IMPLICATIONS

Social Security and the timing of when the elderly decide to claim these benefits has become increasingly important due to the rapid increase in the aging population in the U.S. Besides SSRI wealth, most elderly households carry a large fraction of their asset portfolios in their home equity. In this paper, we use restricted access HRS data to investigate the effects of changes in housing wealth on the probability of claiming SSRI when individuals become eligible during the recent housing boom and bust periods.

Simple Probit estimations are likely to suffer from endogeneity issues due to unobserved individual characteristics and unobserved local demand shocks. To address the endogeneity problems, we utilize two different instrumental variables for the changes in home equity: (1) changes in the MSA house price index and (2) the interaction between changes in the national house price index and a measure of the housing supply elasticity. The second instrument constitutes the central identification strategy of our paper, as we find that using the MSA house price index as an instrument likely does not address all endogeneity issues.

We find consistent evidence that when house prices increase, individuals delay receiving SSRI after immediately becoming eligible. This estimated effect is statistically significant during the boom period but not during the bust period. We also find that females are more likely to respond and delay receiving SSRI after an increase in house prices, consistent with a longer life expectancy encouraging the delay. We further find that people are more likely to increase the total amount of home loans (primary mortgages, any additional mortgages, and any home equity line of credit) when house

35 The reduction for early claiming and credit for delayed retirement were obtained from <https://www.ssa.gov/planners/retire/ageincrease.html>, and <https://www.ssa.gov/planners/retire/delayret.html>, respectively.

36 The mortality rate in Poterba (2014) is the probability of dying within one year at a certain age (conditional on living to a certain age). We calculate the monthly mortality rate to be $1 - (1 - \text{annual mortality})^{(1/12)}$, giving us the probability of dying within the next month at a certain age. We then calculate the survival rate at age 62 based on the conditional mortality rate.

37 This discount rate is the long term inflation rate in the U.S. and has been used in previous papers such as Munnell and Soto (2005) and Heiland and Yin (2014). Consequently, the monthly discount rate is 0.25%.

38 Note that the sample size increased significantly as we do not restrict the sample to within one or two years of an individual becoming eligible to receive SSRI and we do not restrict respondents to have a well-defined early claiming dummy as in previous regressions.

prices appreciate. This finding suggests that these individuals are borrowing against their home equity to obtain the necessary finances to cover their expenses instead of receiving SSRI earlier.

Overall, our findings suggest that the elderly treat increases in home equity and SSRI as substitutes to finance retirement expenses. A simple present value calculation suggests that the value of a female's retirement benefits could increase by about 17-19 percent if she claims later rather than when immediately eligible. Moreover, individuals may prefer to utilize home equity given the option of a reverse mortgage or the consideration that drawing upon home equity is contingent on current house price appreciation while SSRI is a permanent and safe asset. If home equity provides an alternative source of income that is more contingent on market conditions, elderly females will have the incentives to delay receiving their SSRI benefits and use housing equity to finance their expenditures when this option is available.

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REFERENCES

- Adelino, M., Schoar, A. and Severino, F., 2015. House prices, collateral, and self-employment. *Journal of Financial Economics*, 117(2), pp.288-306.
- Aladangady, A. Forthcoming. Housing Wealth and Consumption: Evidence from Geographically-linked Microdata. *American Economic Review*.
- Behaghel, L. and Blau, D.M., 2012. Framing social security reform: Behavioral responses to changes in the full retirement age. *American Economic Journal: Economic Policy*, 4(4), 41-67.
- Bell, F.C. and Miller, M.L., 2005. Life tables for the United States social security area. *Social Security Administration Publications*, (11-11536).
- Benitez-Silva, H., Garcia-Pérez, J.I. and Jiménez-Martín, S., 2015. The Effects of Employment Uncertainty, Unemployment Insurance, and Wealth Shocks on the Retirement Behavior of Older Americans. *Documento de Trabajo*, p.06.
- Blau, D.M. and Gilleskie, D.B., 2006. Health insurance and retirement of married couples. *Journal of Applied Econometrics*, 21(7), 935-953.
- Blau, D.M. and Gilleskie, D.B., 2008. The role of retiree health insurance in the employment behavior of older men. *International Economic Review*, 49(2), pp.475-514.
- Boskin, M.J. and Hurd, M.D., 1978. The effect of social security on early retirement. *Journal of Public Economics*, 10(3), pp.361-377.
- Bostic, R., S. Gabriel, and G. Painter, 2009. Housing wealth, financial wealth, and consumption: New evidence from micro data. *Regional Science and Urban Economics*, 39(1), 79-89.
- Brown, J.R., Kapteyn, A. and Mitchell, O.S., 2011. *Framing effects and expected social security claiming behavior* (No. w17018). National Bureau of Economic Research.
- Browning, M., Gørtz, M. and Leth-Petersen, S., 2013. Housing wealth and consumption: a micro
- Burtless, G., 1986. Social security, unanticipated benefit increases, and the timing of retirement. *The Review of Economic Studies*, 53(5), pp.781-805.
- Campbell, J.Y. and Cocco, J.F., 2007. How do house prices affect consumption? Evidence from micro data. *Journal of Monetary Economics*, 54(3), pp.591-621.
- Card, D., Maestas, N. and Purcell, P.J., 2014. Labor market shocks and early Social Security benefit claiming.
- Card, D., Maestas, N. and Purcell, P.J., 2014. Labor market shocks and early Social Security benefit claiming.
- Chaney, T., Sraer, D. and Thesmar, D., 2012. The collateral channel: How real estate shocks affect corporate investment. *The American Economic Review*, 102(6), 2381-2409.
- Chetty, R., Sándor, L. and Szeidl, A., 2017. The effect of housing on portfolio choice. *The Journal of Finance*, 72(3), pp.1171-1212.
- Clark, R.L. and Gohmann, S.F., 19983. Retirement and the acceptance of Social Security benefits.
- Cloyne, J., Huber, K., Ilzetzki, E., and Kleven, H., 2017. The effect of house prices on household borrowing: A new approach. NBER Working Paper 23861.
- Coile, C. and P.B. Levine. 2011a. Recessions, Retirement and Social Security. *American Economic Review Papers and Proceedings* 101(3), 23-28.
- Coile, C. and P.B. Levine. 2011b. The Market Crash and Mass Layoffs: How the Current Economic Crisis May Affect Retirement. *The B.E. Journal of Economic Analysis and Policy: Contributions*, 11(1).
- Coile, C., P. Diamond, J. Gruber, and A. Jousten. 2002. "Delays in Claiming Social Security Benefits." *Journal of Public Economics*, 84(3), 357-385.
- Coile, C.C. and Levine, P.B., 2007. Labor market shocks and retirement: Do government programs matter?. *Journal of Public Economics*, 91(10), 1902-1919.
- Cooper, D., 2013. House price fluctuations: the role of housing wealth as borrowing collateral. *Review of Economics and Statistics*, 95(4), pp.1183-1197.
- Coronado, J.L. and Perozek, M. 2003. Wealth effect and the consumption of leisure: Retirement decisions during the stock market boom of the 1990s. Board of Governors of the Federal Reserve System, Finance and Economics discussion series no. 2003-20.
- Corradin, S. and Popov, A., 2015. House prices, home equity borrowing, and entrepreneurship. *The Review of Financial Studies*, 28(8), pp.2399-2428.
- Crawford, V.P. and Lilien, D.M., 1981. Social security and the retirement decision. *The Quarterly Journal of Economics*, 96(3), 505-529.
- Cvijanović, D., 2014. Real estate prices and firm capital structure. *Review of Financial Studies*, 27(9), 2690-2735.
- Dettling, L.J. and Kearney, M.S., 2014. House prices and birth rates: The impact of the real estate market on the decision to have a baby. *Journal of Public Economics*, 110, pp.82-100.
- Disney, R. and Gathergood, J., 2009. Housing wealth, liquidity constraints and self-employment. *Labour Economics*, 16(1), pp.79-88.
- Disney, R., Ratcliffe, A. and Smith, S., 2015. Booms, busts and retirement timing. *Economica*, 82(327), 399-419.
- Engelhardt, G.V., 1996. House prices and home owner saving behaviour. *Regional Science and Urban Economics*, 26(3), 313-336.

- Farnham, M. and Sevak, P., 2007. Housing wealth and retirement timing. Michigan Retirement Research Center Research Paper No. UM WP, 172.
- French, E. 2005. The effects of health, wealth, and wages on labour supply and retirement behaviour. *Review of Economic Studies*, 72(2), 395-427.
- French, E. and Jones, J.B., 2011. The effects of health insurance and self-insurance on retirement behavior. *Econometrica*, 79(3), 693-732
- Gan, J., 2010. Housing wealth and consumption growth: Evidence from a large panel of households. *The Review of Financial Studies*, 23(6): 2229-2267.
- Glaeser, E.L. and Gyourko, J., 2003. The impact of building restrictions on housing affordability. *Federal Reserve Bank of New York Economic Policy Review*, 9(2), pp.21-21.
- Glaeser, E.L., Gyourko, J. and Saks, R., 2005. Why is Manhattan so expensive? Regulation and the rise in housing prices. *The Journal of Law and Economics*, 48(2), pp.331-369.
- Goda, G.S., Shoven, J.B. and Slavov, S.N., 2011. What explains changes in retirement plans during the Great Recession?. *The American Economic Review*, 101(3), 29-34.
- Goda, G.S., Shoven, J.B. and Slavov, S.N., 2012. Does stock market performance influence retirement intentions?. *Journal of Human Resources*, 47(4), 1055-1081.
- Goodman, J.L. and Ittner, J.B., 1992. The accuracy of home owners' estimates of house value. *Journal of Housing Economics*, 2(4), pp.339-357.
- Gruber, J. and Wise, D., 1998. Social security and retirement: An international comparison. *The American Economic Review*, 88(2), pp.158-163.
- Gustman, A.L., and T.L. Steinmeier. 2005. The Social Security early retirement age in a structural model of retirement and wealth. *Journal of Public Economics*. 89(2-3), 441-463.
- Harding, J.P. and Rosenthal, S.S., 2017. Homeownership, housing capital gains and self-employment. *Journal of Urban Economics*, 99, pp.120-135.
- Haurin, D., Moulton, S. and Shi, W., 2017. The Accuracy of Senior Households' Estimates of Home Values: Application to the Reverse Mortgage Decision. *Real Estate Economics*.
- Heiland, F. and Yin, N., 2014. Have We Finally Achieved Actuarial Fairness of Social Security Retirement Benefits and Will It Last?.
- Himmelberg, C., Mayer, C. and Sinai, T., 2005. Assessing high house prices: Bubbles, fundamentals and misperceptions. *The Journal of Economic Perspectives*, 19(4), pp.67-92.
- Hurd, M.D. and Boskin, M.J., 1984. The effect of social security on retirement in the early 1970s.
- Hurd, M.D., Smith, J.P. and Zissimopoulos, J.M., 2004. The effects of subjective survival on retirement and social security claiming. *Journal of Applied Econometrics*, 19(6), 761-775.
- Hurst, E. and Lusardi, A., 2004. Liquidity constraints, household wealth, and entrepreneurship. *Journal of Political Economy*, 112(2), pp.319-347.
- Imbens, G.W., Rubin, D.B. and Sacerdote, B.I., 2001. Estimating the effect of unearned income on labor earnings, savings, and consumption: Evidence from a survey of lottery players. *American Economic Review*, 91(4), 778-794.
- J. Shoven and S. Slavov. 2014b. "Recent Changes in the Gains from Delaying Social Security."
- Jiang, S., Sun, W. and Webb, A., 2011. Did the Housing Boom Increase Household Spending? (No. ib2011-10). *Journal of Financial Planning*, 27(3), 32-41.
- Kerr, S., Kerr, W.R. and Nanda, R., 2015. *House money and entrepreneurship* (No. w21458). National Bureau of Economic Research.
- Laitner, J. and Silverman, D., 2012. Consumption, retirement and social security: Evaluating the efficiency of reform that encourages longer careers. *Journal of public economics*, 96(7), pp.615- 634.
- Lee, R.D., 2014. Macroeconomic Consequences of Population Aging in the United States: Overview of a National Academy Report. *The American Economic Review* 104(5): 234-239.
- Liebman, J.B., Luttmer, E.F. and Seif, D.G., 2009. Labor supply responses to marginal Social Security benefits: Evidence from discontinuities. *Journal of Public Economics*, 93(11), pp.1208- 1223.
- Lovenheim, M.F. and Mumford, K.J., 2013. Do family wealth shocks affect fertility choices? Evidence from the housing market. *Review of Economics and Statistics*, 95(2), 464-475.
- Lovenheim, M.F. and Reynolds, C.L., 2013. The effect of housing wealth on college choice: Evidence from the housing boom. *Journal of Human Resources*, 48(1), 1-35.
- Lovenheim, M.F., 2011. The effect of liquid housing wealth on college enrollment. *Journal of Labor Economics*, 29(4), 741-771.
- Madrian, B.C., Burtless, G. and Gruber, J., 1994. The effect of health insurance on retirement. *Brookings Papers on Economic Activity*, 1994(1), 181-252.
- Mahaney, J.I. and P.C. Carlson. 2007. "Rethinking Social Security Claiming in a 401(k) World." Working paper 2007-18. Philadelphia: Pension Research Council.
- Mastrobuoni, G., 2009. Labor supply effects of the recent social security benefit cuts: Empirical estimates using cohort discontinuities. *Journal of Public Economics*, 93(11), 1224-1233.
- Mayer, C.J. and Simons, K.V., 1994. Reverse mortgages and the liquidity of housing wealth. *Real Estate Economics*, 22(2), pp.235-255.
- Merrill, S.R., M. Finkel, and N. Kutty. 1994. Potential beneficiaries from reverse mortgage products for elderly homeowners: An analysis of AHS data. *Journal of the American Real Estate and Urban Economics Association* 22(2), 257-99.
- Meyer, W. and W. Reichenstein. 2010. "Social Security: When to Start Benefits and How to Minimize Longevity Risk." *Journal of Financial Planning*, 23(3), 49-59.
- Mian, A., and A. Sufi, House Prices, Home Equity Based Borrowing, and the U.S. Household Leverage Crisis, *The American Economic Review*, 101 (2011), 2132-2156.
- Mian, A., and A. Sufi. 2014. What Explains the 2007-2009 Drop in Employment? *Econometrica*, 82(6), 2197-2223.
- Mian, A., K. Rao, and A. Sufi. 2013. Household Balance Sheets, Consumption, and the Economic Slump, *The Quarterly Journal of Economics*, 128, 1687-1726.
- Mirrlees, T.W., 1998. The optimal time to file for Social Security Benefits. *Public Finance Review*, 26(6), 611-636.
- Munnell, A.H. and M. Soto. 2005. "Why do Women Claim Social Security Benefits so Early?" Issue Brief 35, Center for Retirement Research. Chestnut Hill: Boston College.
- Munnell, A.H. and Sass, S.A., 2012. Can the actuarial reduction for Social Security early retirement still be right?. *Center for Retirement*

Research at Boston College, Issue in Brief, (12-6).

Munnell, A.H., and M.S. Rutledge. 2013. The effects of the Great Recession on the retirement security of older workers. *The ANNALS of the American Academy of Political and Social Science* 650(1), 124-142.

National Tax Journal, 36(4), 529-534.

Ondrich, J. and A. Falevich, 2016. The Great Recession, housing wealth, and the retirement decisions of older workers. *Public Finance Review*, 44(1), 109-131.

Ong, R., Parkinson, S., Searle, B.A., Smith, S.J. and Wood, G.A., 2013. Channels from housing wealth to consumption. *Housing Studies*, 28(7), pp.1012-1036.

panel study. *The Economic Journal*, 123(568), pp.401-428.

Poterba, J.M., 2014. Retirement security in an aging population. *The American Economic Review*, 104(5), pp.1-30.

Rust, J. and Phelan, C., 1997. How Social Security and Medicare affect retirement behavior in a world of incomplete markets. *Econometrica*, 65(4), 781-831.

Saiz, A., 2010. The geographic determinants of housing supply. *Quarterly Journal of Economics*, 125(3), 1253-1296.

Samwick, A.A., 1998. New evidence on pensions, social security, and the timing of retirement. *Journal of Public Economics*, 70(2), pp.207-236.

Sass, S.A., W. Sun, and A. Webb. 2013. "Social Security Claiming Decision of Married Men and Widow Poverty." *Economic Letters*, 119(1), 20-23.

Shoven, J. and S. Slavov. 2014a. "Does it Pay to Delay Social Security?" *Journal of Pension Economics and Finance*, 13(2), 121-144.

Shoven, J.B., Slavov, S.N., Wise, D.A., 2017. Social Security Claiming Decisions: Survey Evidence. NBER Working Paper 23729.

Sinai, T. and Souleles, N.S., 2007. *Net worth and housing equity in retirement* (No. w13693). National Bureau of Economic Research.

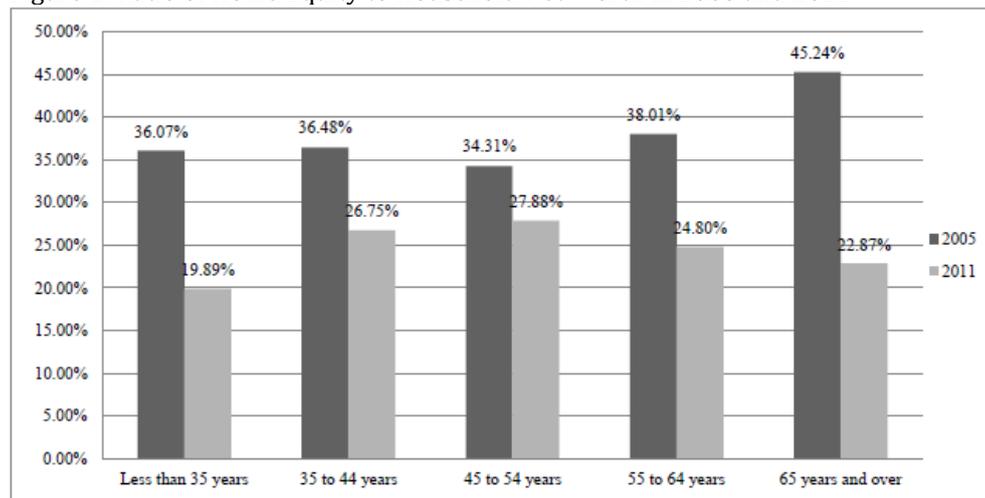
The Quarterly Journal of Economics, 99(4), 767-790.

Van der Klaauw, W. and Wolpin, K.I., 2008. Social security and the retirement and savings behavior of low-income households. *Journal of Econometrics*, 145(1), pp.21-42.

Zhao, L. and G. Burge. Forthcoming. Housing wealth, property taxes, and labor supply among the elderly. *Journal of Labor Economics*.

Zhao, L. and G. Burge. Forthcoming. Retirement, unretirement, and housing wealth during the Great Recession. *Journal of Housing Economics*.

Figure 1: Ratio of Home Equity to Household Net Worth in 2005 and 2011



Source: Survey of Income and Program Participation (SIPP), 2013.

Table 1: Summary Statistics ¹

	full sample		2002	-	2008-	
	Mean	Std. Dev.	Mean	2006	2010	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Claim SSRI within 1 year of eligibility	0.5149	0.4999	0.5460	0.4980	0.4438	0.4972
Claim SSRI within 2 years of eligibility	0.6066	0.4886	0.6311	0.4826	0.5493	0.4979
Δ% in house value in previous 2 years	0.1186	0.3209	0.1888	0.3224	-0.0419	0.2528
Δ% in US HPI in previous 2 years	0.0965	0.1222	0.1746	0.0319	-0.0833	0.0253
Δ% in MSA HPI in previous 2 years	0.0969	0.1653	0.1754	0.1159	-0.0854	0.1095
Housing supply elasticity	1.7326	1.0724	1.7252	1.0865	1.7500	1.0393
Dummy for total home loan increased in the previous 2 years	0.2062	0.4047	0.2191	0.4137	0.1773	0.3822
Female	0.5677	0.4955	0.5553	0.4971	0.5960	0.4910
White	0.8633	0.3436	0.8619	0.3451	0.8663	0.3406
Married	0.8213	0.3832	0.8302	0.3756	0.8009	0.3996
Tenure at last job zero to five years	0.2302	0.4211	0.2257	0.4182	0.2404	0.4276
Tenure at last job five to ten years	0.1159	0.3203	0.1051	0.3068	0.1408	0.3481
Tenure at last job more than ten years	0.3492	0.4768	0.3576	0.4794	0.3300	0.4706
High school	0.5638	0.4960	0.5653	0.4959	0.5605	0.4967
College	0.2774	0.4478	0.2568	0.4370	0.3243	0.4685
Non-housing wealth	428063	2201155	462014	2610368	350404	579714
Self-assessed health status	2.4773	0.9848	2.4565	0.9968	2.5248	0.9558
Retired	0.3847	0.4866	0.3837	0.4864	0.3869	0.4874

1 Other control variables include gender, race, marital status, tenure in the last job, education, total non-housing wealth, retirement

status, and self-assessed health status.

Table 2: Probit Regressions - Claiming SSRI within 1 or 2 years after Becoming Eligible¹ (t statistics are reported in parentheses using clustered standard errors at the MSA level)

Dependent Variable	2002 – 2006				2008- 2010			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Claim SSRI within 1 Year		Claim SSRI within 2 Years		Claim SSRI within 1 Year		Claim SSRI within 2 Years	
	<i>Probit Regression Coefficient</i>							
Δ% in house value in previous 2 years	-0.1373 (-1.13)	-0.0967 (-0.79)	-0.1623* (-1.82)	-0.1177 (-1.34)	0.0053 (0.30)	0.1468 (0.67)	0.1708 (0.68)	0.1832 (0.69)
	<i>Marginal Effect</i>							
Δ% in house value in previous 2 years	-0.0405 (-1.13)	-0.0283 (-0.79)	-0.00474* (-1.83)	-0.0342 (-1.35)	0.0191 (0.30)	0.0423 (0.68)	0.0478 (0.68)	0.0513 (0.69)
State Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	NO	YES	NO	YES	NO	YES	NO	YES
Observations	1600	1600	1578	1578	677	677	669	669
Log Pseudolikelihood	-834.8475	-828.8786	-817.5137	-812.5042	-351.4872	-246.3202	-332.9841	-332.8628

1 Other control variables include gender, race, marital status, tenure in the last job, education, total non-housing wealth, retirement status, and self-assessed health status.

Table 3: IV Probit Regressions – Claiming SSRI within 1 or 2 Years after Becoming Eligible¹ (t statistics are reported in parentheses using clustered standard errors at the MSA level)

Dependent Variable	2002 – 2006				2008- 2010			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Panel A: Second-Stage</i>								
	Claim SSRI within 1 Year		Claim SSRI within 2 Years		Claim SSRI within 1 Year		Claim SSRI within 2 Years	
	<i>Probit Regression Coefficient</i>							
Δ% in house value in previous 2 years	-0.4853 (-0.62)	0.2581 (0.23)	-0.7711 (-1.06)	0.1059 (0.10)	-0.1535 (0.27)	-0.1927 (-0.25)	-0.2782 (-0.56)	-0.0411 (-0.06)
	<i>Marginal Effect</i>							
Δ% in house value in previous 2 years	-0.1378 (-0.60)	0.0666 (0.23)	-0.2916 (-1.05)	0.0413 (0.10)	-0.0525 (0.27)	-0.0640 (-0.25)	-0.0988 (-0.55)	-0.0162 (-0.05)
<i>Panel B: First-Stage</i>								
	<i>Δ% in House Value in Previous 2 Years</i>							
Δ% in MSA HPI in previous 2 years	0.7277*** (5.62)	0.6085*** (4.28)	0.7315*** (5.84)	0.6206*** (4.49)	0.9929*** (13.97)	0.9238*** (9.44)	0.9852*** (14.59)	0.9029*** (9.40)
State Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	NO	YES	NO	YES	NO	YES	NO	YES
Wald Test of Exogeneity	0.22	0.09	0.74	0.04	3.02*	1.86	6.44**	2.18
Observations	1558	1558	1538	1538	639	639	627	627
Log Pseudolikelihood	-1157.2796	-1146.5978	-1101.8946	-1092.6191	-156.5519	-151.1644	-134.1805	-133.0718

1 Other control variables include gender, race, marital status, tenure in the last job, education, total non-housing wealth, retirement status, and self-assessed health status.

Table 4: IV Probit Regressions – Claiming SSRI within 1 or 2 Years after Becoming Eligible¹ (t statistics are reported in parentheses using clustered standard errors at the MSA level)

	2002 – 2006				2008 – 2010			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Panel A: Second-Stage</i>								
<i>Dependent Variable</i>	Claim SSRI within 1 Year		Claim SSRI within 2 Years		Claim SSRI within 1 Year		Claim SSRI within 2 Years	
	<i>Probit Regression Coefficient</i>							
Δ% in house value in previous 2 years	-1.3456*** (-2.67)	-1.4673** (-2.49)	-1.5865*** (-3.05)	-1.5158** (-2.37)	-0.1672 (-0.26)	-0.3451 (-0.54)	-0.3935 (-0.63)	-0.4111 (-0.66)
	<i>Marginal Effect</i>							
Δ% in house value in previous 2 years	-0.4265*** (-2.67)	-0.4262** (-2.50)	-0.5694*** (-3.05)	-0.5469** (-2.39)	-0.0513 (-0.25)	-0.1082 (0.54)	-0.1439 (-0.63)	-0.1504 (-0.66)
<i>Panel B: First-Stage</i>								
<i>Dependent Variable</i>	Δ% in House Value in Previous 2 Years							
Δ% in U.S. HPI in previous 2 years	2.4399*** (6.80)	-	2.3907*** (6.66)	-	2.1882*** (7.46)	-	2.1684*** (7.59)	-
Δ% in U.S. HPI in previous 2 years × MSA land supply elasticity	-0.5330*** (-4.92)	-0.5080*** (-4.56)	-0.5301*** (-4.74)	-0.5174*** (-4.65)	-0.4687*** (-3.60)	-0.4651*** (-3.54)	-0.4661*** (-3.69)	-0.4663*** (-3.67)
State Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	NO	YES	NO	YES	NO	YES	NO	YES
Wald Test of Exogeneity	5.75**	4.53**	6.57**	3.78*	3.38*	4.39**	6.71***	6.84***
Observations	1197	1197	1181	1181	486	486	477	477
Log Pseudolikelihood	-839.7136	-834.4523	-800.8656	-796.5949	-76.2845	-73.0165	-72.4884	-72.4506

1 Other control variables include gender, race, marital status, tenure in the last job, education, total non-housing wealth, retirement status, and self-assessed health status.

Table 5: IV Probit Regressions - Claiming SSRI within 1 or 2 Years after Becoming Eligible (Heterogeneity by Gender)¹ (t statistics are reported in parentheses using clustered standard errors at the MSA level)

<i>Dependent Variable</i>	2002 – 2006			
	Claim SSRI within 1 Year		Claim SSRI within 2 Years	
	Male	Female	Male	Female
	<i>Probit Regression Coefficient</i>			
Δ% in house value in previous 2 years	-0.3590 (-0.03)	-2.4488*** (-5.56)	-0.3354 (-0.28)	-2.5615*** (-5.30)
	<i>Marginal Effect</i>			
Δ% in house value in previous 2 years	-0.0756 (-0.03)	-0.7205*** (-5.56)	-0.0779 (-0.28)	-0.7415*** (-5.31)
State Fixed Effects	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES
Wald Test of Exogeneity	0.02	10.34***	0.00	10.55***
Observations	534	660	526	652
Log Pseudolikelihood	-302.6201	-479.0185	-312.5938	-435.3687

1 Other control variables include gender, race, marital status, tenure in the last job, education, total non-housing wealth, retirement status, and self-assessed health status.

Table 6: IV Probit Regressions – The impact of a change in housing value on the probability of cashing out home equity¹ (t statistics are reported in parentheses using clustered standard errors at the MSA level)

	2002 – 2006		2008- 2010	
	(1)	(2)	(3)	(4)
<i>Panel A: Second-Stage</i>				
<i>Dependent Variable</i>	Indicator Variable = 1 if total housing loan amount in previous 2 years increased			
	<i>Probit Regression Coefficient</i>			
Δ% in house value in previous 2 years	0.9456*** (3.69)	0.6879** (2.09)	0.5384*** (3.27)	0.5073*** (3.37)
	<i>Marginal Effect</i>			
Δ% in house value in previous 2 years	0.3540*** (3.69)	0.2674*** (2.08)	0.1868*** (3.27)	0.1732*** (3.37)
<i>Panel B: First-Stage</i>				
<i>Dependent Variable</i>	Δ% in House Value in Previous 2 Years			
Δ% in U.S. HPI in previous 2 years	1.9751*** (7.44)	-	1.9833*** (8.37)	-
Δ% in U.S. HPI in previous 2 years × MSA land supply elasticity	-0.2751*** (-3.56)	-0.2767*** (-3.53)	-0.4430*** (-4.63)	-0.4430*** (-4.61)
State Fixed Effects	YES	YES	YES	YES
Year Fixed Effects	NO	YES	NO	YES
Wald Test of Exogeneity	6.40**	1.61	2.58	2.33
Observations	11832	11832	7992	7992
Log Pseudolikelihood	-8926.1255	-8909.3752	-4172.6865	-4160.0701

1 Other control variables include gender, race, marital status, tenure in the last job, education, total non-housing wealth, retirement status, and self-assessed health status.

Table 7: Probit Regressions – The impact of cashing out home equity on SSRI claiming¹ (t statistics are reported in parentheses using clustered standard errors at the MSA level)

	2002 – 2006		2008- 2010	
	(1)	(2)	(3)	(4)
<i>Panel A: Second-Stage</i>				
<i>Dependent Variable</i>	Withdraw within 1 Year	Withdraw within 2 Years	Withdraw within 1 Year	Withdraw within 2 Years
	<i>Probit Regression Coefficient</i>			
Indicator Variable = 1 if total housing loan amount in previous 2 years increased	-2.0442*** (-11.34)	-1.9574*** (-6.14)	0.1510 (0.13)	0.4261 (0.30)
	<i>Marginal Effect</i>			
Indicator Variable = 1 if total housing loan amount in previous 2 years increased	-0.6280*** (-11.34)	-0.6484*** (-6.14)	0.0600 (0.12)	0.1567 (0.30)
<i>Panel B: First-Stage</i>				
<i>Dependent Variable</i>	Total housing loan amount in previous 2 years increased			
Δ% in U.S. HPI in previous 2 years	1.8010 (1.19)	-	0.5366 (0.678)	-
Δ% in U.S. HPI in previous 2 years × MSA land supply elasticity	-0.1521 (-0.97)	-0.1806 (1.19)	0.2719 (0.75)	0.3043 (0.73)
State Fixed Effects	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES
Wald Test of Exogeneity	5.42**	3.35*	0.08	0.01
Observations	734	727	349	344
Log Pseudolikelihood	-819.0046	-835.9681	-383.4974	-385.7844

1 Other control variables include gender, race, marital status, tenure in the last job, education, total non-housing wealth, retirement status, and self-assessed health status.

SS00_2. Forty under Forty

1402 STATUS DISCREPANCY AND THE STRUCTURE OF INDIVIDUAL AND COLLECTIVE PATHWAYS OF RESIDENTIAL MOBILITY FOR THE CHICAGO METROPOLITAN AREA (2006-2015)

ABSTRACT

Urban planners and housing policy analysts have long been concerned with neighborhood income mix. The theoretical rationale holds that mixed income neighborhoods will foster more robust social networks, social controls, behavior, and political economy for residents at all income levels within the neighborhood (Joseph, Chaskin, and Webber, 2007). Particular emphasis has been placed on the potential stabilizing effects of mixed-income neighborhoods for low-income households. U.S. low-income housing programs such as HOPE VI and the Moving to Opportunity for Fair Housing Demonstration Program have, as a matter of policy, relied upon developing mixed-income housing on former public housing sites to promote uplift for low-income residents. Outside of these special contexts, however, the process through which naturally occurring mixed-income neighborhoods evolve and are sustained remains elusive. In this paper, I build upon the work of Galster and Turner (2017) who examine the role of status discrepancies – the differences between household income and neighborhood income structure – on the likelihood of residential mobility. Status discrepancy theory suggests that when individual incomes become much higher or lower than neighborhood income that the likelihood of residential mobility will increase. In their analysis conducted in Oslo, Norway, Galster and Turner find that status discrepancy mattered both for the mobility behavior of low-income and high income households, suggesting a long-run tendency towards homophily in neighborhood income structure. Drawing upon a novel source of longitudinal household-level data, I examine the applicability of Galster and Turner’s findings to the Chicago, Illinois metropolitan area. Specifically, I use data from the InfoUSA Consumer Database (2006-2015) to construct longitudinal household-level residential mobility histories for over 8.1 million households in the Chicago MSA. Over this period, more than 1.2 million unique household moves were made. I model the likelihood of moving as a function of status discrepancy at origin and at destination. I then pool residential mobility data into an origin-destination matrix representing the shares of flows between different neighborhoods. I use this derived network to examine the contribution of status discrepancy to the shares of flows between neighborhoods and to broader processes of economic sorting of households within the metropolitan area. While this type of network-based analysis remains rare within housing policy analysis (Depwolf and Lyles, 2012), several researchers are using data with network structures to engage with housing policy issues (Greenlee and Wilson, 2016; Gaumer, Jacobowitz, and Brooks-Gunn, 2014; Sanchez, 2015). This approach has substantial implications for interpretation of regional demographic trends including population loss, the suburbanization of poverty, and continued patterns of racial and economic segregation within the metropolitan area. This work also underscores the previously identified challenges associated with policy-based approaches to sustaining mixed-income neighborhoods.

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1527 WHERE WE CHOOSE TO LIVE AND WHY? A CASE STUDY OF ACCESSIBILITY FACTORS INFLUENCING RESIDENTIAL CHOICES

ABSTRACT

Buying a home is one of the biggest decisions an individual makes in their life. Renting a home is also a major decision. These decisions are motivated by major life events and the circumstances of job and/or requirement of companionship. Urban policies may not be able to influence when an individual buys/rents a home. However, where they will buy/rent a home is heavily influenced by the decisions made by the urban planners and development authorities of the city. The way infrastructure is developed makes certain neighbourhoods more likely to become the preferred choice for residential development. The primary indicator of suitability is the price/rent value since the demand drives these values up (or brings them down). The way these residential location choices are made varies across the nations, cities, genders, income groups and numerous other behavioural variables. This research tries to understand how these decisions are made and what variables affect it the most. To illustrate the phenomenon of housing choice dynamics, the case undertaken is the urban area in the vicinity of urban metro rail. Accessibility significantly influences the housing choice. A study of neighbourhoods near metro rail in comparison to the control group of areas with lower accessibility will highlight the decision making in residential choices.

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1666 REVISITING THE FUNDAMENTAL LAW OF ROAD CONGESTION USING QUANTILE REGRESSION

ABSTRACT

We revisit Duranton and Turner's (2011) paper on the effect of lane kilometres of roads on vehicle-kilometres travelled (VKT) in US cities. The main conclusion of Duranton and Turner (2011) is that increasing road and highway availability would not reduce traffic congestion as VKT rises proportionately to the availability of roads. However, this result might seem counterintuitive even after accounting for the usual suspects. Common sense tells us that for all the over-worked road networks, increasing road availability should alleviate congestion at least by certain amount, however small that might be. In order to solve this apparent puzzle, we use quantile regression method on Duranton and Turner's data. Quantile regression can help us understand how elasticity of vehicle kilometres travelled with respect to lane kilometres of roads varies for the different percentiles of the vehicle kilometres travelled. In our quantile regression estimate, using a panel of metropolitan statistical areas (MSA) in the United States for the years 1983, 1993, and 2003, we find that there is a significant variation in terms of elasticity of vehicle kilometres travelled with respect to lane kilometres of roads for different quantiles of vehiclekilometres travelled. In the 10th percentile, the elasticity is 0.96 whereas in the 50th percentile it is 0.82, and in the 90th percentile it is 0.72. These results are obtained after controlling for geography (elevation within the MSA, ruggedness of terrain within MSA, heating degree days, cooling degree days, sprawl in 1992), demographics (share of college educated workers, average income, 1980 segregation index, share of poor, share of manufacturing employment), decennial population variables from 1920 to 1980, and census division dummies. As is evidenced by our elasticity estimate, the percentage change in vehicle-lane kilometers traveled is not uniform across different percentiles following a percentage change in available lane kilometers of roads. Hence, we may argue that for MSAs with an already lower rate of congestion, additional roads built might not bring congestion level any further down. However, for MSAs experiencing significant amount of congestion, additional roads being built might be successful in reducing the congestion level. As a result, it might be beneficial after all to build more roads and highways in regions experiencing higher level of congestion.

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1090 PUBLIC INFRASTRUCTURE AND REGIONAL GROWTH RELATIONSHIP FROM A SPATIAL PERSPECTIVE WITH A TIME-VARYING SPATIAL WEIGHT MATRIX*Zeynep Elburz, K. Mert Çubukçu***ABSTRACT**

The aim of this study is to analyze the spatial effects of land transport infrastructure on regional economy in Turkish NUTS 2 regions between 2004 and 2014. We employ an augmented Cobb-Douglas production function model and use spatial Durbin model to estimate spatial effects. Apart from previous studies that employ spatial econometric models, we create eleven different spatial weight matrices based on inverse distance matrixes that change over time between 2004 and 2014. According to the results land infrastructure investment has significant and positive spatial spillover effect on regional growth.

Keywords: Transport infrastructure, spatial weight matrix, spatial Durbin model

1 INTRODUCTION

The economic effects of transport infrastructure on economics have been attracting a great deal of attention both from policy makers and researchers since the pioneering works of Aschauer in the late 1980s. Although there is a strong belief in a positive link between transport infrastructure and regional economic performance, the impacts of transportation infrastructure on regional economy are still uncertain regarding the sharp differences in the results of empirical studies. From the policy makers' point of view, the provision of infrastructure, which generates positive externalities and promotes the productivity of firms, is an important policy tool for promoting regional growth and reducing regional disparities. For this reason, like most of the developed and developing countries, Turkey has invested in transportation infrastructure in its less-developed regions to diminish the regional economic inequalities since the early 1960s. To accomplish economic development goals, 26.3% of the total public investment has been assigned to transportation and communication infrastructure between 2000 and 2011. In the beginning of the 2000's, the total length of the dual-carriageways in the country was 6,101 km. In less than ten years, this number has been raised to 23,522 km. However, this serious change in the transport infrastructure stock has captured little attention in the literature. To our knowledge, this study is the first attempt to measure the latest developments of transportation infrastructure in twenty-six NUTS 2 regions in Turkey with from a spatial perspective.

The aim of this study is to examine spatial effects of public land transportation infrastructure investments on regional economic growth. We employ a Cobb-Douglas production function model, and estimate the model with spatial panel regression taking into consideration the high and significant Moran's I statistics for the residuals of the non-spatial estimation. The novelty of the paper lies on selecting the most appropriate spatial weight matrix for detecting the spatial effects more accurate. Instead of employing conventional contiguity based spatial weight matrices, we create 11 different spatial weight matrices pertaining to each year for the period 2004-2014, which reflect the change over time, to capture the impacts of recently built-up dual-carriageways or extension the existing ones on regional economic growth. We use network analysis to calculate the distances in minutes between the regions based on 3 different road categories with different speed limits each. Eventually, we run 11 spatial panel regressions that includes 11 spatial weight matrices each. The results of the spatial Durbin model show that land infrastructure investment has significant and positive spatial spillover effect on regional growth and employing time-varying spatial weight matrices matters for obtaining the significant and accurate findings.

The remaining part of the paper is organized as follows. Section 2 reviews briefly the literature which uses a production function model to estimate the effects of different types of transportation infrastructures. Next Section 3 and Section 4 provide an overview of the methodology and data, while Section 5 presents the results of the econometric modeling analyses. Finally, Section 6 offers a conclusion from our research, suggesting also new pathways for the futures.

2 LITERATURE REVIEW

Aschauer (1989)'s study which suggested that the stock of public infrastructure may explain the economic output has triggered much attention from both academics and policy makers. In his study Aschauer (1989) entitled streets and highways, airports, electrical and gas facilities, mass transit, water systems, and sewers as core infrastructure and finds that the estimated elasticity for the core infrastructure is 0.24. This result has interpreted as there is a strong and significant relationship between economic output and infrastructure and subsequently Munnell (1990) found similar strong relationship with a lower elasticity (0.15) at the subnational level. A number of studies have analyzed the effects of transportation infrastructure investments especially highway investments in different countries and found similar significant results with Aschauer (1989) and Munnell (1990) (see Table 1).

On the other hand, many studies claim that the results from Aschauer (1989) and Munnell (1990) are problematic for not taking into account the causality between dependent and independent variables and the nonstationary of the data. Eisner (1991) underlined a serious question for state output and public capital by asking which one is cause and which one is effect. Evans and Karras (1994) used panel data between 1970-1986 from 48 US states to estimate the stock of highway capital on Gross State Product (GSP) and reached significant and negative results. Garcia-Milla et al. (1996) also employed panel data from 48 US states and examined highway investments with fixed effects and concluded insignificant effects on highway on GSP.

The 1990's was the golden years for the infrastructure investment studies following the seminal work of Aschauer (1989). More recently, studies mostly concentrated on the spatial effects of transport infrastructure by using spatial econometric models as well as causality and non-stationary issues which have been highly criticized in the literature since 1990's. Cohen (2010) used the USA states highway capital stock data for 1996 to investigate the broader effects - indirect effects- of transportation infrastructure. The results based on spatial lag model with contiguity weight matrix showed a positive effect of transport infrastructure on the output. Cohen (2010) concluded that ignoring spatial effects may cause omitted variable bias. Jiwattanakulpaisarn et al. (2009) also find positive spillovers of highway infrastructure to neighboring states with spatial panel model for the case the USA. On the contrary, Del Bo and Florio (2012) investigated the EU case for the effects of motorways with a spatial Durbin model and found that the spillover effect varies on the type of the transportation infrastructure. Motorways and roads have different spatial spillover effects on EU regions.

Table 1. Literature review

	Authors	Year	Data Type	Time Period	Estimation	Scope	Country	Transportation Meas.	Spillover/Spatial Effect	Spatial Weight	Results
1	Aschauer	1990	pooled data	1960-1985	OLS WLS 2SLS	48 states	USA	existing road mileage	-	-	Positive
2	Munnell	1990	pooled data	1970-1986	OLS	48 states	USA	highway	-	-	Positive
3	Evans and Karras	1994	panel data	1970-1986	FE	48 states	USA	highway capital stock	-	-	Negative
4	Holtz-Eakin and Schwartz	1995	panel data	1975-1986	ML	48 states	USA	highway capital stock	spillover effect	-	Negative spillover effects
5	Baltagi and Pinnoi	1995	panel data	1970-1986	OLS, FE	48 states	USA	highway and street ways	-	-	Insignificant
6	Garcia-Milla et al.	1996	panel data	1970-1983	FE	48 states	USA	highway investment capital	-	-	Insignificant
7	Kelejian and Robinson	1997	panel data	1972-1985	OLS 2SLS GMM	48 states	USA	highway public capital	spillover effect	-	Sensitive to econometric problems
8	Boarnet	1998	pooled data	1969-1988	GLS Spatial Lag Model	58 countries	USA	street and highway capital stock	spatial effect	contiguity matrix	Both positive and negative spillover effects
9	Percoco	2004	panel data	1970-1994	ML 2SLS	20 regions	Italy	roads, rail, maritime, communication	spillover effect	-	Positive
10	Cantos et al.	2005	panel data	1965-1995	FE, IV	17 regions	Spain	road railway port airport capital stock	spillover effect	-	Positive
11	Berechman et al.	2006	time-series	1990-2000	OLS	48 state, 18 county, 389 municipality	USA	highway capital stock	spillover effect	-	Positive
12	Ozbay et al.	2007	time-series	1990-2010	OLS	18 counties	USA	highway capital stock public infrastructure	spillover effect	-	negative spillover effect
13	Kustepeli and Akgungor	2010	cross section	2000	OLS	26 regions	Turkey	per capita, rural asphalt road, proportion of asphalt road	-	-	Positive
14	Cohen	2010	cross section	1996	Spatial Lag OLS, 2SLS	48 states	USA	highway capital stock	spatial effect	contiguity matrix demographic variables	Positive
15	Jiwattanakulpaisarn et al.	2011	panel data	1984-1997	OLS, FE, BG, FGLS, GMM, 2SLS	48 states	USA	Existing road lane miles	spatial effect	binary contiguity and inversed distance matrix	Positive
16	Del Bo and Florio	2012	cross-section	2006	OLS, 2SLS, SDM	262 regions	EU	length of motorways and regular roads	spatial effect	contiguity based on inverse distance	Spatial spillovers of motorways are insignificant, roads are positive
17	Jiwattanakulpaisarn et al.	2012	panel data	1984-2005	GMM-SYS	48 states	USA	roadway lane mile	-	-	Positive
18	Tong et al.	2013	panel data	1981-2004	SDM	44 states	USA	road disbursement, rail miles	spatial effect	contiguity matrix	Positive
19	Xueliang	2013	panel data	1993-2009 2000-2009	FE SLM	29 province, region	China	km of highways	spatial effect	binary contiguity and inversed distance matrix	Positive
20	Chen and Haynes	2013	panel data	1991-2009	SAR SEM SDM	32 MSA	USA	highway and railway stock	spatial effect	Queen contiguity matrix	Positive
21	Arbues et al.	2015	panel data	1986-2006	SDM ML IV GMM	47 provinces	Spain	road capital stock	spatial effect	contiguity matrix	Positive

2	Li et al.	20	panel	2005-	SARFE	31	china	highway	spatial	Binary	Positive
2		17	data	2014	Spatial torbit model	province s		network km/km2	effect	matrix	
2	Shabani and	20	panel	2001-	SDM FE	28	Iran	road length per	spatial	inverse	Positive
3	Safaie	18	data	2011		province s		capita	effect	distance	

Transportation infrastructure investments have been used as an important policy tool for policy makers in Turkey since 1960's. However, the number of studies that focuses on the effects of transportation infrastructure on regional economic growth is limited. Kuştepelı and Akgüngör (2010) investigated this phenomenon by using cross section data from 2000 with 26 NUTS 2 regions in Turkey and concluded that transportation investments have positive effect on regional Gross Value Added (GVA). Recently, Elburz et al. (2017) studied the role of transport infrastructure stock in the Turkish regions with different estimation methods. They used OLS, fixed-effects, 2SLS and Hausman-Taylor IV estimations with region and time effects from 2004 to 2011. The results confirmed road and highway infrastructure have significant and positive effects on Turkish regional GVA.

3. DATA

One of the main reasons of the limited number of studies on the effects of transportation infrastructure on Turkish regions is the problematic process of finding the appropriate data at the subnational level in Turkey. Along with the EU accession process, TurkStat released regional data based on NUTS 2 level instead of provincial data starting from 2004 which diminish the number of observation. Another limitation on the data is about the time period. Gross Domestic Product (GDP) data is only available for the time period between 2004 and 2014 which is launched by TurkStat at the end of 2016. Therefore we use macroeconomic data from 26 NUTS 2 regions from 2004 to 2014 (see Table 2).

Table 2. Definitions of variables

Variables	Year Coverage	Description	Data Source
Y (GDP per capita)	2004-2014	Gross Domestic Product per capita	TurkStat
K (Private Capital)	2004-2014	Industrial electricity consumption per capita	TurkStat
L (Labor Force)	2004-2014	Labor force	TurkStat
H (Human Capital)	2004-2014	University graduates divided by total population	TurkStat
T (Transport Infrastructure)	2004-2014	Divided roads and motorway infrastructure (km) divided by total surface area	TurkStat

We use an augmented Cobb-Douglas production function to measure the role of transport infrastructure on regional economic performance with GDP per capita as regional output. Since private capital stock data is unavailable in Turkey, we use industrial electricity consumption per capita as a proxy for private capital stock as proposed in Moody (1974). We use employment data as an input variable and, following Barro (1990) we add human capital variable to the model which is the proportion of the university graduated to the total population. Finally, we augmented the production function by adding transportation infrastructure variable. We measure transport infrastructure stock by adopting physical measurement instead of monetary measures as indicated in Bröcker and Rietveld (2009) and Vickerman (2008) that monetary measure is less accurate than physical measurement of transport infrastructure stock. We employ length (km) of total highway and divided roads which are standardized with the total surface area of a region (see Table 2).

Table 3. Descriptive statistics of the variables

Variables	Observation	Std. Dev.	Min	Max
Y (GDP per capita)	286	0.52025	8.02715	10.59638
K (Private Capital)	286	1.07473	-3.50348	1.511887
L (Labor Force)	286	0.604826	12.11724	15.44397
H (Human Capital)	286	0.706927	-2.656185	1.781816
T (Transport Infrastructure)	286	0.1962483	-2.792852	-1.94226

4. METHODOLOGY

In the present study, we use an augmented Cobb-Douglas production function approach which is the most preferred function to investigate the link between transport infrastructure stock and regional economic growth, for 26 NUTS 2 regions in Turkey. We added transport infrastructure as an input variable to the function and take the log of both side of the equation. The augmented production function model can be expressed as:

$$\ln Y_{it} = \alpha \ln K_{it} + \beta \ln L_{it} + \gamma \ln H_{it} + \delta \ln T_{it} \tag{1}$$

where Y, K, L, H, T, i, and t denote, respectively, output, private capital, labor force, human capital, transport infrastructure stock, region, and time.

Taking into account the spatial spillover effects that highlighted in the literature review section, we test spatial autocorrelation in the model by using Moran's I statistics. Before applying spatial analysis, it is needed to determine the spatial weight matrix which is the simplest measure of spatial influence (Bavaud, 1998). Anselin (1988) states that a misspecified spatial weight matrix may cause inconsistent and misleading results however there is no true spatial weights that fits all cases (Bavaud, 1998). In the literature most of the studies prefer to rely on contiguity matrices which is simple and easy to interpret (see Table 1). In this study we follow a different path from the previous studies to generate

spatial weight matrix. We create 11 different spatial weight matrices pertaining to each year for the period 2004-2014, which reflect the change over time, to capture the impacts of recently built-up dual-carriageways or extension the existing ones on regional economic growth. Approximately 30% of the total public investment has been transferred to transportation investments since 2004 and it is clear that there is a change in the land infrastructure stock in terms of length of the state highways, provincial roads and motorways in Turkey between 2004 and 2014 (Figure 1 and Figure 2). As expected, building new road network and/or extension of the existing ones cause a reduction of the travel times between regions. Based on this fact we believe a simple contiguity weight matrix would not reflect the real changes in Turkish transportation infrastructure and thus would not measure the spatial influence properly. Therefore, we create 11 different spatial weight matrix for each year from 2004 to 2014. We use network analysis to calculate the distances in minutes between the regions based on 3 different road categories excluding village roads, with different speed limits each. After obtaining the annual changes in the distance between regions we generate 11 different inverse distance spatial weight matrices ($1/d^2$) for 26 NUTS 2 regions and transform them with row-standardization.

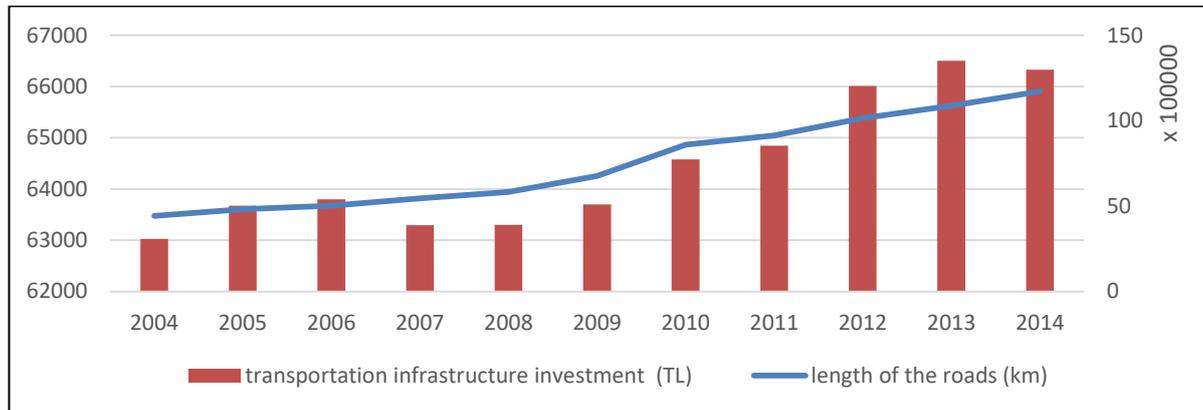


Figure 1. Transportation infrastructure investment and total road length changes



Figure 2. State highways, provincial roads and motorways in Turkey

First we apply Moran’s I statistic test to all variables -both dependent and independent variables- and reach highly significant results of an existing spatial autocorrelation. Then we repeat the Moran’s I test for the residuals of the OLS regression for the equation (1). The findings (Table 4 and Table 5) support the previous results so it is necessary to consider spatial models since simple OLS is not an appropriate estimation method (Anselin and Florax, 1995). Therefore, the next step is to analyze the relationship between transportation infrastructure and regional economic output by using spatial econometric models.

Table 4. Moran’s I statistics and Levin-Lin-Chu unit root test for variables in the model

	Y	H	K	L	T
2004	0.355***	0.403***	0.449***	0.413***	0.272***
2005	0.355***	0.403***	0.449***	0.413***	0.272***
2006	0.355***	0.403***	0.449***	0.413***	0.272***
2007	0.355***	0.403***	0.449***	0.413***	0.272***
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2011	0.356***	0.404***	0.449***	0.413***	0.272***
2012	0.356***	0.403***	0.449***	0.413***	0.272***
2013	0.356***	0.403***	0.449***	0.413***	0.272***
2014	0.355***	0.404***	0.449***	0.413***	0.272***
Levin-Lin-Chu unit root test	-5.154***	-10.143***	-7.806***	-8.320***	-10.926***

Table 5. Moran’s I statistics for residuals of the OLS regression

	Moran's I	Spatial Error Lagrange Multiplier	Robust Multiplier	Lagrange	Spatial Lag Lagrange Multiplier	Robust Multiplier	Lagrange
2004	7.493 (0.000)	21.746 (0.000)	26.982 (0.000)		0.181 (0.671)	5.417 (0.020)	
2005	7.606 (0.000)	21.702 (0.000)	26.934 (0.000)		0.182 (0.000)	5.414 (0.020)	
2006	7.612 (0.000)	21.620 (0.000)	26.854 (0.000)		0.186 (0.667)	5.420 (0.020)	
2007	7.708 (0.000)	21.755 (0.000)	27.012 (0.000)		0.186 (0.666)	5.443 (0.020)	
2008	7.718 (0.000)	21.700 (0.000)	26.949 (0.000)		1.87 (0.666)	5.435 (0.020)	
2009	7.759 (0.000)	21.760 (0.000)	27.013 (0.000)		0.185 (0.667)	5.438 (0.020)	
2010	7.761 (0.000)	21.767 (0.000)	27.022 (0.000)		0.185 (0.667)	5.440 (0.020)	
2011	7.639 (0.000)	21.782 (0.000)	27.069 (0.000)		0.191 (0.662)	5.478 (0.019)	
2012	7.733 (0.000)	21.707 (0.000)	26.963 (0.000)		0.188 (0.665)	5.444 (0.020)	
2013	7.733 (0.000)	21.707 (0.000)	26.963 (0.000)		0.188 (0.665)	5.444 (0.020)	
2014	7.764 (0.000)	21.707 (0.000)	26.989 (0.000)		0.194 (0.660)	5.476 (0.019)	

5. RESULTS

We run non-dynamic spatial Durbin model with region fixed-effects since all the data are stationary according to the Levin-Lin-Chu unit-root test results (Table 4). The results of the spatial Durbin models are shown at Table 6. According to the findings, the spatial autocorrelation coefficient rho is positive and significant across all years. Spatial lag of transport infrastructure and spatial lag of labor variables are significant and positive in all cases indicating the existing externalities.

Following LeSage and Pace (2009), summary measures of direct, indirect and total impacts were computed to assess the importance of spatial spillovers. Table 7 presents the estimates of the direct and spillover effects. The results of the direct effects reflect that human capital, private capital and labor variables in region i have significant and positive effects on regional output in the same region. On the other hand, transportation variable has positive and significant indirect (spillover) effect which shows that transportation infrastructure investment in region i has an effect on regional output in other regions. And lastly, total effect results indicate that all explanatory variables are significant and positive meaning that all four explanatory variables in region i affect dependent variable in all regions.

6. CONCLUSION

The effects of transportation infrastructure investment have captured a lot of attention from both researchers and policy makers since 1980's. After the global economic crisis in 2008, the governments started to re-consider the effect of transportation infrastructure as an important regional policy tool. As an emerging economy, the number of studies which investigates the relationship between transportation and regional economy is rather limited in Turkey. In this study we aim to examine the spatial effects of transportation with spatial panel econometric model. We create 11 different spatial weight matrices based on annual change in the distance between regions to underline the boost of land transport stock in Turkey since the beginning of the 21st century. According to the SDM results, it is clear that transportation infrastructure investments in Turkey has significant and positive effect on regional economy. But the most important conclusion is that transport investment in a region has much more effect on other regions indicating a strong spillover effects. Subsequent studies may analyze this relationship by taking into account the causality problem which we ignore in our study.

Table 6. Estimation results of SDM with region fixed effects

Dep var. Y	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
H	0.059*** (0.017)	0.057*** (0.017)	0.057*** (0.017)	0.057*** (0.017)	0.057*** (0.017)	0.056*** (0.017)	0.056*** (0.017)	0.058*** (0.017)	0.057*** (0.017)	0.057*** (0.017)	0.057*** (0.017)
K	0.050*** (0.012)	0.050*** (0.012)	0.049*** (0.012)	0.48*** (0.012)	0.048*** (0.012)	0.048*** (0.012)	0.048*** (0.012)	0.049*** (0.012)	0.049*** (0.012)	0.049*** (0.012)	0.049*** (0.012)
L	0.005 (0.027)	0.004 (0.027)	0.004 (0.027)	0.004 (0.027)	0.004 (0.027)	0.004 (0.027)	0.004 (0.027)	0.005 (0.027)	0.004 (0.027)	0.004 (0.027)	0.004 (0.027)
T	0.037 (0.079)	0.037 (0.079)	0.037 (0.079)	0.036 (0.079)	0.036 (0.079)	0.036 (0.079)	0.036 (0.079)	0.035 (0.079)	0.036 (0.079)	0.036 (0.079)	0.036 (0.079)
W*H	0.044 (0.032)	0.047 (0.032)	0.046 (0.032)	0.046 (0.032)	0.046 (0.032)	0.046 (0.032)	0.046 (0.032)	0.043 (0.032)	0.043 (0.032)	0.043 (0.032)	0.044 (0.032)
W*K	0.041 (0.028)	0.039 (0.028)	0.040 (0.028)	0.042 (0.028)	0.042 (0.028)	0.042 (0.028)	0.042 (0.028)	0.043 (0.028)	0.042 (0.028)	0.042 (0.028)	0.043 (0.028)
W*L	0.300*** (0.062)	0.299*** (0.062)	0.300*** (0.062)	0.299*** (0.062)	0.299*** (0.062)	0.298*** (0.062)	0.298*** (0.062)	0.299*** (0.063)	0.303*** (0.063)	0.303*** (0.063)	0.302*** (0.063)
W*T	0.422** (0.153)	0.434** (0.160)	0.431** (0.160)	0.432** (0.160)	0.430** (0.160)	0.429** (0.160)	0.429** (0.160)	0.418** (0.154)	0.414** (0.156)	0.414** (0.156)	0.414** (0.156)
rho	0.773*** (0.033)	0.773*** (0.032)	0.773*** (0.032)	0.773*** (0.032)	0.773*** (0.033)	0.774*** (0.033)	0.774*** (0.033)	0.773*** (0.033)	774*** (0.033)	774*** (0.033)	0.774*** (0.033)
R2	0.731	0.732	0.731	0.732	0.732	0.734	0.734	0.735	0.734	0.734	0.734
number of observations	286	286	286	286	286	286	286	286	286	286	286
log likelihood	536.513	538.091	538.014	538.657	538.74	538.977	538.975	537.65	538.11	538.11	538.032
5											

(* p<0.05; ** p<0.01; *** p<0.001)

Table 7. Spillover effects of variables

Dire ct	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
H	0.085*** (0.019)	0.084*** (0.185)	0.084*** (0.018)	0.083*** (0.018)	0.083*** (0.018)	0.083*** (0.018)	0.083*** (0.018)	0.084*** (0.018)	0.083*** (0.018)	0.083*** (0.018)	0.083*** (0.018)
K	0.074*** (0.017)	0.072*** (0.017)	0.072*** (0.017)	0.072*** (0.017)	0.072*** (0.017)	0.072*** (0.017)	0.072*** (0.017)	0.073*** (0.017)	0.073*** (0.017)	0.073*** (0.017)	0.073*** (0.017)
L	0.099*** (0.028)	0.096*** (0.028)	0.096*** (0.028)	0.095*** (0.028)	0.095*** (0.028)	0.094*** (0.028)	0.094*** (0.028)	0.096*** (0.028)	0.096*** (0.028)	0.096*** (0.028)	0.096*** (0.028)
T	0.169 (0.110)	0.171 (0.11)	0.170 (0.111)	0.168 (0.110)	0.168 (0.110)	0.168 (0.110)	0.167 (0.110)	0.163 (0.110)	0.163 (0.110)	0.163 (0.110)	0.163 (0.110)
Indirect											
H	0.364*** (0.105)	0.374*** (0.105)	0.370*** (0.105)	0.370*** (0.104)	0.371*** (0.104)	0.370*** (0.105)	0.370*** (0.105)	0.361*** (0.105)	0.361*** (0.105)	0.361*** (0.105)	0.362*** (0.105)
K	0.327** (0.119)	0.317** (0.119)	0.322** (0.119)	0.323** (0.119)	0.326** (0.119)	0.329** (0.119)	0.329** (0.119)	0.336** (0.120)	0.329** (0.120)	0.329** (0.119)	0.333** (0.120)
L	1.251*** (0.161)	1.248*** (0.162)	1.248*** (0.162)	1.247*** (0.163)	1.245*** (0.163)	1.244*** (0.164)	1.244*** (0.163)	1.252*** (0.163)	1.268*** (0.165)	1.268*** (0.165)	1.264*** (0.164)
T	1.814* (0.717)	1.865* (0.743)	1.854* (0.742)	1.858* (0.749)	1.850* (0.748)	1.852* (0.750)	1.852* (0.750)	1.798* (0.724)	1.790* (0.736)	1.790* (0.736)	1.790* (0.736)
Total											
H	0.449*** (0.114)	0.458*** (0.114)	0.454*** (0.114)	0.453*** (0.114)	0.454*** (0.114)	0.453*** (0.114)	0.453*** (0.114)	0.445*** (0.114)	0.444*** (0.114)	0.444*** (0.114)	0.445*** (0.114)
K	0.401** (0.131)	0.389** (0.131)	0.394** (0.131)	0.398** (0.132)	0.398** (0.131)	0.401** (0.132)	0.401** (0.132)	0.409** (0.132)	0.402** (0.132)	0.402** (0.132)	0.406** (0.132)
L	1.35*** (0.176)	1.344*** (0.176)	1.350*** (0.176)	1.342*** (0.176)	1.341*** (0.176)	1.339*** (0.177)	1.339*** (0.177)	1.348*** (0.177)	1.365*** (0.178)	1.365*** (0.178)	1.360*** (0.178)
T	1.983* (0.803)	2.037* (0.83)	2.025* (0.830)	2.027* (0.836)	2.019* (0.835)	2.019* (0.837)	2.019* (0.837)	1.961* (0.810)	1.953* (0.823)	1.953* (0.823)	1.953* (0.823)

REFERENCES

Anselin, L. (1988). Spatial econometrics: Methods and models. Kluwer, Dordrecht.

Anselin, L., and Florax, R.J.G.M. (1995). New Directions in Spatial Econometrics. Springer-Verlag, Berlin.

Arbués, P., Banos, J. F., and Mayor, M. (2015). The spatial productivity of transportation infrastructure. *Transportation Research Part A: Policy and Practice*, 75, 166-177.

Aschauer, D.A. (1989). Is public expenditure productive? *Journal of Monetary Economics* 23, 177-200.

Aschauer, D.A. (1990). Why is infrastructure Important? In: A.H. Munnell (ed.) *Is there a shortfall in public capital investment?* Federal Reserve Bank of Boston, Boston, MA.

Baltagi, B. H., and Pinnoi, N. (1995). Public capital stock and state productivity growth: Further evidence from an error components model. *Empirical Economics*, 20(2), 351-359.

Barro, R. J. (1990). Government spending in a simple model of endogeneous growth. *Journal of political economy*, 98(5, Part 2), S103-S125.

Bavaud, F. (1998). Models for spatial weights: a systematic look. *Geographical analysis*, 30(2), 153-171.

Berechman, J., Ozmen, D., and Ozbay, K. (2006). Empirical analysis of transportation investment and economic development at state, county and municipality levels. *Transportation* 33(6), 537-551.

Boarnet, M. G. (1998). Spillovers and the locational effects of public infrastructure. *Journal of Regional Science*, 38(3), 381-400.

Bröcker, J., Rietveld, P. (2009). Infrastructure and Regional Development. *Handbook of Regional Growth and Development Theories*. Editörler: R, Capello, P, Nijkamp. Cheltenham: Edward Elgar.

Cantos, P., Gumbau-Albert, M., and Maudos, J. (2005). Transport infrastructures, spillover effects and regional growth: evidence of the Spanish case. *Transport Reviews* 25(1), 25-50.

Chen, Z. and Haynes, K. E. (2013). Public surface transportation and regional output: A spatial panel approach. *Papers in Regional Science*.

Cohen, J. P. (2010). The broader effects of transportation infrastructure: Spatial econometrics and productivity approaches. *Transportation Research Part E: Logistics and Transportation Review*, 46(3), 317-326.

Del Bo, C. F., and Florio, M. (2012). Infrastructure and Growth in a Spatial Framework: Evidence from the EU regions. *European Planning Studies* 20(8), 1393-1414.

Eisner, R. (1991). Infrastructure and regional economic performance: comment. *New England Economic Review*. September, pp. 47-58.

Elburz, Z., Nijkamp, P., and Pels, E. (2017). Public Infrastructure and Regional growth: Evidence from Turkey. *European Journal of Transport & Infrastructure Research*, 17(4).

Evans, P., and Karras, G. (1994). Are government activities productive? Evidence from a panel of US states. *The Review of Economics and Statistics* 76, 1-11.

Garcia-Mila, T., McGuire, T. J., and Porter, R. H. (1996). The effect of public capital in state-level production functions reconsidered. *The review of economics and statistics*, 177-180.

Holtz-Eakin, D., and Schwartz, A. E. (1995). Spatial productivity spillovers from public infrastructure: evidence from state highways. *International Tax and Public Finance* 2(3), 459-468.

Jiwattanakulpaisarn, P., Noland, R. B. and Graham, D. (2011). Highway infrastructure and private output: evidence from static and dynamic production function models. *Transportmetrica*, 7(5), 347-367.

- Jiwattanakulpaisarn, P., Noland, R. B., and Graham, D. J. (2012). Marginal productivity of expanding highway capacity. *Journal of Transport Economics and Policy (JTPEP)*, 46(3), 333-347.
- Jiwattanakulpaisarn, P., Noland, R. B., Graham, D. J., and Polak, J. W. (2009). Highway infrastructure and state-level employment: A causal spatial analysis. *Papers in Regional Science*, 88(1), 133-159.
- Kelejian, H. H., and Robinson, D. P. (1997). Infrastructure productivity estimation and its underlying econometric specifications: a sensitivity analysis. *Papers in Regional Science*, 76(1), 115-131.
- Kuştepel, Y., and Akgüngör, S. (2014). Bölgesel Sanayi Üretimi ve Karayolları Altyapı Harcamaları. *Dokuz Eylül Üniversitesi İşletme Fakültesi Dergisi*, 11(1), 21-33.
- LeSage, J. and Pace, R. K. (2009). *Introduction to Spatial Econometrics* (Boca Raton, FL: CRC Press).
- Li, J., Wen, J., and Jiang, B. (2017). Spatial Spillover Effects of Transport Infrastructure in Chinese New Silk Road Economic Belt. *International Journal of E-Navigation and Maritime Economy*, 6, 1-8.
- Moody, C. E. (1974). The measurement of capital services by electrical energy. *Oxford Bulletin of Economics and Statistics*, 36(1), 45-52.
- Munnell, A.H. (1990). How does public infrastructure affect regional economic performance? *New England Economic Review*, September, 11-32.
- Ozbay, K., Ozmen-Ertekin, D., and Berechman, J. (2007). Contribution of transportation investments to county output. *Transport Policy*, 14(4), 317-329.
- Percoco, M. (2004). Infrastructure and economic efficiency in Italian regions. *Networks and Spatial Economics*, 4(4), 361-378.
- Shababi and Safaie (2018). Do transport infrastructure spillovers matter for economic growth? Evidence on road and railway transport infrastructure in Iranian provinces. *Regional Science Policy and Practice*, 10(1), 49-63.
- Tong, T., Yu, T. H. E., Cho, S. H., Jensen, K., and Ugarte, D. D. L. T. (2013). Evaluating the spatial spillover effects of transportation infrastructure on agricultural output across the United States. *Journal of Transport Geography* 30, 47-55.
- Vickerman, M. 2008. "Recent evolution of research into the wider economic benefits of transport infrastructure investments". In *The Wider Economic Benefits of Transport: Macro-, Meso and Micro Transport Planning and Investment Tools—Summary and Conclusions*, Paris: OECD. Discussion paper no. 2008-06
- Xueliang, Z. (2013). Has Transport Infrastructure Promoted Regional Economic Growth?—With an Analysis of the Spatial Spillover Effects of Transport Infrastructure. *Social Sciences in China*, 34(2), 24-47.

1147 THE MISSING MILLIONS: UNDERCOUNTING URBANIZATION IN INDIA

ABSTRACT

The measurement and characterization of urbanization crucially depends upon defining what counts as urban. According to The Indian Planning Commission, less than a third of the Indian population lives in urban areas, and while Indian cities are increasingly important to the economy, India is perceived fundamentally as a rural country. In this paper, we show that this received wisdom is an artefact of the definition of urbanity and the official statistics vastly undercount the level of urbanization and its importance for development policies in India. We begin by creating temporally-consistent, high-resolution population maps from sub district level population data available from the Indian Census for 2001 and 2011. The modeling framework is a two-step process that applies a Random Forest-based model to generate a prediction weighting layer subsequently used to inform a gridded dasymetric redistribution of original census counts at 100 m resolution (Stevens et al. 2015). We then apply density thresholds, contiguity conditions, distance based clustering and minimum population sizes to construct urban agglomerations for the entire country. Compared to the official estimates, we find that this approach counts 8%-30% (depending on thresholds) more urban population in 2011. We find large urban agglomerations that span large portions of Kerala and the Gangetic plain. Thus, while official estimates count more cities in the country, we delineate fewer cities but large urban regions that span jurisdictional boundaries. This has implication for urban policies. We also characterize the changes in the urbanization pattern between 2001 and 2011. Of all Indian states included in the Census, only three experienced rapid urbanization (>5%) over the last decade. Our results show that this level of urbanization is much more common and is consistent with notion of subaltern urbanization where growth in smaller cities is often overlooked (Denis and Zérah 2017; Pradhan 2013). We conclude with the discussion about the extensive and intensive growth patterns of these urban agglomerations.

REFERENCES

Denis, Eric, and Marie-Hélène Zérah, eds. 2017. *Subaltern Urbanisation in India - An Introduction to the Dynamics of Ordinary Towns. Exploring Change in South Asia*. Springer. www.springer.com/in/book/9788132236146.

Pradhan, Kanhu Charan. 2013. "Unacknowledged Urbanisation: New Census Towns of India" *xlvi* (36):43–51.

Stevens, Forrest R., Andrea E. Gaughan, Catherine Linard, and Andrew J. Tatem. 2015. "Disaggregating Census Data for Population Mapping Using Random Forests with Remotely-Sensed and Ancillary Data." *PLOS ONE* 10 (2):e0107042. <https://doi.org/10.1371/journal.pone.0107042>.

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1540 MAKING ROOM APPROACH: AN ALTERNATIVE TO CONVENTIONAL PLANNING APPROACH FOR MANAGING INDIA'S RAPID URBANIZATION?

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ABSTRACT

Urban population in India is around 377.10 million, according to the Census of India 2011. As per the estimates in 'World Cities Report 2016 – Futures' by UN Habitat, India will add another 300 million people by 2050. To accommodate this fast paced urbanization, there is not only a need to rebuild and retrofit our existing cities, but also to build new cities. Else, this unprecedented urban growth will pose several challenges, which will have consequences on our living conditions, economic growth as well as environment. If not planned and properly managed, our cities will be congested, chaotic and haphazard, giving rise to several conflicts. Thus there is an urgent need to relook at the way in which we plan and manage our cities.

An important planning aspect that is generally neglected when we plan our urban areas is related to delineation of urban boundaries. An analysis by IIHS shows that top 100 largest cities inhabit 16% of the country's population, but occupy only 0.24 percent of India's geographical area, which is very less compared to the size of its urban population. Indian cities are planned by conventional approach of delineating an area as 'urban' area, and then preparing a Master Plan or a Development Plan. Generally, the delineation of urban boundary adopts a conservative approach, mainly with an intention to contain urban growth from sprawling in contiguous rural hinterlands. These boundaries become too stringent and restrict the supply of urban land, result of which is evident as development outside the earmarked developable zone. Thus, this approach is unable to match the pace of urban growth, and is not capable to meet development needs of the city. Because of this, the gap between actual plan, actual growth and development needs is ever widening.

The paper revisits compact city versus sprawling city debate and its significance for urbanizing countries like India. Research tries to understand the aspect of limiting growth boundaries, and whether it creates scarcity of overall availability of urban land. It tries to draw attention towards the direct effect of restricting overall supply of urban land, and its relation with proportion of available urban land per person. For this analysis, planning approaches adopted by three large cities in India, viz. Hyderabad, Nagpur and Bangalore have been reviewed in detail. These planning approaches have been reviewed in reference to Shlomo Angel's 'Making Room' paradigm, which consists of four components:

1. Realistic projection of urban land needs
2. Generous metropolitan limits
3. Selective protection of open spaces
4. Arterial road network integrated with land-use

Using these four components, the study compares previous master plans, statutory urban boundaries and urban growth envisaged in the master plan versus actual resulting urban sprawl. Aim of the research was to understand whether making room paradigm can be used as an alternative planning approach for Indian cities, and if so what needs to be done.

INDIA'S URBAN GROWTH REALITY

India is witnessing steady urban growth over the last few decades. Looking at the demographic trends (table 1), it is clearly evident that India's urban population is constantly rising. After independence, the share of urban population was only seventeen percent (Census 1951), which has increased to 31 percent (Census 2011). Corresponding with increase in urban population, the number of urban areas has also increased substantially within this duration. According to Census 1951, there were 2843 urban agglomerations in India, which were reported 7935 in Census 2011. Thus, the number of urban agglomerations increased by 2.8 times during the same period.

Table 1: Urbanization trend in India (1901-2011)

Year	No. Urban Agglomeration town	Total population (in crore)	Urban population (in crore)	Urban Population %	Decadal Growth rate in urban population
1901	1827	23.83	2.58	10.8	
1911	1825	25.20	2.59	10.3	0.34
1921	1949	25.13	2.80	11.2	8.24
1931	2072	27.89	3.34	12	19.12
1941	2250	31.86	4.41	13.9	31.98
1951	2843	36.10	6.24	17.3	41.42
1961	2363	43.92	7.89	17.97	26.40
1971	2590	59.81	10.91	19.91	38.23
1981	3378	68.33	15.94	23.34	46.14
1991	3768	84.43	21.71	25.72	36.19
2001	5161	102.70	28.53	27.86	31.39
2011	7935	121.05	37.71	31.16	32.15

Source: (Deshmukh, 2015)

As per Census 2011, India has more than 500 urban areas with more than 1 lakh population, which were just 69 in number as per Census 1951. A similar rise in class 2 urban areas is also visible during the Census period between 1951 to 2011. The number of class 2 towns increased by 498 between Census 1951 and Census 2011. However, substantial increase can be observed in class 3, 4 and 5 categories of towns. The table below shows that the number of urban areas across all five class of urban areas are constantly rising.

Table 2: Urbanization by Class of Towns over Census years

Census Year	Class I: 100,000 & above	Class II: 50,000 – 99,999	Class III: 20,000 – 49,999	Class IV: 10,000 – 19,999	Class V: 5,000 – 9,999
1951	69	107	363	571	737
1961	108	145	478	710	634
1971	156	208	609	848	604
1981	227	309	797	1046	748
1991	326	401	1033	1247	790
2001	448	498	1389	1564	1043
2011	505	605	1905	2233	2187

Source: (A. Subbarayan & G. Kumar, 2016)

According to Census 1951, only 5 cities in India had population more than 1 million, which increased to 35 and 53 in Census 2001 and 2011 respectively. These 53 cities are estimated to produce about 32% of the GDP with only 13.3% of the population and with only 0.2% of the land area. The 100 largest cities by population in India are estimated to produce about 43% of the GDP with 16% of the population and only 0.24% of the land area (Revi, et al., 2012).

Table 3: Number of UA/Towns and Outgrowths

Type of UA/Towns and Outgrowths	Number of towns	
	Census 2011	Census 2001
Statutory Towns	4041	3799
Census Towns	3894	1362
Urban Agglomerations	475	384
Out growths	981	962

Source: (Census of India 2011)

One of the highlights of Census 2011 is the rapid growth in number of census towns since 2001 (table 3). From 1362 census towns in 2001 to 3894 towns in 2011 has seen the fastest growth of census towns. There are noteworthy number of Outgrowth (OGs) as per Census 2001 and 2011. These settlements are contiguous to a statutory town, and generally possess all the urban characteristics. However, these settlements do not technically qualify to be an independent town, as they do not satisfy the definition of an urban area.

To accommodate the increasing urban population the largest cities in India have expanded, they have significant population and built-up areas outside the ULB boundaries. (Revi, et al., 2012) study shows that in most cases, the proportion of built-up area outside the urban local body boundary of the city is greater than the proportion of population outside the administrative boundaries, implying relatively low-density sprawl. Comparing the spatial expansion from 1990-2000 and 2000-2010 shows that the expansion has accelerated between 2000 and 2010. To accommodate this fast-paced urbanization, there is not only a need to rebuild and retrofit our existing cities but also to build new cities. Else, this unprecedented urban growth housing problems, energy, water and sanitation challenges which will have consequences on our living conditions, economic growth as well as environment. If not planned and properly our cities will be congested, chaotic and haphazard, giving rise to several conflicts.

URBAN PLANNING APPROACH IN INDIA

One of the key instruments used for planning Indian cities is Master Plan or Development Plan. The Third Five Year Plan defined the term 'Master Plan' as a statutory instrument for controlling, directing and promoting sound and rational development and redevelopment of an urban area with a view to achieving maximum economic, social and aesthetic benefits (Meshram, 2006). Master Plan is visualized as a long term perspective plan, which is drafted considering the future growth of the city, its economic development potential and infrastructure requirement. Delhi Development Authority defines Master Plan as, "A Master Plan is the long term perspective plan for guiding the sustainable planned development of the city. This document lays down the planning guidelines, policies, development code and space requirements for various socio-economic activities supporting the city population during the plan period. It is also the basis for all infrastructure requirements." These plans are prepared under the Town Planning Acts, thus have legal backing and are statutory in nature.

Evolution

The evolution of contemporary planning practice in India starts with the Bombay Improvement Act 1920. Afterwards, the town and country planning act were enacted in various states. Later on the lines of the Town and Country Planning Act, 1947 the statutory process of master planning was adopted in India, as the improvement act did not have the provision for preparing the master plan of the whole city. In 1962, The Model Town and Regional Planning and Development Act, 1962 was adopted which provided the framework of planning to various states for enacting town and

country planning acts. The master plans in India are statutory in nature, and are used to regulate use of land in the city, envision the future growth of the city and are the instrument of land supply.

Current Urban Planning Process and its challenges

In India, Town Planning is a State function and is not included in the concurrent list of the Central Government (Mahadevia, Joshi, & Sharma, 2009). State Town & Country Planning offices overlook the mandate of preparation of urban plans. The provisions related to urban planning are practised under the statutory provisions of State level urban planning legislations. The legislations also have provisions to establish a specific development authority or planning authority for towns and cities, more specifically in case of large metropolitan cities. Major function of the state level town planning agencies is the preparation of Development Plans, Master Plans, Regional Plans, Zonal Plans, Town Planning Schemes, Urban Estates' Plans, Sector Plans, etc. In general, state level agencies are responsible for setting up General Development and Control Regulations (GDCR), preparing landuse plans and providing basic infrastructure in an area notified as urban area in the Master Plan or Development Plan.

(Mahadevia, Joshi, & Sharma, 2009) City level plan (i.e. Master Plan or Development Plan) is a long-term plan and is generally prepared for a horizon year of 10 to 20 years. The process begins with projection of population of an urban area and an estimate of an average household size, which together with income levels of different household categories; determine the demand for residential space. The requirements of industry, office, and retail spaces are based on projections of the economic prospects for the cities; the transport patterns follow from the land use pattern and the space requirement for transportation is typically a residual. The space needs for conservation of natural resources and protection of built heritage are also determined residually, unmindful of considerations of sustainability or contextual nuances (Ahluwalia). For preparation of an urban plan (as per the process mentioned above), a statutory urban boundary is delineated by the planning authority and approved by the state government. This boundary is typically known as 'Urban Growth Boundary (UGB)', and formally termed as 'Planning area or Development area' as per the legislations. The intention behind delineating such a boundary is to mandate the area inside the boundary to be used for urban development, while are outside this boundary is generally conserved in its natural setting or rural use. Delineation of this boundary is either based on the principle of urban containment or urban expansion.

Urban containment and expansion debate

Containing urban growth within a growth boundary has its supporters as well as detractors. The advocates of containment approach claim that it is an antidote to sprawl and limiting the growth of cities increase urban population densities, reduce the excessive fragmentation of urban footprints, reduce dependency on automobile, revitalize public transport protect farmlands, biodiversity, decrease the cost of infrastructure and save energy. However, this also means that the supply of land is artificially restricted, causing increase in the price and hence making housing unaffordable making it out of range to people and firms and making it non-competitive. This also imposes cost of monitoring, enforcing the strict and rigid regulation a acting against the development trends. Taking the global example of green belt in Seoul, which used the green belt as a containment strategy, prohibited the conversion of land to urban use in an area of 1482 sq. km. This green belt initially enjoyed wide public support. But later its detractors pointed out that it restricts urban land supply thereby creating artificial scarcity of land thereby increasing the price and making it less affordable. Thus, at one end of the spectrum there are those who advocate limiting the boundaries of the cities by all means and at the other end there are those who welcome it. (Angel, L., Civco, & Blei, 2011) quotes (Nelson, Sanchez & Dawkins 2004, 342) defining containment as *"Broadly speaking, urban containment programs can be distinguished from traditional approaches to land use regulation by the presence of policies that are explicitly designed to limit the development of land outside a defined area, while encouraging infill development and redevelopment inside the urban areas"*.

Metropolitan strategy for many cities in India also are based on the concept of urban growth boundaries using them to contain the urban growth through green belts or no- development zones. (Venkataraman, 2013) has highlighted the effects of restricting the supply of urban land by analysing the effects of urban growth boundary in the city of Bangalore. The city is enclosed within a green belt with zoning restriction to limit urban sprawl.

In the study it is pointed out that the land inside the urban growth boundary is valued higher than the land outside the urban growth boundary, this is consistent with the internal evidence but shows only part of story. He further goes on to explain that the land which is outside the growth boundary is generally converted to illegal revenue layouts that are sold in piece meal to public, this land at a later point awaits to be regularised. These areas of the urban growth boundary which are later regularised develop haphazardly, with lack of basic infrastructure, open spaces, arterial street network and even encroach on the environmentally sensitive areas.

The Making Room Paradigm by Shlomo Angel

(Angel, et al., 2005) brings to fore the unanswered question underlying the debate, whether expansion should be resisted, accepted or welcomed. The paradigm is grounded in the belief that there is a need to make minimal preparation for the sustainable growth and expansion of cities in urbanizing countries rather than to restrict and contain urban growth. It promotes the accommodation and rejects the placement of limits on urban expansion in rapidly urbanising countries.

The paradigm consists of four components

1. Realistic projections of urban land needs:
2. Generous Metropolitan limits

3. Selective protection of open spaces
4. An arterial grid of roads

ABOUT THIS PAPER

The intention of this paper is to probe further on the debate of urban expansion and urban containment. It tries to examine and assess the applicability of these two basic principles, which form the basis to determine the urban growth boundary in context to Indian cities. For this, the paper reviews ‘The Making Room’ paradigm being promoted by Shlomo Angel and attempts to analyse Indian cities in reference to four-step action being discussed in this paradigm. The study further explores whether this paradigm can be used as alternate paradigm for planning Indian cities. City level plans of Nagpur, Bengaluru and Hyderabad were taken as case studies.

REVIEWING MASTER PLANS OF INDIAN CITIES W.R.T ‘MAKING ROOM APPROACH’

Realistic projections of urban land needs

The making room paradigm suggests that while making projection for urban land needs consideration should be given to the declining densities in high density areas of the city and avoiding assumptions of unnecessary densification in already dense areas of the urbanizing country cities. Misplaced hopes for infill development should be avoided. The land projections that incline on the higher sides shall be considered so as to open up more land area. Urban growth boundaries like green belt, no development zone that makes the planning process and the urban expansion rigid should be discouraged.

- **Nagpur:** Master Plan of Nagpur proposed the total developable area proposed for development till 2011 (figure 1). The zone outside this area comes under the no development zone. Any construction activity is strictly discouraged in this zone. The total land in proposed developable zone the DP was 150.33 sq.km, and the no development zone was demarcated in an area of 57.74 sq.km, which is almost one third of the total area of the development zone.

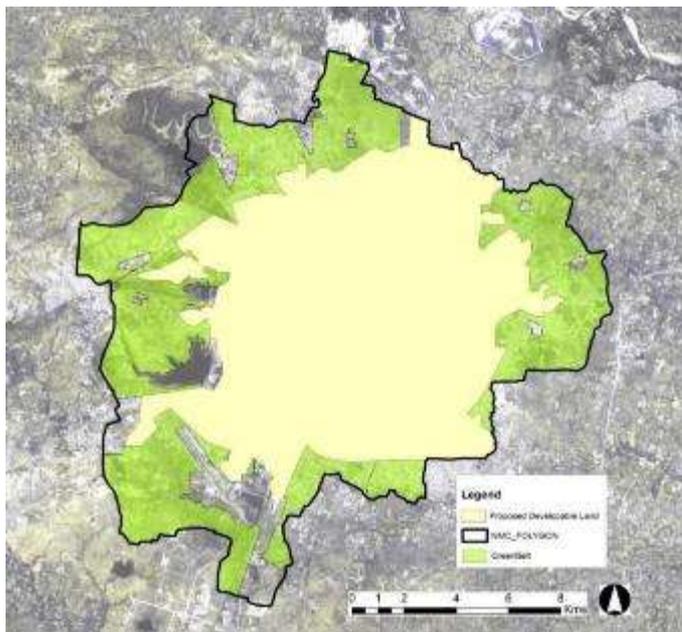


Figure 3 Map showing proposed developable area in Nagpur Master Plan 2011

In order to analyse the extent to which green belt was effective to contain the development, the urban land cover map was prepared through ArcGIS from Landsat imagery for the year 2011. Figure 2 shows that the urban growth has expanded beyond the developable land estimated in the Master Plan.

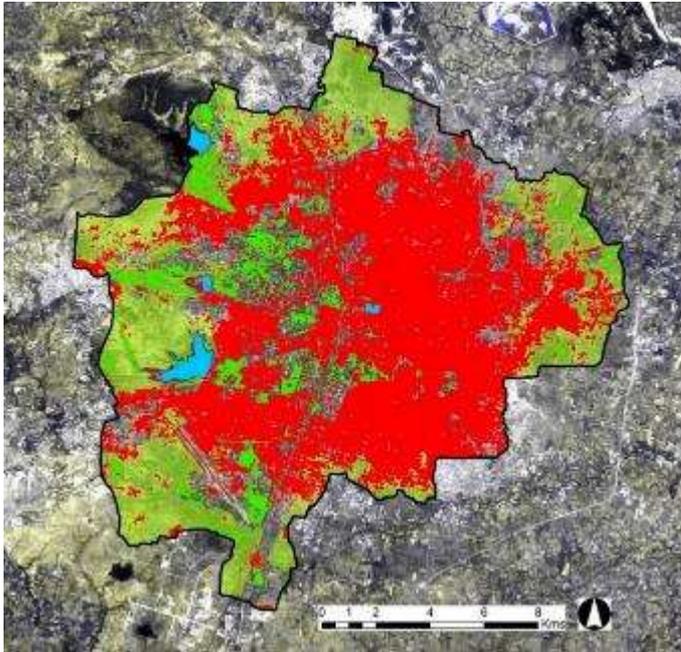


Figure 4 Map of Nagpur showing urban expansion in 2011

Area of the development outside the developable zone calculated based on the raster pixel comes to be 35 sq. km. This shows that around 60 percent of the area of the no development zone was urbanized as of 2011. Thus, the urban expansion went beyond the developable area, seems to be more towards south, east and north-west.

It has been observed that the land owners in the no development zone are subdividing the land and selling it as unauthorised revenue layout. These layouts are in a later stage regularised by the planning authority against a regularization charge. This is a clear breach of the core principles of 'green belt' based containment approach.

The actual area that was urbanised is the horizon year of the master plan was much more than the proposed land requirement estimated in the development plan. The growth that has taken place was not foreseen or facilitated by the development plan. Such development was regularised and thus had minimal physical and social infrastructure.

- Bengaluru:** In Master Plan 2015, Bengaluru's the developable zone was increased and adjoining growth centres were also added in the Bengaluru Metropolitan Area. Currently, the metropolitan planning area is 1300 sq.km, out of which 800 sq.km falls under the jurisdiction of Bengaluru Municipal Corporation. The city is also encircled by a green belt, with an objective to control urban sprawl beyond the organizable limit defined in the Master Plan. Area of the proposed green belt comes out to be 270 sq.km, which is approximately 20 percent of the total area of the metropolitan area. Additionally, the Master Plan also demarcated an area of around 174 sq.km (13.5 percent) as agriculture zone. The development restriction for both green belt and the agriculture zone are the same. So, the total developable area as per the master plan comes around 564.73 sq.km and the area of the green belt and the agriculture zone comes around 444 sq. Km (figure 3).

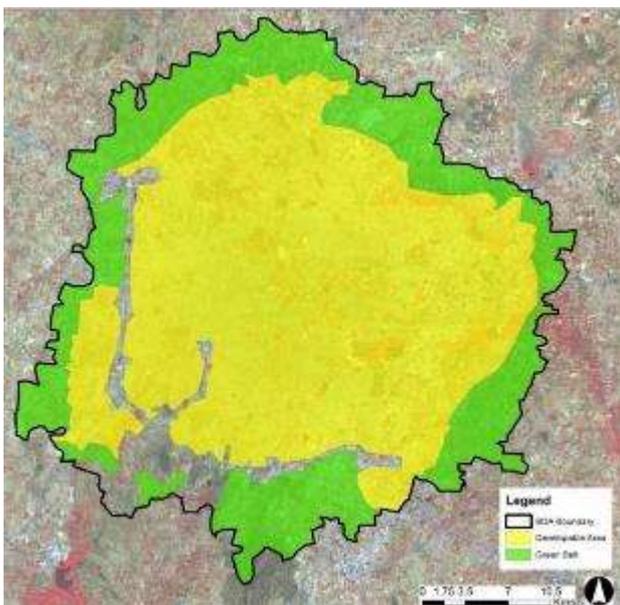


Figure 5 Map showing proposed developable area for Revised Bengaluru Master Plan of 2015

A study by (Venkataraman, 2013) quotes study by (Ravindra, et al., 2012) on land market assessment of Bengaluru that suggests around 11% of the green belt was converted into land used for non-agricultural purposes. Around 22.3 sq. km. of land had been developed without authorisations between 2003 and 2010. That is about 5.37 percent of the green belt area or 50 percent of the urbanised green belt land. Venkataraman has also observed in his study that there is extensive building on revenue layouts in the transition areas in the green zone. Revenue layouts are the private layouts that are made after converting land from agriculture use to non-agriculture use, often illegally and without necessary approval. The land cover analysis done on ArcGIS (figure 4) from the Landsat imagery of 2015, it is clearly seen that urban growth has expanded beyond the developable zone onto the green belt in certain areas.

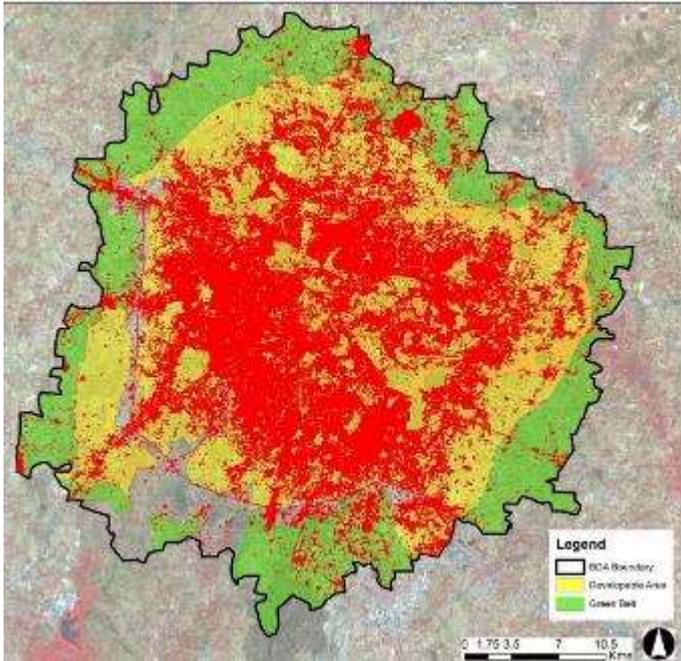


Figure 6 Map of Bengaluru showing urban expansion in 2015

- **Hyderabad:** Hyderabad Master Plan gave the areas to be developed by 2011. These areas are proposed as the extension of the developed areas in 1993. The developable areas in 1993 as well as the developable land area opened up for development till 2011 are shown in Figure 5.

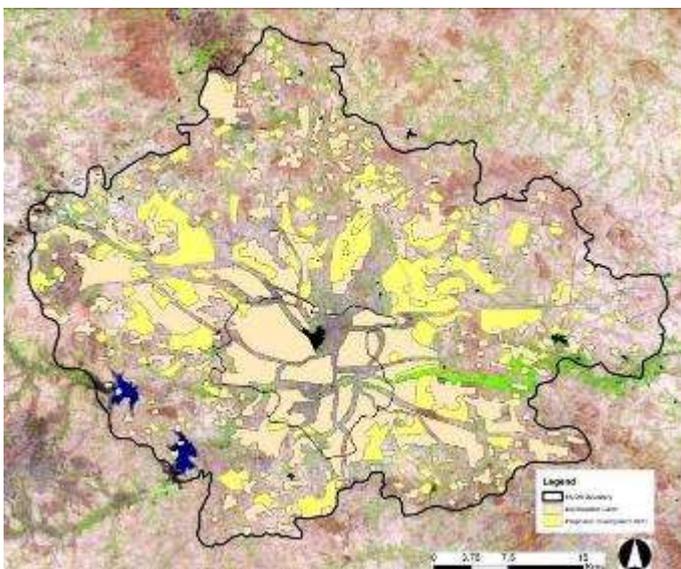


Figure 7 Map of Hyderabad showing proposed developable area

The extent of urban expansion in the city till 2011 shows that the areas opened up for development in the master plan was much more than the area that had actually urbanised till 2011.

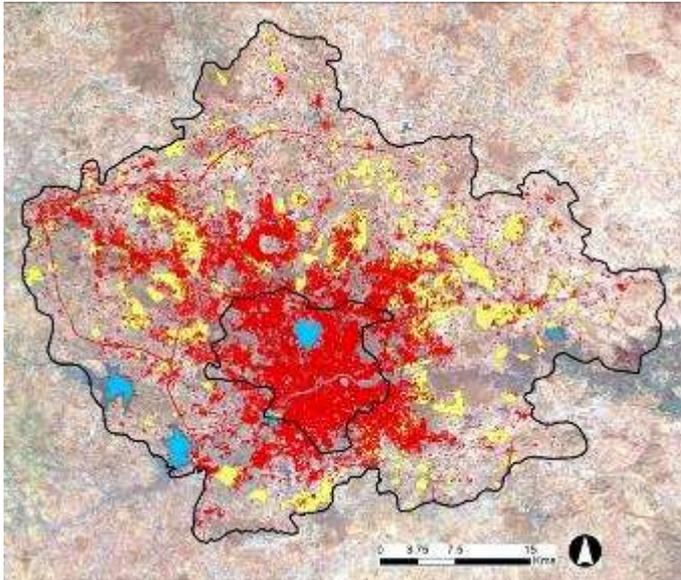


Figure 8 Map of Hyderabad showing urban expansion in the year 2011

This suggests that the land requirement may have been overestimated, which indicates that the development strategy was liberal in nature, which gives more room for the city to expand.

Generous Metropolitan limits

Making room paradigm suggests that the metropolitan limits have to be large enough to accommodate 20-30 years of urban expansion and should be periodically monitored if a revision in the boundary is required. In order to analyse growth of the city with respect to its planning boundary, a comparison of the metropolitan boundary against the physical growth of the agglomeration in two different time frames was done by analysing Landsat satellite images. Land cover for the base year and metropolitan boundary was compared with the land cover of urban expansion that took place in the horizon year.

- Nagpur:** Planning area in the Development Plan 1990-2011 for Nagpur city falls within the jurisdiction of Nagpur Municipal Corporation. The total area of NMC is 21,756 Ha. The city's planning boundary has not been revised since 1951. The population of the city was 4.5 lakhs in 1951, which has increased to 24 lakhs in 2011. Thus, even though the city's population has increased, as well as the city witnessed spatial growth through these years, the planning boundaries were not revised (figure 7). While, the development plan 2011 has reached its horizon year and the city has expanded much beyond the NMC boundary, there has been no effort to expand the boundary and comprehensively plan the outer expansion and the urban growth areas outside the city limits. Only until January 2018, when the Nagpur Metropolitan Region Development Authority's development plan was sanctioned, these areas outside the municipal limit were brought under the jurisdiction of metropolitan region development authority for planning these areas. Till early 2018, there was no planning metropolitan development plan to holistically plan the city and the surrounding growth centres. The areas just outside the periphery do not fall under the master plan, thus underwent unplanned growth.

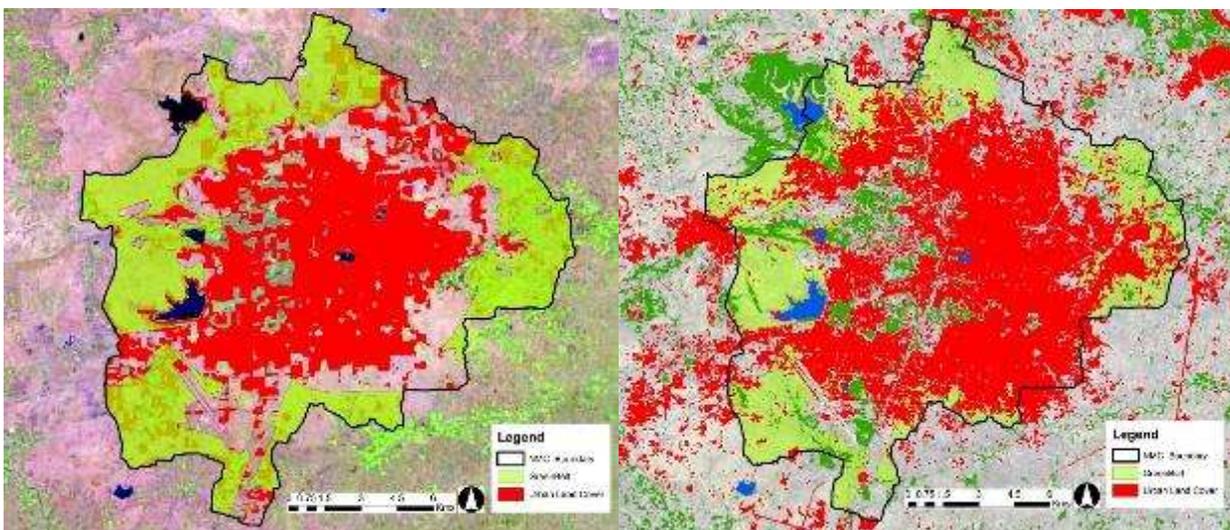


Figure 9 Map showing urban land cover of Nagpur in 1990 (L) and 2011 (R). The urban expanse of the city had gone beyond the planning boundary.

- Bengaluru:** Planning area in the Master Plan 2005-2015 for Bengaluru city falls under the jurisdiction of Bengaluru Development Authority (BDA). The total area of BDA is 1300 Sq.km. Even though the master plan's

horizon year was 2015, the agglomeration had already expanded much beyond the developable land and into the green belt to reach the periphery of the BDA Boundary. This area which is near the periphery does not fall under the Master Plan, thus causing uncoordinated growth. The map below shows the trend of urbanisation from 2005-2013. The master plan does not discuss about the future course of urbanisation in this regard, and the future boundary which could be taken up to accommodate planned urban expansion.

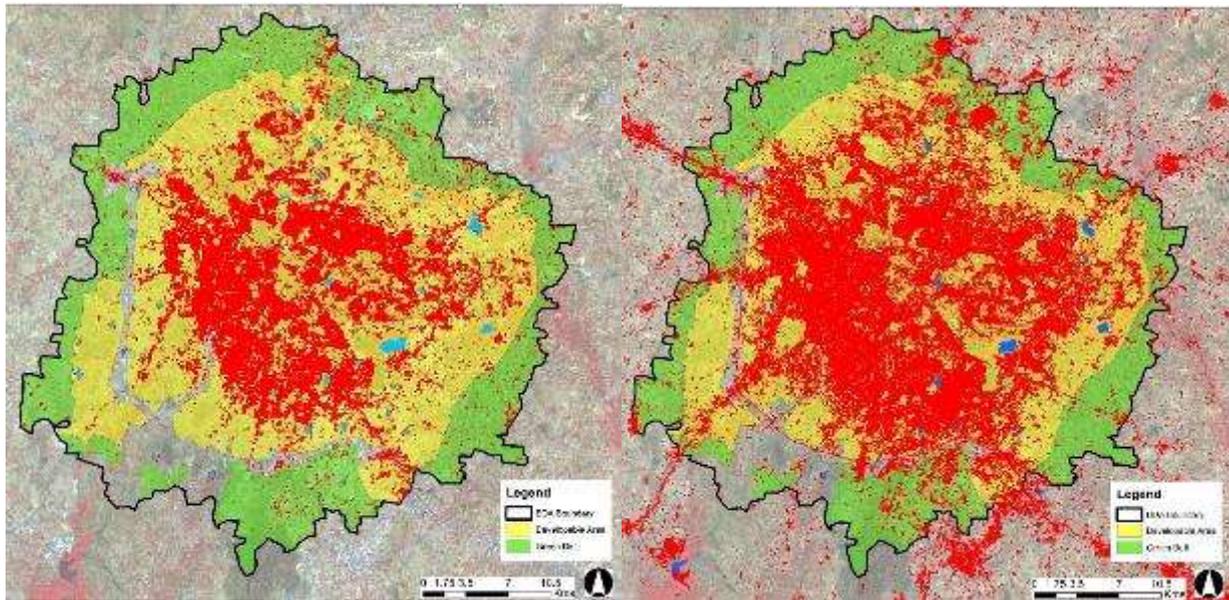


Figure 10 Map showing urban land cover of Bengaluru in 2005 (L) and 2015 (R) showing the growth of the town with respect to its planning boundary

- **Hyderabad:** The planning area in the master plan 1993-2011 for Hyderabad city was the area erstwhile Hyderabad Urban Development Authority (HUDA). The total area of HUDA was 1875 Sq.km. Only in the case of Hyderabad, the urban expansion of the city had not reached the periphery of the metropolitan boundary. Even though urban sprawl had taken place much before the master plan's horizon year- 2011, the agglomeration hadn't expanded till the periphery of the HUDA Boundary and large amount of land still had potential to urbanise.

Selective protection of open spaces

Making room paradigm describes this component for protecting environmentally sensitive areas and open spaces by making metropolitan open space plan. This plan should contain hierarchy of open spaces, ranging from playgrounds, parks, natural parks, fertile agriculture, etc. To enforce regulations that mandate the allocation of a certain share of private land for public use. Creation of institutional framework comprising public, private and civic organisation for aggressive protection of open spaces. This study does not cover the allocation of certain share of private land for public use and creation of institutional framework, since it limits the study to overall planning approach and does not venture into local level planning.

- **Nagpur:** Development Plan of Nagpur identifies open spaces of all hierarchy, ecologically sensitive areas, and proposes to protect these areas by developing these spaces by converting some of them into city level recreational spaces. Identification of parks garden at differential level, ranging from city level to neighbourhood level open space has been done in the plan. Identification of water bodies, urban forest, etc and proposal of lake front and international zoo were also included in the Revised Development Plan.

Thus, the Master Plan gives emphasis on the protection of open spaces, environmentally sensitive areas and reserving land for public use, identification of parks from city level open space to neighborhood level.

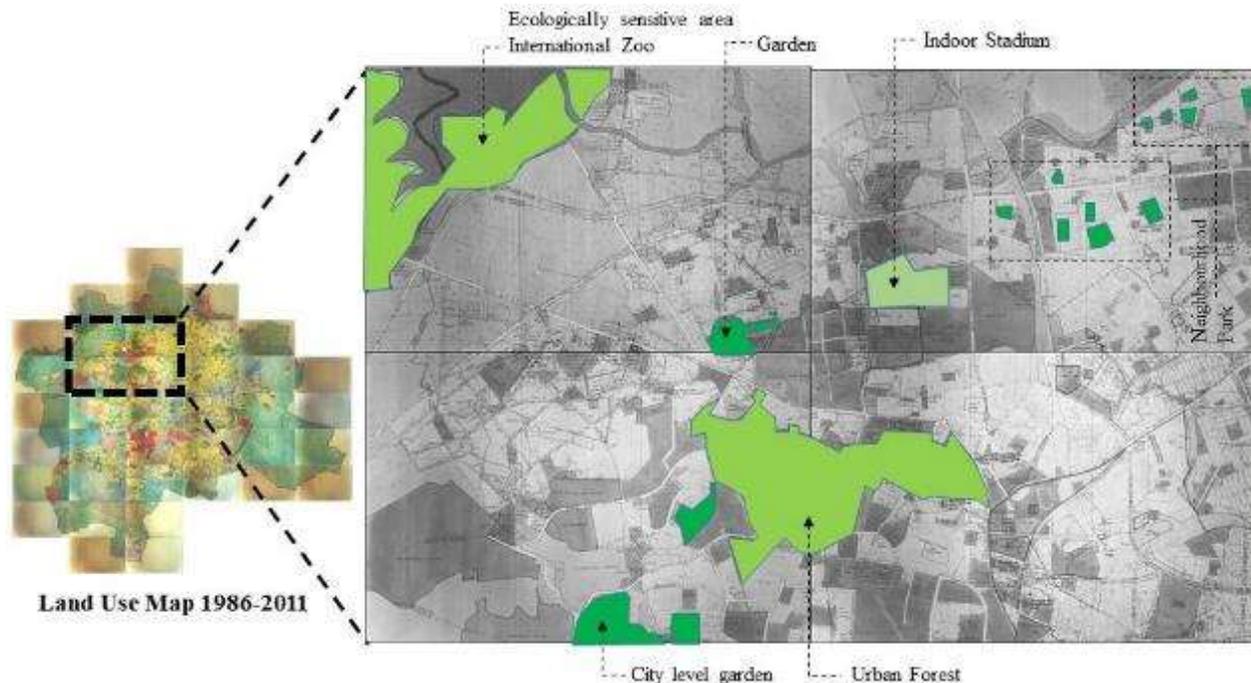


Figure 11 Hierarchy of open spaces in Nagpur master plan

- **Bengaluru:** Master Plan gives importance to the provision and protection of open spaces available in the city and the conservation of other open spaces in the city like lakes, natural drains, urban forests. However, (Thippaiah, 2009) in his study points out that Bengaluru witnessed the decline in the number of lakes, out of 262 lakes only 81 lakes survive now.

The plan does not give concrete strategy to protect of lakes, other than developing few selected ones. What happens to the other lakes and how they would be protected is not clear. This causes conflicts during implementation of master plan resulting in degradation of open spaces.

- **Hyderabad:** The master plan proposes to reserve land for new regional level parks. Smaller and local level parks created through the process of layouts development by reserving land for public purpose. In addition to these regional parks the proposed land use has reserved all hillocks, valleys, lakes and river banks as recreational areas and 'No development zones'.

An arterial grid of roads

Making room paradigm suggests that the planning for the arterial road network must be planned for next 20-30 years. The network should follow a hierarchy and should ensure that public transport is within ten-minute walk. The roads should also have wide right of way so that dedicated bus lanes and non-motorised transport can also be incorporated. Making room also suggest having an arterial grid of roads of one kilometre by one kilometre so as to encourage cycling, walkability and also to plan public transportation systems in these arterial grids.

- **Nagpur:** Master Plan covers transportation section in detail. It proposes ring roads and major arterial road in the city. It also proposes mass transportation solution for the city and promotion of NMT through improvement of footpath and introduction of cycle tracks. Proposals related to truck terminals on various location of the city to deal with goods traffic movement can also be found in the plan.
- **Bengaluru:** Bengaluru plan proposes road network, a ring road in the inner core and one at intermediate to decongest major arterial roads and also proposes outer peripheral ring road. Proposes separate bus rapid transport system with dedicated bus lanes. Proposes logistic facilities for goods transportation. Multi-modal transportation hub is proposed. The master plan also proposes mass rapid transport systems like metro rail.
- **Hyderabad:** Hyderabad Master Plan proposes outer ring road which has now been executed. Mass rapid transport system is proposed and the number of arterial road and flyovers proposed at different location in the city.

Key Findings

While reviewing the planning approaches of the city with respect to the four components of the making room paradigm it can be analysed that:

- With respect to the projection of urban land needs Hyderabad fared better. The city opened up more land area taking into account the population projection. In case of Nagpur and Bengaluru both cities had introduced urban growth boundary though no development zone or green belt. The urban growth did not stop with the green belts, the land cover map showed how the urban growth expanded into the green belt too. Both in case of Nagpur and Bengaluru it has observed that the land owners in the green belt and no development zone have subdivided

the plot and sold it to people as unauthorised layouts. These layouts are later regularised against conversion charges or betterment levy, leading to unplanned and peace meal development. The master plan does not address how the issue of creation of illegal layouts can be tackled. It was only Hyderabad which had opened up urban land for expansion generously allowing the urban expansion to take place.

- With respect to the second component i.e. Generous Metropolitan Limit, Nagpur had not revised its boundary since 1953. Even as the city's urban growth spread beyond the planning boundary yet the planning boundary was not revised until 2018, when the metropolitan region development plan was sanctioned. In case of Bengaluru the master plan document proposes the conurbation area for the future expansion of the city till 2031, but the land cover maps show that by 2015 itself the city had almost grown beyond the proposed developable areas in some parts and even outside the city metropolitan area in some areas. Only in case of Hyderabad the metropolitan limit was generously larger so as to make provision for the cities expansion for 20- 30 years.
- With respect to the selective protection of open spaces the Nagpur master plan does identify different hierarchy of open spaces, environmentally sensitive areas and reserving land for public use. Identification of parks from city level open space to neighbourhood level and it designates use of such parks for playground, garden, etc. It also does not allow any development in these open spaces thus protecting them. The Bengaluru master plan does focus on the preservation of ecologically sensitive areas but does not provide any concrete strategy on how the lake systems of the city would be protected and preserved. Hyderabad master plan proposes to reserve land for new regional level parks and creation of smaller level parks to be done through the process of layout development. Hence all the three cities give importance to protecting environmentally sensitive areas and open spaces in the city, fulfilling the making room paradigm
- With respect to the fourth component that is An Arterial Grid of Roads all the cities had prepared their road network plan proposing roads of different hierarchy with radial and ring roads. Also the master plans of the three cities went on to proposed mass transit systems and also laid out proposals for promotion of non-motorised transport. The suggestion from making room paradigm of having an arterial grid of one km by one km could not be assessed in the master plan.

CONCLUSION – CAN MAKING ROOM PARADIGM BE AN ALTERNATE PLANNING APPROACH FOR INDIAN CITIES?

The review of the planning approach of three cities with respect to the making room paradigm has brought to light the diverse approaches of planning between the cities. Also, on assessing these cities in reference to the four parameters of making room approach, it can be said that none of the cities completely corresponds to all these parameters. The planning approach adopted by the case cities against the making room paradigm is to understand that there were some approaches which were contradictory and some that were going hand in hand with making room paradigm. Nagpur and Bangalore had adopted a conservative approach by limiting the urban growth with introduction of urban growth boundaries resulting in the haphazard development in the green belt or no development zones. While Hyderabad opened up the much more area for urban development than required. The protection of open spaces and arterial road network were the strategies identified by the three cities.

The key point that could be understood by analysing these case study cities and their Master Plans, it is very clearly found out that the plan making process and the decision related to urban growth boundary did not seem to be based on strong analysis of the existing situation and growth patterns of the cities. Scientific basis and rationale behind fixation of urban growth boundary, using expansion approach or containment approach, was not found in either of these case studies.

It could be said that different cities may have to adopt dissimilar approach depending on their context. What we also need to consider is the economic growth of the cities and future population they would attract. This would alter the housing demand for the city and would change the land supply need for housing development. While projecting for the urban land needs and deciding the metropolitan boundary regional economics should also be considered, giving an insight to the city's and region's development in the future. This would enable the planners to foresee and integrate the said vision by adopting the suitable planning paradigm.

Whether making room paradigm can fully be adopted as a planning paradigm would need a much more in-depth study at the city level. But there could be some universal changes that can be brought about in the planning approach of rapidly urbanising Indian cities so that they can cope with the pressure of urbanisation. These are as follows:

1. The master planning process should be as dynamic as the city itself, it should be able to adapt the fast-changing scenarios in Indian cities. The city government should be able to revise the plans based on their study through continuous monitoring of the city's growth. Empowering the city governments to make planning decision involving making and revising master planning.
2. There is a need of getting rid of ideas of over densification of cities. Since Indian cities already have high densities; unnecessary densities create pressure on urban infrastructure. High densities, where required, should be supported by adequate infrastructure.
3. Letting go of growth boundaries like green belt, no development zone, etc. This could be replaced by more liberal planning approach where sectors for future development are earmarked for phase wise development.

4. While delineating metropolitan boundaries for the cities, the city and its surrounding growth centres shall be considered. A metropolitan plan or a city-region plan would have more holistic approach since it considers the economic vision for the whole metropolitan area.
5. Use of liberal zoning policies, mix land use zoning, varying FSI based on urban forms and density should be adopted.
6. Demarcating ecologically sensitive areas, open spaces, recreational spaces in the whole planning area and making strategies for its protection. Making a city level open space plan should also be considered.
7. Planning of the arterial grid road network that encourages walkability and public transport should be undertaken. Implementation of the road network could be in a phased manner so as to implement these roads as the city expands. The city should also start looking at preparing integrated mobility plans, that not only link public transport networks, but also include non-motorized means of transport.

The above recommendations which are inspired by the making room paradigm could be adopted for planning of Indian cities. The answer to whether making room paradigm could be an alternative planning approach for Indian cities, can only be answered though context and challenges faced by each city, its economic vision, geographical limitations and other challenges that are faced by each Indian city.

BIBLIOGRAPHY

- A. Subbarayan, & G. Kumar. (2016). Overall Size Distribution of Cities and Towns in India: 2011 Census. *Journal of Applied Science*, 230-235. doi:10.3923/jas.2016.230.235
- Ahluwalia, I. J. (n.d.). *ICRIER*. Retrieved from http://icrier.org/Urbanisation/pdf/Ahluwalia_Planning_for_Urban_%20Development.pdf
- Angel, S., L., D., Civco, D. L., & Blei, A. M. (2011). *Making Room for a Planet of Cities*. Cambridge, MA: Lincoln Institute of Land Policy.
- Angel, S., Sheppard, S. C., Daniel L. Civco, Buckley, R., Chabaeva, A., Gitlin, L., Perlin, M. (2005). *The Dynamics of Global Urban Expansion*. Washington D.C.: Transport and Urban Development Department, The World Bank.
- Census of India 2011. (n.d.). *Census of India*. Retrieved from Census of India Website: http://censusindia.gov.in/2011-prov-results/paper2/data_files/India2/1.%20Data%20Highlight.pdf
- Deshmukh, M. (2015). Emerging Trends of Urbanization in India. *EPRA Internal Journal of Economic and Business Review*, 146-153.
- Mahadevia, D., Joshi, R., & Sharma, R. (2009). *Integraing the Urban Poor in Planning and Governane Systems, India*. Ahmedabad: Centre for Urban Equity, CEPT University.
- Meshram, D. (2006). Interface Between City Development Plans and Master Plans. *ITPI Journal*. Retrieved from http://www.itpi.org.in/pdfs/07_01.pdf
- Revi, A., Idicheria, C., Jain, G., Anand, G., Sudhira, H., Seddon, J., . . . Srinivasan, S. (2012). *Urban India 2011: Evidence*. IIHS.
- Thippaiah, P. (2009). *Vanishing Lakes: A Study of Bangalore City*. Bangalore: Institute for Social and Economic Change.
- Venkataraman, M. (2013). *Analysing Urban Growth Boundary Effects in the City of Bengaluru*. Bangalore: Indian Institute of Management Bangalore.

SS00_4. Forty under Forty

1000 DOES THE COHESION POLICY WORK IN CENTRAL AND EASTERN EUROPE? SPATIAL HETEROGENEITY MATTERS

ABSTRACT

Since the EU’s cohesion policy creation, this policy has aimed at reducing regional disparities, restructuring regional economies, creating jobs and stimulating private investment. In their article, BECKER ET AL. (2012) wondered whether this policy really helped to favour growth in the regions concerned. They concluded that reorienting the European aid that was more concentrated in targeted regions would improve the effectiveness of the spent funds. They were therefore able to demonstrate the spatial heterogeneity of the effectiveness of the cohesion policy in Europe. Despite the fact that the EU has been extended to eleven new Central and Eastern European countries, the question of the future of European policies, particularly the cohesion policy, remains problematic. As the aim of our article is more to identify the spatial nonstationarity of the effectiveness of the funds than to establish general rules and regularities about the studied phenomenon, we prefer using a local model rather than a global spatial model, like these scholars. Furthermore, this is what DALL’ERBA AND FANG (2015) recommend in order to reconsider the “one size fits all” theory, and therefore demonstrate that the European funds can have a significant positive impact in some regions and no or even opposite effects in others. We use the GWR - geographically weighted regression - to assume that there is a significant spatial variation in the influence of the factors instrumental in regional growth. One of our main objectives is to show the spatial heterogeneity of the effectiveness of European funds in the explanation of the growth of Central and Eastern European regions. Our article contributes to the understanding of the evaluation of the effectiveness of European structural funds over the last two programming periods. The analysis is based on a sample of 147 Central and Eastern European regions at NUTS 3 level over the period 2000-2014 using GWR. Although the favoured level of allocation of European funds is NUTS 2, we have made the decision to work on NUTS 3 regions in order to provide more detailed understanding of the effects generated by the EU Cohesion Policy transfer on growth (like BECKER ET AL., 2012 or GAGLIARDI AND PERCOCO, 2017). The choice of (i) focusing on Central and Eastern European regions, (ii) this level of analysis, NUTS 3 and (iii) this method is unprecedented in the literature.

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1407 HAPPINESS INDEX: WHAT MAKES YOU HAPPY?

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ABSTRACT

There are many countries with having low Gross Domestic Product (GDP) and probably will not be able to come to the first quartile in the world. But that doesn't necessarily mean that citizens living out there, are not happy with their quality of life or service provisioning. So economic progress & provision of basic services does not guarantee certain happiness, it is necessary to measure citizen's aspirations & happiness-shortfall for policy amendment. Researchers tried to assess for various aspects, but overlooked composing as a whole, which was done here. Literature suggested that there are four major components - Health, Social Interaction, Governance & Services and Living Standards, which are the measures of Subjective Well Being (SWB), which contributed remarkably on happiness for Individual, Community, National, & Regional level. We have also identified the criteria of these major components. A web based app was developed to ideate citizen's happiness index by inclusive questionnaire incorporating those components and their criteria. We deployed our system to observe field-reaction and perceive disparities in SWB's domains in our result. Finally the Happiness Index was established as a representation of subjective wellbeing of citizen. Test-values from Cronbach's-alpha & Spearman-Brown-split-half, confirmed the reliable-results, which reveal predominant association of happiness with Education level, Health, Social tie (especially with family & friends), Living standard (Income, work-life balance & Educational facilities). The methodology and tools used in this study, creates a base or an example to evaluate citizens' happiness for all those backward countries, even they have low GDP. This study is very helpful for policy & decision makers in order to identify the focusing aspects of improvements. Researchers can conduct similar study in other contemporary societies. Further the larger dataset will provide better analytics and deeper insights.

Keywords: Well-being, Happiness, Index, Assessment, Indicators, Metric.

1 INTRODUCTION

Happiness - the ultimate human aspiration, and can also be a measure of social progress. America's founding fathers declared the inalienable right to pursue happiness. Pursuit of Happiness is a fundamental right mentioned in the America's declaration of Independence and is defined as: to freely pursue joy & live life in a way that makes a person happy, as long as the person do not do any illegal or violate the rights of others.

Happiness research was predominantly a domain for Psychology until it was linked to Economics. Since the late 1990s, economists from different part of world started to contribute to happiness research through large-scale empirical analyses of the indicators of happiness.

Many researcher have carried out research to find indicators of happiness, measure them, find the shortfalls and use them as a tool for making policy for enhanced wellbeing and quality of life. Happiness can be measured at Personal level, Community/ Organizational level, National level, and Regional level in at least two ways - the first as an emotion and the second as an evaluation.

Happiness is a fuzzy concept and can mean many different things to many people [1], for Psychologists it is individual perspective-personal flourishing. Sociologists and Economists focus primarily on society's perspective i.e. the Nation's or Community's flourishing.

So there is a need of generating a reliable dataset for analysis of policy, as objective dataset are not available. But the question is, can data on self-reported happiness collected through ICT provide critical insights into the prevalent policies and guide policy making? What are the relevant indicators of happiness in Indian cities? Are they different from earlier indicators of happiness found by researchers across the globe?

In this study, the major domains with their indicators, were identified through the exhaustive literature review over the globe. Then questionnaire formed with the expert help, and was embedded in an android app to take the survey. Then those collected data were analyzed to find out the most effective indicators, which are playing major roles behind happiness. The results further tested for reliability and sensitivity. And finally how this study can help the citizen, policy and decision makers, was discussed or concluded. Further spatial or area specific study can infer more stories.

2 PROBLEM STATEMENT

Happiness research has revealed that economic progress or other traditional prosperity measures like health, living standard individually do not necessarily translate into increase in people's quality of life. Provision of basic services and amenities to citizens do not necessarily guarantee happiness. For the average citizen, happiness is unlikely to be dependent on any single domain, but is rather the sum of the weighted indicators. There is need for bottom up approach to measure happiness of citizens to improve/ enhance quality of life. Governments are not aware of happiness status of the citizen and at the same time they are not aware of what is required to be done to make them happy. There is a need to develop a methodology to identify happiness indicators; to collect data; and to measure/ assess happiness, as a framework to identify the disparity; and to propose targeted policy interventions and amendments.

3 ASSESSMENT NEED & REQUIREMENTS

From the problem statement, it was apparent that the need of the study is to assess the happiness that is quantification of happiness, among individuals and to understand their life satisfaction in various domains of well-being.

The model is a system which collects responses from individuals, store the responses, calculate the aggregated score and display the result to user. The study team decided to collect self-reported happiness and life evaluation data from users through a mobile app and display to user their happiness measured in terms of an Index. It was contemplated that through this Happiness Index app:

- People will know their individual index in comparison to community or higher level.
- It will aid people in self-assessment of what makes them happy and what matters most to them.
- Government will come to know the inconsistency in various facilities which are directly associated with people's happiness/overall life satisfaction, needs of its residents which may help further to propose policy intervention or any amendment.

4 LITERATURE REVIEW

4.1 Prior Work

Prior attempts have been made to measure the overall average happiness of people located in cities using word frequency distributions collected from a large corpus of geo-located messages or ‘tweets’ posted on Twitter, with individual words scored for their happiness independently by users of Amazon’s Mechanical Turk service [2].

To explain the variation in happiness across different cities how individual word usage correlates with happiness and various social and economic factors is examined using the ‘word shift graph’ technique developed in [3], as well as correlate word usage frequencies with traditional city-level census survey data. The combination of these techniques produces significant insights into the character of different cities and places.

The Mappiness App is an iOS based mobile app created by Dr. George MacKerron and Dr. Susana Mourato of the Department of Geography & Environment and the Grantham Research Institute on Climate Change and the Environment at the London School of Economics and Political Science (LSE) for their academic research. The aim was to better understand how people's feelings are influenced by features of their current environment—things like air pollution, noise, and green spaces. Statistical methods were used to combine responses from everyone taking part. The location data were collected and used to estimate what the environment was like in the places where people responded give [4].

A City of Wellbeing [5] explained concisely about previous literature review on various Wellbeing Indices, targeted level, their descriptions, the "overall goal", that is, the problem the index was designed to resolve and Domains measured, adopted all over the world.

4.2 Literature Review on Indicators of Happiness

As mentioned in Problem statement, it is unfair to consider a domain to evaluate happiness Index. So, to identify the indicators and factors of Happiness, literature on happiness research was carried out, and indices of subjective wellbeing or happiness over the world were referred [5] and an exhaustive list (Table 5) of the indicators and factors were prepared.

Table 5. Different wellbeing indicators of various literature

	National Level			Local Level										
	Bhutan Gross National Happiness Index 2008/10	Canadian Index of Wellbeing 2011	UK National ONS Wellbeing Index 2011	Bristol Workplace Wellbeing Charter 2012 Bristol	Greater New Haven Community Index 2012 New Haven	Gross National Happiness USA 2008 Vermont	Hertfordshire Forward 2006 Hertfordshire	Jacksonville Quality of Life Progress Report	Manchester Community Strategy 2006 Manchester	Roquetes Barcelona and Lindängen Malmö 2012	Santa Monica Local Wellbeing Index 2013 Santa Monica	Somerville Report On Wellbeing 2011 Somerville	Spirit of South Tyneside 2006 South Tyneside	Sustainable Seattle 1991 Seattle
Health	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Education	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Community vitality	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Economy	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Safety & security	√	√	√	√	√	√	√	√	√	√	√	√	√	√

5 SYSTEM DESIGN

The intent is to develop an app which will

- Calculate the Individual Happiness Index.
- Visualization dashboard which shows the Individual Happiness Index compared to the aggregated Community Level Happiness Index.

The need of the study was a system which collects responses through either a web interface or mobile app, store the responses, calculate the aggregated score and display the result to user.

System designed for the study works as described below, shown in Fig.13: The responses are collected either through an user interface web-page or through an android based mobile app. Once the user submit the filled-up the questionnaire form, then the responses are collected (with the predefined weights) and appended into a previously stored response file (.csv format) through form processing. After storing the data, score calculator read all the stored data and calculate the average score for the higher level. And then it reflects the scores or results to the user-interface.

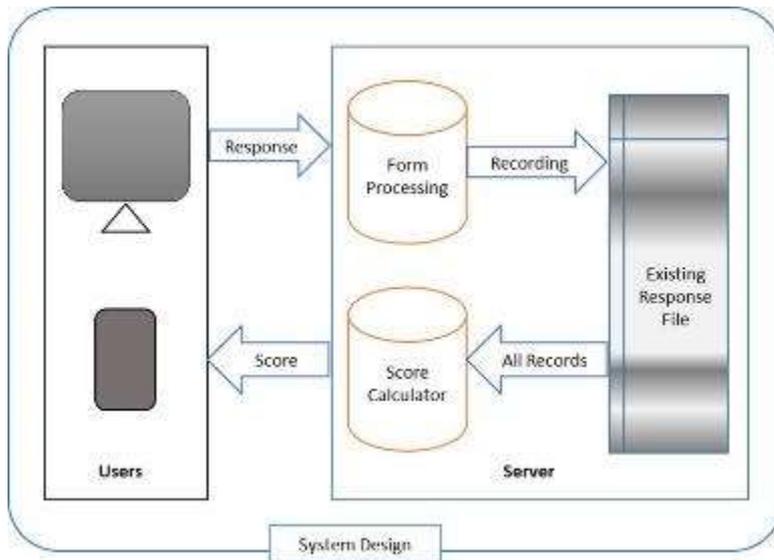


Fig.13. System Design

6 METRICS

6.1 List of Metrics

Scholarly research on measurement of Happiness revealed that it is measured in two ways. One as an emotional reporting and another as life evaluation. Emotional happiness is more correlated with variables such as social time [6] and life evaluation with variables such as income [7]. High income improves evaluation of life but not emotional well-being [8]. In our attempt to calculate Happiness Index, we have incorporated questions on both emotional reporting and life evaluation scores as measurement of Happiness.

6.1.1 Controlled experimental survey for questionnaire

The questionnaire is designed with reference to literatures on happiness research by notable scholars. While framing questions the points considered are: the reason why? For designing this particular app; and for whom? (Target audience); how will we quantify and aggregate the value and what will be our research output. The metric was tested within a controlled audience and their feedback was incorporated in the next levels of survey.

The questionnaire consist of six domains: Demographic, Social Interaction, Health, Governance and Services, Living Standards and Overall Perceived Happiness. The questions on demographic domain consist of user's nominal data on Age, Gender, Relationship status, Employment status, Education level, Number of family members, and PINCODE of current place of residence. Social interaction domain's questions consist of questions on level of socialization, number of close person (social contacts) and frequency of interaction with them. The questions on Health domain consist of questions on Psychological stress and Physical health. The question on Governance & Services domain consist of rating happiness of ten basic services provision of public open spaces and protection of environment, provision of good health facilities, provision of good educational facilities, Sanitation, Safety and security, Waste management, Transportation, Water supply and Electricity supply on five point ordinal scale and their predominant reason. The Living Standard domain consist of questions on income, current residential locality, housing and work life balance and individual's happiness rating on a five point scale.

6.2 Specific choices made

An attempt is being made to rationalize our questions and the weight given to our questions through literature reviews. Friends and family are a long-established support for subjective well-being [9]. Happiness depends not just on the

number of close friends, but also the frequency with which they are seen [10, 11]. The survey asks about the number of close friends and relatives, and the frequency with which they are seen.

6.3 Index Construction

As stated above in section 4, happiness is unlikely to be dependent on any single domain, but is rather the sum of the weighted indicators. The weighting scheme designed for the Happiness Index follows the Alkire and Foster method [12], developed by Sabina Alkire and James Foster of University of Oxford, who presented a weighting scheme for the multidimensional poverty index. Gross National Happiness Index of Bhutan also follows the same weighting method. The following weighting scheme is an adaptation of Alkire and Foster method:

- a) Domains have equal weight in the index
- b) Sub-domains have equal weight within Domains

Fig.14 shows major domains and it's sub-domains with respective weights, adapted from Alkire and Foster Method



Fig.14. Weighing Scheme

Responses to questions covering the sub-domains are in ordinal scale and variable scores are assigned to them based on their relative importance and contribution to the Happiness within the sub domains. That means responses who are correlated to Happiness are assigned scores based on the nature of correlation (positive or negative).

Happiness Index = Weighted aggregates of score of responses.

7 WORKING OF THE SYSTEM

7.1 Pilot Survey

A pilot survey was conducted on Survey Monkey which is a web based platform from 26th February 2016 to 4th March 2016 with survey questionnaire consisting of 10 questions on five domains, Demographics, Social interaction, Health, Governance & Services and Living standard. On an average it took 8 minutes 18 seconds to completely answer the questionnaire. Another survey of above survey questionnaire was conducted using Google forms to check the sensibility of construct of survey questionnaire. It consisted of only two questions, first question was "Are the questions are understandable to you?" and second one was "Do you think it is a lengthy questionnaire". The response options were 'Yes' or 'No' and the respondents were asked to select questions which are not understandable and which they find lengthy. Total 16 responses to the question "Are the question understandable to you?" were collected. Out of which only 18.8% i.e. 3 respondents responded that question number 9 on Governance & Services is ambiguous and need clarity. 81.3% i.e. 13 respondents can understand our questionnaire without difficulty. Total 15 responses to the question "Do you think it is a lengthy questionnaire?" were collected. Out of which only 26.7% i.e. 3 respondents responded that the questionnaire is lengthy and particularly one respondent responded that question number 9 on Governance & Services is lengthy. 73.3% i.e. 12 respondents did not consider the questionnaire lengthy.

Another pilot survey on Survey Monkey was carried out from 16th March 2016 to 20th March 2016 consisting of 19 questions on six domains: Demographics, Social interaction, Health, Governance & Services and Living standard and Overall Perceived Happiness. Responses collected till 20th March 2016 were selected for the analysis. On an average it took 9 minutes 40 seconds to completely answer the questionnaire.

7.2 Happiness Index

A Web Questionnaire Survey was designed to collect user-responses to calculate and display Individual Happiness as well as aggregated Community level Happiness Index. It also provide information on individual's performance on each domain. Once user submit the filled-up form, then the server stored the data as per the pre-defined weights and calculates the happiness scores both for the individual & higher level. After that, server reflects those score at the user interface as shown in Fig.15. It also shows that, in which domain(s), that particular user is happy enough and where he/ she is lacking, with the detailed score breakdown of each attribute (domain), in comparison between individual and community level.

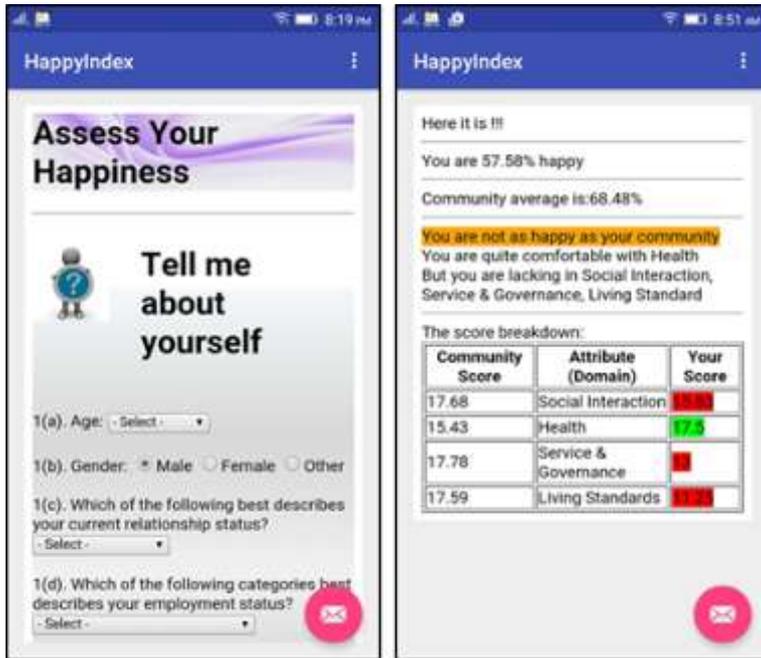


Fig.15. Screenshot of an HI App.

8. TEST RESULTS

8.1 Reliability & Sensibility

In this section, Reliability of the questionnaire using survey responses is carried out. Reliability used to test the random error in measurement. The type of reliability test depends on the type of questionnaire (ordinal, nominal, and interval) [13]. To test the Reliability of the survey responses, both Spearman-Brown split-half reliability and Cronbach's alpha test were performed. These two methods measure the internal consistency of the responses among all survey questions. The two tests were performed in SPSS (Statistical Package for Social Science) version 22. The SPSS guidelines for both the tests, are:

- > 0.9 Very Highly reliable
- 0.8 - 0.89 Highly reliable
- 0.7 - 0.79 Reliable
- 0.6 - 0.69 Marginally reliable
- <0.6 Unacceptable.

In our analysis, the Spearman Brown split-half reliability value was 0.934 and Cronbach's alpha value was 0.813 respectively. Thus the overall Reliability of our study was highly reliable.

8.2 Sample Profile

The objective here is to investigate the relationship between overall happiness and various independent variables as mentioned in Table 6. The Demographics variables with sample size shown in brackets is categorized as shown in Table 6. The style of the table has adapted from [14].

Table 6. General profile of 127 citizens.

Age	Marital Status	Employment Status	Family Size
18 to 30(68)	Single(65)	Employed, working full-time(60)	1 to 2(12)
30 to 45(50)	Married(56)	Employed, working part-time(6)	11 to 20(1)
45 to 60(7)	Divorced(3)	Full time homemaker(3)	3 to 5(97)
above 60(2)	Live in Relationship(3)	Not employed(2)	5 to 10(16)
		Retired(2)	above 20(1)
Sex	Education Level	Student(35)	
Male(78)	Post Graduate(85)	Student with or without scholarship(13)	
Female(49)	Graduate(37)	Unemployed looking for work(1)	
	Higher Sec.(5)	Unemployed not looking for work(1)	

8.3 Correlation Analysis

Due to the limited responses, only Pearson's chi square value and significance values has included as shown in Table 7. The correlations among all categories shows significant relation except basic services. The domains such as social score, living standard score and health has high significant correlation. The correlation analysis was performed at 99% and 95% confidence interval level.

Table 7. Correlation Score.

		Social Score	Health Score	Basic Service	Living Standard	Overall Happiness Score
Social Score	Pearson Correlation	1	.461**	0.181	.221*	.541**
	Sig.(2-tailed)		.000	0.05	0.016	.000
	N	127	127	127	127	127
Health Score	Pearson Correlation	.461**	1	0.099	.210*	.512**
	Sig.(2-tailed)	.000		0.288	0.023	.000
	N	127	127	127	127	127
Basic Service	Pearson Correlation	0.181	0.099	1	.744**	.821**
	Sig.(2-tailed)	0.05	0.288		.000	.000
	N	127	127	127	127	127
Living Standard	Pearson Correlation	.221*	.210*	.744**	1	.869**
	Sig.(2-tailed)	0.016	0.023	.000		.000
	N	127	127	127	127	127
Overall Happiness Score	Pearson Correlation	.541**	.512**	.821**	.869**	1
	Sig.(2-tailed)	.000	.000	.000	.000	
	N	127	127	127	127	127

**Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

8.4 Chi square Test Statistics

The chi square test for total 28 variables is carried in this study. The results of the chi square test are presented in Table 8.

Table 8. Chi square Test Results.

Sr. No.	Group	Variable name	Pearson chi square value	Significance value
1	Services & Governance	Public Open Spaces	21.64	0.360
2		Health facilities	19.32	0.501
3		Education facilities	35.64	0.017
4		Sanitation	19.23	0.507
5		Safety & Security	20.82	0.408
6		Waste Management	27.49	0.122
7		Transportation	18.9	0.528
8		Water supply	26.56	0.15
9		Electric supply	25.55	0.18
10		Reduction of corruption	18.85	0.531
11	Social Network	Family, friends & neighbors	42.09	0.013
12		With family	38.71	0.001
13		With friends	34.36	0.005
14		With neighbors	31.44	0.05
15		Social tie	18.48	0.296
16		Time spent	22.92	0.11
17	Health	Psychological stress level	54.73	0.001
18		Physical stress level	59.23	0.000
19	Personal Details	Age	20.67	0.192
20		Gender	9.66	0.067
21		Marital status	8.74	0.725
22		Education	26.007	0.001
23		Family size	37.37	0.04
24		Employment status	73.69	0.10
25	Living Standards	Income	56.45	0.000
26		Locality	29.79	0.073
27		Housing	25.81	0.172
28		Work life balance	53.55	0.00

The significant values are less than 0.05, which is the conventionally accepted minimum level of significance. Thus it indicates that there is a strong influence on citizen's overall happiness. From Demographics data, Education level & Family size are having significance values 0.001 and 0.04 respectively. The significance value for Education facilities under Governance & Services, is 0.017. Physical and Psychological health variables having 0.000 & 0.001 values. Whenever any person is in touch with Family, friends & neighbors, it shows significant values 0.001, 0.005 & 0.05 respectively indicates your happiness level is raising. Citizens in study area, becomes more disturbed due to Work Life imbalance, having significant values 0.00

8.5 Limitation

The methodology is able to reveal successfully the association between overall happiness and components of SWB and able to find relevant components of happiness, but in our case the limitation is, sample size considered for the study. Hence it is not scalable for a particular region.

Because of the varying sample size for demographics variables, we are not able to emphasize which variable say Gender, Cohort, Marital status are dominant components which influence citizen's happiness.

9 CONCLUSION

The Model is developed to assess happiness, both for Individual & aggregate level along with informing user about those factors which are affecting their happiness strongly by highlighting in an App as shown in Figure 4. According to the survey, the significant indicators which influence the happiness strongly are from Health, Social Network & Living Standards domains as mentioned in section 8.4

The foremost indicators are lack of Education and its facilities, increasing stress, health issues, and inconsistencies in social ties, Income and Work life balance. So, the implication for Governments and policy makers is that to focus on these basic needs, to improve citizen's happiness and alternatively zonal development.

There is still scope to enhance this study in terms of geo tagging the responses and analyzing the data spatially. This kind of study will be very effective in making specific area based policy. The mobile app can be made more user friendly and additional features like auto pop up, auto reminder and visualization dashboards for users' location can be added. This was a cross sectional research and the indicators used in the study are highly significant in measurement of happiness, but there is still possibility to add/subtract indicators based on their significance over a period of time through longitudinal research.

ACKNOWLEDGEMENTS

We take this opportunity to express our heartfelt gratitude to Prof. Krithi Ramamritham & Prof. Arnab Jana for their valuable input to this research. We are grateful to Mr. Karan Punamiya for his guidance. We are thankful to all the respondents. And lastly, we are thankful to all our colleagues and friends for their valuable comments and support.

REFERENCES

1. Wikipedia. *Happiness*. 2016 [cited 2016 17-June-2016]; Available from: <https://en.wikipedia.org/wiki/Happiness>
2. Mitchell, L., et al., *The geography of happiness: Connecting twitter sentiment and expression, demographics, and objective characteristics of place*. PloS one, 2013. **8**(5): p. e64417.
3. Dodds, P.S. and C.M. Danforth, *Measuring the happiness of large-scale written expression: Songs, blogs, and presidents*. Journal of Happiness Studies, 2010. **11**(4): p. 441-456.
4. MacKerron, G., & Mourato, S. *Mappiness*. 2016; Available from: <http://www.mappiness.org.uk/>.
5. Warner, K., & Kern, M., *A City of Wellbeing: The what, why & how of measuring community wellbeing: City of Santa Monica Office of Wellbeing*. 2013.
6. Harter, J. and R. Arora, *Social time crucial to daily emotional well-being in US*. Gallup. com, June, 2008. **5**: p. 2008.
7. Deaton, A., *Income, health and wellbeing around the world: Evidence from the Gallup World Poll*. The journal of economic perspectives: a journal of the American Economic Association, 2008. **22**(2): p. 53.
8. Kahneman, D. and A. Deaton, *High income improves evaluation of life but not emotional well-being*. Proceedings of the national academy of sciences, 2010. **107**(38): p. 16489-16493.
9. Helliwell, J.F. and H. Huang, *Comparing the happiness effects of real and on-line friends*. PloS one, 2013. **8**(9): p. e72754.
10. Helliwell, J.F. and S. Wang, *Trust and well-being*. 2010, National Bureau of Economic Research.
11. Van der Horst, M. and H. Coffé, *How friendship network characteristics influence subjective well-being*. Social Indicators Research, 2012. **107**(3): p. 509-529.
12. Alkire, S. and J. Foster, *Counting and multidimensional poverty measurement*. Journal of public economics, 2011. **95**(7): p. 476-487.
13. Radhakrishna, R.B., *Tips for developing and testing questionnaires/instruments*. Journal of Extension, 2007. **45**(1): p. 1-4.
14. Higgins, J.E. and G.G. Koch, *Variable selection and generalized chi-square analysis of categorical data applied to a large cross-sectional occupational health survey*. International Statistical Review/Revue Internationale de Statistique, 1977: p. 51-38.

1626 THE BREW PATH: ANALYZING THE ECONOMIC EFFECTIVENESS OF CRAFT BEER TOURISM PROGRAMS

ABSTRACT

The size and influence of the U.S. craft brewing industry has increased significantly in recent years which has many communities building upon a tradition of food and beer tourism by initiating policies and programs to use the industry’s success in efforts to stimulate local tourism and economic development. Similar to the renowned Kentucky Bourbon Trail and Napa Valley wine trails, craft brewery trails are being introduced around the country wherein individuals obtain stamps in a “brew passport” from each participating brewery, ultimately to be exchanged for pride and prizes upon completion. This paper employs a difference-in-difference methodology using proprietary sales data from participant and non-participant breweries in northeast Ohio’s Summit Brew Path to analyze the effectiveness of a brewery passport program managed by the local visitor’s bureau. Additionally, we test the reliability of social media locational check-in data as a proxy for brewery sales to further analyze similar programs from around the country. This paper builds upon a growing literature on craft beer research, utilizes novel data and data collection methods, and presents causal results that inform policies and practices of local breweries and tourism agencies.

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SS00_5. Forty under Forty

1227 CLIMATE VARIABILITY AND FERTILITY: EVIDENCE FROM BRAZILIAN REGIONS

ABSTRACT

According to the literature, temperature directly impact fertility in at least two ways: i) climate can affect sexual behavior; ii) temperature could influence factors related to reproductive health, such as sperm mobility and menstruation. There is evidence that both an extremely cold winter and a very hot summer have an impact on births. However, the effects of climate variability on fertility in developing regions are not well known, since most of the existing studies focus mainly on families from rich countries. To isolate the effects of temperature, we consider the following natural experiment: year-to-year climatic fluctuations in each region are effectively random and therefore a possible test is to verify whether births in a region have changed after an exceptionally hot or cold year. In this sense, our objective is to verify whether climatic variations had any effect on fertility in Brazilian regions. For this, we estimate a panel model. As a dependent variable, we use the number of children by women aged 15 to 49 years living in region i in a given year t . We use as independent variables: the difference between the mean temperature of year $t-1$ and the temperature of the mean of year $t-2$ of region i ; a set of controls that vary in time and at the level of the region; region specific fixed effects; year fixed effects. Adding the fixed effects of the region, we will control for unobserved characteristics invariant in time, while time dummies will capture the trend of fertility that is common in all areas. Regarding the data, we constructed a panel with information obtained from the Demographic Census conducted by the Geography and Statistics Brazilian Institute (IBGE) for the years 1980, 1991, 2000 and 2010. The survey covers the entire national territory and has all the variables necessary to estimate the panel model. The second source of data comes from the Climatic Research Unit at University of East Anglia. The results suggest that climatic variations have a significant effect on fertility. This result is relatively important in a climate change scenario. This is because current research has pointed out that climatic variations occurred in greater intensities in poor and developing regions. In addition, the Brazilian fertility rate is below the replacement level. Thus, results showing evidence of the relationship between climatic variability and fertility is important for planning public policies.

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1349 AN EFFICIENT AND EFFECTIVE DISASTER RISK REDUCTION PLANNING THROUGH SMART LOCATION INTELLIGENCE AND ACTIVE COMMUNITY PARTICIPATION

ABSTRACT

Natural hazards are natural phenomena that potentially cause loss to human lives and properties. When natural hazard is turned into a disaster, it unsettles the normal livelihood and often causes incomparable losses to the society. It disrupts economic activities, environmental set up and usually takes a considerably longer time to recover. According to National Disaster Management Authority, GoI, "India is vulnerable, in varying degrees, to a large number of disasters. More than 58.6% of the landmass is prone to earthquakes of moderate to very high intensity; about 12% of its land is prone to floods and river erosion; close to 76% of the coastline is prone to cyclones and tsunamis; 68% of its cultivable area is vulnerable to droughts." Disaster preparedness is the key measure to disaster prevention or at least to reduce its effects. It involves activities like disaster risk zone identification, mitigation measures for vulnerable population and efficient execution to deal with the consequences. Sendai Framework for Disaster Risk Reduction 2015–2030 has been accepted worldwide. Government of India has also taken several initiatives for strengthening disaster reduction strategies and formulated India's first National Disaster Management Plan based on Sendai Framework having four priority themes - understanding disaster risk, strengthening disaster risk governance, investing in disaster risk reduction (through structural and non-structural measures) and enhancing disaster preparedness, early warning and building back better in the aftermath of a disaster. Structural measures include physical construction to reduce or avoid possible impacts of hazards, or the application of engineering techniques or technology to achieve hazard resistance and resilience in structures or systems. Whereas, non-structural measures use knowledge, practice or agreement to reduce disaster risks and impacts, in particular through policies and laws, public awareness raising, training and education. The efficacy of any disaster preparedness largely depends on community involvement in both planning and execution phases as part of non-structural measures. Coupled with information technology and location intelligence, local crowd sourcing enables effective, realistic and coordinated disaster preparedness planning, reduces ambiguities of efforts and key personnel and increase the overall response efforts. Community participation, in particular, plays significant role in hazard mapping, identification of facility requirements, evacuation route planning and etc. Based on the experience of community participation and interaction for formulating disaster prevention plan in Sapporo, Japan, a similar measure is proposed for India in this study. A web based public information system is suggested to be prepared which would create a bridge between the administrators or decision makers and the citizens ensuring information dissemination in both vertical and horizontal direction. A possibility of real-time data sharing with locational information from local citizens will play a vital role in developing the core competencies of the disaster preparedness and survival planning. Disaster preparedness is a continuous and integrated process resulting from a wide range of activities and people participation. A proper locational and strategic data dissemination tool for disaster preparedness integrating both decision makers and citizens would minimize the disaster risk and loss.

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1408 CLIMATE CHANGES IN BRAZIL: REGIONAL VULNERABILITY AND ECONOMIC IMPACTS ON AGRICULTURAL PRODUCTIVITY³⁹

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ABSTRACT

Climate variation are one of the main causes of productivity losses for the agricultural sector around the world. However, most of the theoretical framework applied to estimate this effect across regions focuses only on the estimation of the direct economic impact that such changes will have on the agricultural activity of a given locality. In addition, little is discussed about the vulnerability that different regions of a given country may face. According to the definition of the Intergovernmental Panel on Climate Change (IPCC), the most vulnerable regions in terms of climate changes will be those that – beyond of facing harsher process of climate change - have little adaptive capacity to deal with such changes and depends more heavily on the agricultural sector in its productive structure.

This paper measures the economic impact that the projected climate changes for Brazilian regions may have during this century. In particular, estimates the direct impact that such shift on climate pattern will have on the productivity of the country's main agricultural crops, and the indirect impact of this changes on the Brazilian economy as a whole. In addition, builds an index of vulnerability that allows to detect which are the Brazilian regions more vulnerable in terms of climate changes in this century.

To do so, it uses a physical model - that takes into account the most recent projections of climate changes from IPCC - to predict the effect of such changes on the productivity of Brazilian agriculture. This physical model is integrated with the computable general equilibrium model (CGE) B-MARIA27 - which has the most recent available data on its calibration - in order to assess the systemic impact that changes in agricultural productivity may cause in the level of activity, well-being and production of the Brazilian states.

The analysis is conducted using data on soybean, sugarcane, maize, beans, coffee and orange between 1994 and 2015. These crops account for about 82% of the country's agricultural production. In addition, the CGE interregional model uses the 2011 data in its calibration and captures the regional interdependence of the 27 Brazilian states. Finally, the work uses the projections for the regional climate changes pattern provided by the IPCC's Fifth Assessment Report (AR5).

The preliminary results points to a very heterogeneous economic impact among the Brazilian regions. Estimates indicate that the southern region of Brazil, while experiencing an intense increase in temperature until the end of the century, will face deep costs from changes in climate. The northeastern region of Brazil, which is notoriously the least developed in the country, will be the most affected since the projections indicate that will suffer a slow process of desertification until 2100. The northern region, which houses the Amazon Forest, is the one that will face the most extreme events of intense rainfalls and prolonged droughts being the region that will have the biggest change in its agricultural pattern during the century.

Key words: Climate Changes, Regional Economics, Brazil.

1 INTRODUCTION

"I've wasted time enough," said Lestrade rising. "I believe in hard work and not in sitting by the fire spinning fine theories."

Inspector Lestrade.

The Adventure of the Noble Bachelor

The United Nations Framework Convention on Climate Change is the largest international cooperation treaty aimed at mitigating the harmful effect that human activity can have on the environment. This treaty defines climate change as changes in climate that are attributed directly or indirectly to human activity by changing the composition of the global atmosphere beyond natural climate change (in comparable periods). Its aim is to stabilize the emission of greenhouse gases (GHGs) in the atmosphere at levels that prevent their interference in the global climate system.

Brazil, the host country of the conference, was the first country to sign the treaty, ratifying it at the beginning of 1994. In this sense, the country recognized its influence on the phenomenon of climate change by voluntarily undertaking to comply with and respect the terms arranged in the agreement. Some 140 countries are signatories to this conference, signaling to the world that efforts to mitigate the human impact on climate are a topic of great attention on most of the planet. Although the treaty did not initially set clear and specific targets of the signatory countries on the amount of greenhouse gas emissions over time, it set a precedent for the elaboration of protocols (the most famous of which is the Kyoto Protocol) which would create binding emission limits for signatory countries.

In 2008, Brazil presented the National Plan on Climate Change, whose main objective is to encourage the development and improvement of emission mitigation actions in the national territory. One of the pillars of this plan is to generate research and development aimed at the measurement and studies of impact, vulnerability and adaptation on climate change in Brazil and worldwide.

³⁹ We would like to thank Instituto Escolhas, Rede Clima and the INCT for Climate Changes for the financial support.

The recent water crisis observed in Brazilian Southeast in 2014 was an alert for how the country's economy may be vulnerable to climate change. The impact of these on the productivity of Brazilian agriculture is a subject extensively explored in recent literature. However, there are few studies that explore the second and third order effects of climate change on the country's economy.

Certain productivity shocks on agricultural goods in the Brazilian regions can affect - in a differentiated way - the local demands of the most diverse economic agents. Spatial and sectoral relations may also play a key role in the process of economic adjustment: the food sector of a given region, when facing a relative shortage of agricultural genres for its production, will have to pass on part of its cost increase to consumers. These, in turn, will become poorer in that they will have lower real income to acquire such products. As a result, they will have to reduce their demand for goods from other sectors, while these sectors will tend to decrease their production and prices, and potentially have to dismiss part of their workforce in response to a possible drop in demand. The net effect on economic variables can be quite complex to predict in the various sectors and regions of the country in both the short and long term.

In this context, the objective of this work is to analyze the economic vulnerability of the regions in relation to potential climatic variations in the country, besides the consequent effect that such changes in the climate can cause on the Brazilian economy in its several sectors. To do so, the framework provided by the computable general equilibrium models is used to integrate physical and economic models with the purpose of evaluating the impacts of the most diverse orders on the Brazilian economic system.

On the one hand, physical models on agricultural production provide estimates of the direct effect that climate change can have on the productivity of a given crop. On the other hand, interregional general equilibrium models account for such estimates in order to capture the effect that changes in agricultural productivity can generate for the economic system by considering the links that the agriculture sector has with other sectors of the country, in addition to the effects different regions of Brazil.

The work is divided into 5 other sections besides this introduction. The next section deals with the literature that uses economic methods applied to measure the impacts of climate change, highlighting the numerous dilemmas that may arise in this process. Section 3 discusses the methodology used, emphasizing the integration of the physical model - which relates the impact of climate changes to agricultural productivity - with the general computable equilibrium model used in the work. The fourth section provides a detailed analysis of the agricultural, economic and climatic data constructed, as well as justifying the choice and construction of the scenarios used for the analysis of the work. Section 5 shows the results, presenting the direct and indirect impacts of climate change on the Brazilian economy, and proposing a methodology to deal with the uncertainty of the results in an explicit way. The sixth and final section concludes the text, summarizing the main results of the work.

2 ECONOMICS AND CLIMATE CHANGE: A GENERATIONAL CONFLICT

"You know my methods. Apply them."

Sherlock Holmes

The Sign of the Four

Economic science has much to say about the impact of climate change on the world's economy and well-being. Measuring and assessing the risks associated with such climate change is now - and increasingly - key to design impact mitigation policies and mechanisms for the various nations of the planet.

The impact of changes in global climate has the potential to affect the most diverse dimensions of human life over time: food production, health, access to water, natural resources, among others. In this sense, the impact of such changes on the world economy is not easy to measure. Stern (2006) collects a series of results from economic models and argues that if no change in the direction of reducing human emissions is made by the middle of this century, the cost of the impacts and risks that climate change will cause on the economy of the globe can be equivalent to losing between 5% and 20% of world GDP annually forever. It also argues that, contrary to what is expected, the cost of moving towards greenhouse gas emission reductions is around 1% of world GDP per year.

In the economic sense, climate change can be considered one of the largest and most comprehensive market failures in history. More specifically, the planet atmosphere can be considered a public good, whereas the emission of GHG an externality: the well-being of a given individual is a function of its consumption and the quality of the atmosphere. Therefore, those who produce GHG are generating a cost of well-being for the entire population today and at all times in the future (even though they do not directly and immediately face the impacts of their actions).

Thus, a change in the quality of the atmosphere changes the well-being of all the people of the globe, but not in a homogeneous way: certain sectors, populations and regions can benefit from climate change, while others can suffer severe losses. The emission pattern itself is not homogeneously distributed around the globe (TOTH et al., 2001). Countries with high emission rates have - so far - few incentives to reduce them since, ironically, they are the least vulnerable to the effects of climate change. Moreover, nations that avoid mitigation policies have the classic incentive of free-riding, that is, to benefit from the potential positive impacts of the actions of other countries (HALSNAES et al., 2007). All this inequality in the distribution of the costs and benefits of mitigation actions makes an international emissions reduction agreement very difficult.

Another aspect well discussed in the literature concerns intergenerational welfare transfers. In other words, anthropogenic impact mitigation actions in the global climate can be considered as a transfer of well-being from current generations to future generations (TOTH et al., 2001). The magnitude of mitigation today has the potential to determine the amount of natural resources (water, arable land, etc.) that future generations receive to consume. However, across generations the costs and benefits of mitigation actions are not equally distributed: future generations benefit without incurring costs while current generations incur cost without seeing benefits.

Yet, another factor of relevance for assessing the economic impacts of climate change involves comparing its consequences at different points of time. To do so, economists generally use discount rates to be able to compare the economic effects over the years. This makes it possible to equate impact trajectories over time by calculating the present value. Therefore, the magnitude of this discount rate is critical to determining the relevance of the economic effects of future climate change. The choice of the discount rate has considerable effects for assessing the economic costs of climate change (HALSNAES et al., 2007): since the magnitude of climate change tends to increase over time (IPCC, 2013), how bigger (lower) are the discount rates considered, the smaller (larger) will be the economic impacts of climate changes in present value.

If we consider that mitigation actions can be seen as an investment, then the (probably positive) return on that investment will require positive discount rates over time. In addition, the return on such investment can be used to decide how much can be spent for mitigation. These rates may be described as prescriptive or descriptive. The descriptive view is based on the discount rates observed in the behavior of individuals when making their daily decisions (IPCC, 2007). Its main advocate, William Nordhaus, argues that the descriptive approach "assumes that investment to slow climate change competes with investment in other sectors."

The prescriptive view chooses the discount rate if it is based on what is considered the most compatible for the interests of future generations. This view is defended by Nicholas Stern, who considers that any positive discount rate is unethical for future generations (WEYANT, 2017). Ackerman (2007) argues that his approach defines the intertemporal discount rate as one that leads to a scenario in which the present generation and future generations have equitable resources and opportunities. A rate equal to zero would indicate that all generations are treated equally. According to Stern, the present generation, which has the decision-making power to design policies to mitigate climate change, has a moral obligation to treat future generations with equality. He advocates a lower discount rate that forces the present generation to invest for future generations to reduce the risks of climate change.

One of the main effects of climate change is the influence, especially in the Brazilian case, on agricultural productivity. Agriculture is one of the economic sectors most vulnerable to changes in the climate as it may be significantly affected by fluctuations in temperature and rainfall. Although Brazil is a country of relative abundance of arable land and water, the limited supply of these concomitant to the growing urbanization of the country enters in this context as potential risks to the development of the sector over time. Nevertheless, the direct effects of climate on Brazilian agriculture are essentially related to frost, severe rain and floods, droughts, and other losses due to extreme short-term climatic events.

Concern about the relationship between climate and agricultural productivity goes back to the earliest times in the history of mankind. The place and period of origin of agriculture is, like almost everything in prehistory, a subject of much controversy among historians. However, it is assumed that its emergence occurred concomitantly in various parts of the globe at some point in the Neolithic period, between 12,000 and 10,000 years BC (DIAMOND, 1997).

In a given climatic region, the conditions of temperature, rainfall, solar energy and soil are practically constant. In essence, such conditions condition fertility and, therefore, the productive capacity of a particular crop in a particular region. Thus, it is to be expected that certain current crops are more or less adapted to particular regions, while consistent climate changes may not only alter the productivity of these crops but also their geographical distribution across the globe.

This is considered one of the main factors for the emergence of the first cities of human history on the famous banks of the Nile River, Mesopotamia, North Sea, Baltic, Siberia and Ganges River valley around 5000 years ago. The literature also considers as a necessary condition for the development of societies that there is a wide and consistent process of food production in an autonomous way in order to guarantee their subsistence. In this sense, the climatic or geographical variations that the people of different parts of the globe have encountered explain, to a large extent, the different destinies that such peoples have faced throughout history (DIAMOND, 1997). The most basic channel to understand this problem comes from the idea that the availability of more calories for consumption - from a possible agricultural surplus - implies a greater surplus of food to be stored, thus guaranteeing the basic conditions for the formation of great densely populated societies of history. Botanic studies estimate that, at the beginning of the process of domestication of wild plants for agricultural cultivation, the productive surplus guarantee that each calorie spends on cereal cultivation was compensated with 50 calories of food production (ZOHARY and HOPF, 1993).

Throughout this process, there is also concern about the determination of seasonal climatic patterns of nature aiming at ensuring a minimum level of agricultural productivity in order to ensure the subsistence of the growing human population. It is assumed that the agricultural revolution during the Middle Ages generated productivity gains of around 100% for cereals (DUBY, 1977).

All this allowed the advancement of human society to the current economic and demographic level. In this process, the increase in economic activity and consequent increase in the magnitude of human impacts caused in nature culminated in the huge debate about human activity exerting influence on the phenomenon of climate change. Here is a distinction: climate change can be seen as a "systematic change in the long-term state of the atmosphere over multiple decades or

more" (IPCC). Such a term is distinct from climatic variation, which is a term that refers to the natural variation of the climate that occurs over the months and years. El Niño, for example, which changes temperature, rainfall and wind patterns in many parts of the globe over 2 to 7 years, is a good example of natural climatic variation.

Yet, it is important to note that while long-term climate change has the potential to change patterns of land use and agricultural irrigation, short-term changes directly affect farmers agricultural productivity and well-being. The growing concern about the phenomenon of climate change in recent years has led to a significant increase in the number of studies attempting to quantify the impact they may have on the world economy.

Since the 1960s, studies aimed at estimating the effect of rainfall and temperature on agricultural productivity have been developed. Oury (1965) suggests a positive relation between agricultural productivity and precipitation and negative relation between productivity and temperature. In addition, it is one of the first to propose an index of aridity and its potential effect on maize productivity in the United States.

In a famous paper, Deschênes and Greenstone (2007) find that the effect of temperature on soybean growth and development is consistently negative and non-linear in the USA. Nonetheless, they estimate that climate change projected for the US will have the potential to increase annual profits from agricultural activity by about 4%. Kucharik and Serbin (2008) indicate that the increase of 1°C in temperature during the summer months has the potential to decrease soybean and maize yields by 16% and 13%, respectively.

However, while much of the empirical studies on the subject agree that climate change will have malefic effects on world agriculture, some point the other way. McCarl (2008) finds that higher temperatures have a positive and statistically significant effect on soybean yield, and no significant effect on other crops. Lobbel et. al. (2008) using aggregated data for various regions of the world between 1961 and 2002 find that the change in agricultural productivity can range from -21% to +8.7% depending on the crop and region studied.

Concerning the effect of rainfall on agricultural productivity, studies are also controversial. McCarl (2008) estimates that increased rainfall projected for the US may have a negative effect on wheat yield, while it may be beneficial to cotton production and insignificant on maize, sorghum and soybeans productivity. Deschênes and Greenstone (2007) and Kucharik and Serbin (2008) suggest that the same increase projected for the North American regions will tend to have a positive impact on corn and soybean production.

Schlenker and Roberts (2009) estimate that global warming can reduce agricultural productivity by around 30% to 82%, depending on how fast the global warming will last by the end of the century. In this sense, the climatic projections for the speed of this phenomenon are also diverse. Such projections are based on a series of biophysical models that attempt to represent the Earth's atmosphere through a vast system of equations. A more detailed description of such projections is made in section 4.3.

In the Brazilian context, Haddad, Porse and Pereda (2013) also estimate the indirect effects of climate variations on the Brazilian economy. By integrating a physical model with an interregional computable general equilibrium model, they evaluate the economic impact of climate Anomalies observed in 2005 in Brazil. Their results indicate that the loss of R \$ 1.00 in agricultural production caused by climate change in 2004 has an impact of causing losses of R \$ 3.25 in the whole Brazilian economy. The authors argue that the links between sectors and regions, besides the effect of prices, are the main channels for the propagation of the evil effects of the loss of Brazilian agricultural productivity. Asuncion and Chein (2016), using data from the Municipal Agricultural Production (PAM) survey and the 2000 demographic census, estimate that global warming under current technology and land use patterns has the potential to decrease Brazilian agricultural productivity in about 18% on average. When they analyze these variations in the municipalities, they find values ranging from -40% to +15%.

This paper aims to contribute to this debate by integrating an econometric model - which relates climatic anomalies with the agricultural productivity of the most relevant agricultural crops for the national production - with an interregional computable general equilibrium model calibrated for the year 2011. For this purpose, aims to quantify what are the direct and indirect impacts of the effect that the projected climatic changes will have on the Brazilian economy by the end of the century.

Yet, the work differs in using the latest climate projections, agricultural data, and climatological data to generate its estimates. Nevertheless, it seeks to innovate in the temporal granularity of climate projections using the monthly projections for climate changes provided by the IPCC's 5th Assessment Report.

3 METHODOLOGY

"I'm afraid that I rather give myself way when I explain", said he. "Results without causes are much more impressive".

Sherlock Holmes.

The Stock-Broker's Clerk

The methodology that will be used in this work has as its basis the computable general equilibrium (CGE) models, a class of economic models that seek to represent a given economy in its most diverse sectors and regions. With a calibrated model for Brazil in 2011, the objective is to map the direct and indirect effects that climate change may have on Brazilian regions.

For this, it will be necessary to generate a productivity shock in the theoretical structure of this model. The magnitude of this shock will be calculated from a set of econometric estimates that relate climate to agricultural productivity. With such estimates in hand, it will be possible to use the climate projections provided by IPCC until the end of century to estimate the future agricultural productivity shocks in the Brazilian economy.

In essence, what we intend to do is to estimate the impacts that temperature and precipitation have on agricultural productivity and to multiply them by projections of climate change with the intention of projecting agricultural productivity in the different regions of Brazil. With such a change in computed productivity, it will be possible to use the Computable General Equilibrium model calibrated for Brazil in 2011 and, thus, to compute the effects of first and second order from such changes in Brazilian agricultural productivity.

3.1 Econometric Model

One of the main channels of influence that determined climate change may have on the agricultural sector is its productivity. In this way, understanding the relationship that it has with potential variations in rainfall and temperature is the first methodological step necessary for the elaboration of the work. For that, the idea is to examine how projected changes in these climatic variables can affect the average productivity of the most diverse agricultural crops in Brazil. The empirical strategy used for such estimation initially needs to define a theoretical specification that relates the productivity y_{it}^h of a given crop h in the municipality i of the State s at some period t with the weather, prices and technology available in that period:

$$y_{it}^h = f(\text{climate}_{\{it\}}, \text{prices}_{\{st-1\}}, \text{technology}_{\{st\}}) \quad (1)$$

Thus, the econometric methodology used is initiated through the construction of a city-level panel elaborated through data provided by the Brazilian Institute of Geography and Statistics (IBGE) Municipal Agricultural Production survey to estimate the effect of climate on conditional agricultural productivity to fixed effects of municipality and state. Thus, the parameters of interest will be identified through specific climatic variations in a given period in relation to the historical average in the municipalities after controlling for common shocks to all cities within a state. In short what will be estimated is the following equation:

$$y_{it}^h = \alpha_i + \gamma_{st} + \sum_c \theta_c f_c(W_{cit}) + X'_{it}\beta + \epsilon_{it} \quad (2)$$

Where i represents a certain municipality, s determined state, t determined year and c determined climatic variable. Such specification allows controlling for a fixed effect of municipality α_i , a state-year fixed effect γ_{st} , a vector of control variables specific to municipalities X'_{it} and a vector of climatic variables W_{cit} , which is constructed from the percentage deviations of average temperature and accumulated rainfall in the municipalities in relation to their respective historical averages. Nevertheless, quadratic terms are included in order to capture the non-linearity of these effects. In this way, the parameter of interest will be θ_c , which will measure the impact that a given climate variable has on the productivity of some crop h .

The agricultural data used come from the Municipal Agricultural Research survey, an annual survey that covers all municipalities in the country and provides information on production, planted and cropped area, average yield and value produced from the main Brazilian agricultural crops. The climate data, in turn, come from the National Institute of Meteorology (INMET) which provides on its website historical climate data from its 265 stations throughout Brazil. For the study in question, monthly observations collected from January 1994 to December 2015 will be used. Such data are spatially interpolated in order to create municipal measures of accumulated rainfall during all months between 1994 and 2016.

With these estimates obtained, we intend to multiply each coefficient of the above equation by its respective projection of climatic Anomaly provided by the IPCC climatic models until the end of the century (better described in the next section). Such a calculation will generate a forecast of the commodity's productivity change h for each year from 2020 to 2100. Such prediction will be fundamental to the construction of the agricultural productivity shocks used in the computable general equilibrium model (described below).

3.2 Projections of Rainfall and Temperature for Brazil

A number of entities develop and estimate their different climate models to reliably reproduce and design the global climate system. Each model uses different scenarios to make its projections and each scenario, in turn, is based on different assumptions about the trajectories of emissions of carbon, aerosols, deforestation, sea currents and mitigation actions of the human society, leading to different results and forecasts.

What should be emphasized about these models is that they are based on physical principles, and they are now able to reproduce many important aspects of the observed climate (IPCC, 2013). With this, the scientific community argues that there is great confidence about their ability to quantify future climate projections.

Each set of estimates of an individual model is called an ensemble member, and in general, the scientific community uses the average estimates of a series of ensemble members to make their projections. When comparing the variations of results among ensemble members it is possible to generate an estimate of the degree of uncertainty associated with climatic variation. Using the average of all these members gives a measure of the scientific community's expectation of such projections (IPCC 2007, Annex to Working Group I, p.945).

The IPCC's 5th Assessment Report emphasizes that the future climate will depend on the warming caused by both past emissions and the anthropogenic emissions and natural climatic variation that will occur in the future. These emissions, in turn, are largely dependent on population and economic growth, world consumption patterns, land use and energy, technology and climate policies.

In this way, the entity generates so-called Representative Concentration Pathways (RCPs), which are used to create future emission projections. These are used as inputs to carry out the simulations of the climate models that create the climate projections for the future. These RCPs are divided into 4 scenarios: a rigorous mitigation scenario (RCP 2.6), two intermediate scenarios (RCP 4.5 and RCP 6.0) and a scenario with very high greenhouse gas emissions (RCP 8.5).

The scenarios are named from the level projected for the difference between the solar radiation absorbed by the planet and the radiation that is reflected back into the space relative to the pre-industrial level of the same measure. This difference is known as radiative force and is defined as an index of the magnitude that solar radiation has as a potential mechanism of climate change. Thus, scenario RCP 4.5 considers that the radiative force by the end of the century will be 4.5 times higher than it was in the pre-industrial level.

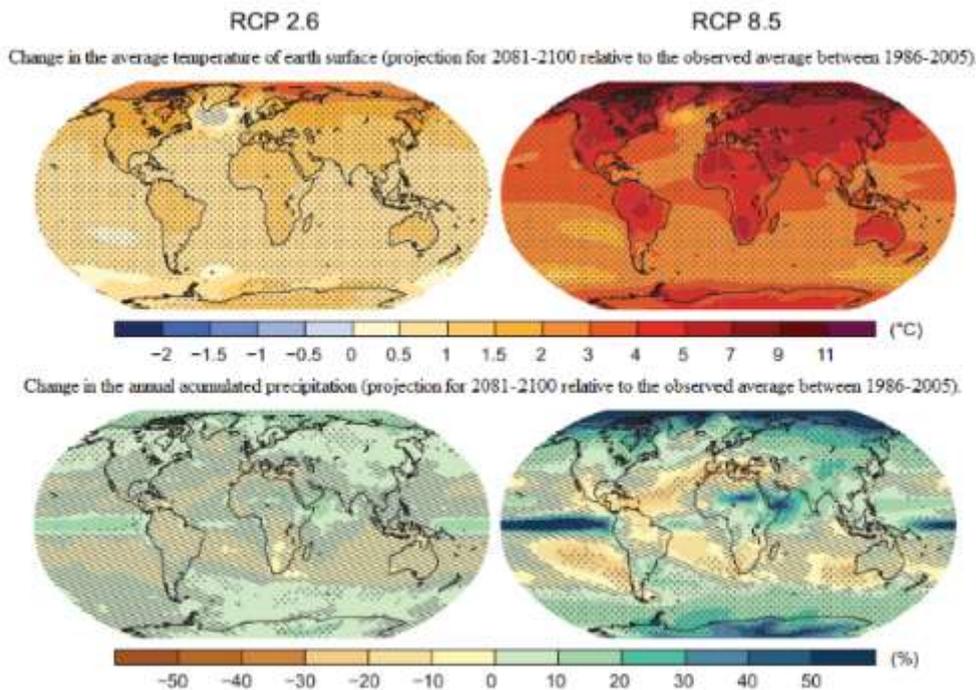


Figure 16 - IPCC Projections (2013).

The figure above shows the global representation of rainfall and average temperature projections performed by the IPCC under the scenarios RCP 2.6 and RCP 8.5. The results indicate that, at least in Brazil, the average temperature will increase between 1°C and 1.5°C in the most optimistic scenario and in more than 4°C in the pessimistic scenario. In terms of rainfall, the estimates project a fall of at least 10% in the annual rain accumulated in the optimistic scenario, and a marked regional difference in the pessimistic scenario: in the Amazon region a fall of 10 to 20% and in the south region an increase of the same magnitude. In addition, the literature on the subject has some consensus about some stylized facts about the projected climatic changes until the end of the century:

- The planet's average temperature is increasing. Since 1900, the average temperature of the globe has been estimated to have increased by 0.8 ° C, with much of this increase occurring in the mid-1970s. In addition, climate projections indicate that the average temperature of virtually all regions of the planet will increase by 2100.
- The low earth atmosphere is becoming hotter and wetter as a consequence of the higher concentration of greenhouse gases. This creates greater potential to accumulate atmospheric energy for storms and extreme weather events (hurricanes, tornados, torrential rains, prolonged droughts). The occurrence of such events will be increasingly frequent and volatile.
- Even if the emission of greenhouse gases were stopped immediately, the average temperature of the planet would not return to the pre-industrial level.

3.3 CGE Model

With the given projections it is possible to use the framework provided by the computable general equilibrium models in order to capture their effect on the economic system as a whole.

This class of models has attracted considerable attention in recent years not only in academic circles but also in policy-making debates. By "general equilibrium" one must understand the analytical framework that sees the economy as a complete and interdependent system whose components (sectors, families, government, investors, importers and

exporters) interact with each other. Such models consider that the economic shocks in a particular sector do not only affect this one but end up generating a chain effect that creates repercussions through the system as a whole.

By "applied", it should be understood that the main focus of these models is to provide results that allow quantitative analysis of policy and economic problems across countries, sectors or regions. To that end, this framework needs data that are obtained, in essence, in the input-output matrices of the Brazilian economy over the years. These matrices are constructed based on the data disclosed through the IBGE national accounts.

Considering that one of the main contributions of this methodology is to consider the parts of an economic system (sectors, regions, families, governments, etc.) as components of an interdependent system that allows analyzing the policy effects and shocks of sector / region for the other sectors / regions of the country.

The regional cut that is intended to be used in the study divides the Brazilian economy into 27 regions (the 26 states of the federation, besides the Federal District) that produce, consume and commercialize goods produced by 68 sectors. Among these goods, we intend to analyze the effect of climate change on the productivity of six of the country's main agricultural crops: sugarcane, soybean, maize, beans, coffee and orange. This effect can be analyzed in an isolated way, that is, considering only one agricultural commodity, or in a global way, when considering the effect of climate changes on the productivity of all agricultural goods at the same time.

Thus, each region has a representative consumer and investor, as well as state and federal government structures. All regions can trade among themselves, in addition to being able to import and export their production to an external sector (under a certain exchange rate). The scope of this class of models allows us to capture the effect of the change in agricultural productivity on a series of economic variables. Of particular note are: production, prices, welfare, employment, wages, household and government consumption, import and export volume, among others. It is worth mentioning that the effect on these variables can be analyzed both from a national and a regional point of view. It is possible to observe, for example, the effect of a change in the productivity of sugarcane cultivation in a given state on the level of wages in another.

From the point of view of production, each industry is able to produce a particular good using a composite good specification that considers each good to be manufactured by using a fixed combination of primary factors and intermediate goods. The factors used are, in general, capital, labor and land which, in turn, combine by means of a function of elasticity constant substitution to form the compound of primary goods. The intermediate inputs, which may have domestic and foreign origin, also combine with a constant substitution elasticity function to form the compound of intermediate inputs. Finally, intermediate inputs and primary factors combine through a Leontief function to generate firm output.

The model uses the structure proposed by Haddad (1999). The construction of the database required for its calibration is done through the top-down approach, which uses national results to create an interregional input-output system capable of generating a snapshot of the Brazilian economy at a given point in time⁴⁰. The model in question was calibrated for the year 2011 and assumes that the tax structure and national tariffs can be replicated for all regions of Brazil in the same year.

The data used for the calibration of this model are essentially derived from the IBGE national accounts system and are constructed from a system of interregional input-output matrices. As is usual in this class of models, the number of unknown parameters exceeds the number of equations required to identify them. In this way, the short-term and long-term closure approach is used, which allows the variation of some model variables to be locked in order to allow it to become exactly identified.

From the regional point of view, the reduction of agricultural productivity in a region ends, *ceteris paribus*, increasing the relative productivity of agriculture in other regions. This tends to cause the agricultural production of the affected state to migrate to other parts of the country, generating an increase in the level of activity of the other states and increasing the availability of factors of production within the affected locality. The excess supply of factors in this region will tend to cause a decrease in the remuneration of these factors and consequent decrease in the price level of the region. The net effect on the price level is unknown and can be measured after the necessary simulations have been carried out on short and long-term horizons. The aim of this study is to estimate the effect that the projected climatic changes in the coming years can have on agricultural productivity and, from such changes in productivity, to analyze the potential effect on the economy of the different sectors and states of Brazil.

4 DATA

"It is a capital mistake to theorize before one has data. Insensibly one begins to twist facts to suit theories, instead of theories to suit facts."

Sherlock Holmes

A Scandal in Bohemia

In order to implement the strategy described in section 3, the most recent data available on agricultural production, temperature, precipitation, and the most recent climate projections available in the IPCC's 5th Assessment Report were

⁴⁰ For more details, see Haddad, Gonçalves Júnior and Nascimento (2017).

collected. In addition, a portrayal of the regional input-output system used for the general computable equilibrium model used will be performed. The description of this data will be detailed in this chapter.

4.1 Agricultural Data

The data on production, value produced, average yield, planted area, proportion of total production and proportion of the total agricultural area are provided through the Municipal Agricultural Production (PAM) survey, made available by IBGE. Data were collected between 1994 and 2015 for all Brazilian municipalities. Six of the main agricultural crops of Brazil were chosen: soybean, sugarcane, maize, coffee, beans and orange.

Table 1 - Representativeness of Cultures Selected in Terms of Produced Value.

Year	2010	2011	2012	2013	2014	2015	Average
Soybean	24.21%	25.77%	24.74%	29.65%	33.58%	34.15%	28.68%
Sugarcane	18.36%	20.06%	19.83%	18.47%	16.76%	16.49%	18.33%
Maize	9.85%	11.37%	13.15%	11.50%	10.35%	11.25%	11.24%
Bean	3.21%	2.63%	3.05%	2.99%	2.06%	2.28%	2.70%
Coffee	7.51%	8.30%	8.19%	5.51%	6.24%	6.00%	6.96%
Orange	3.99%	3.35%	2.25%	2.05%	2.20%	2.15%	2.67%
TOTAL	67.13%	71.49%	71.22%	70.18%	71.19%	72.32%	70.59%

The criterion used to choose these crops sought to cover several dimensions of national agricultural production: crops most representative in terms of value produced (soybean and sugarcane); most representative crops in the agricultural GDP of the municipalities of most regions (maize and beans), crops in which Brazil has a dominant position in world production (coffee and orange). In addition, we tried to merge the analysis of temporary crops (soybean, sugarcane, corn and beans) and permanent cultivation (coffee and orange). Table 1 shows the representativeness of these crops in the value produced by Brazilian agriculture between 2010 and 2015.

Among these, soybean stands out both in terms of value produced (almost 30% of the total produced by Brazilian agriculture between 2010 and 2015) and planted area (38% of the total arable land of Brazil in the Period). Next came sugarcane (18.3% of the value produced and 13.8% of the total area), corn (11.2% of the total of agriculture and 20.8% of the plant area). Coffee, Beans and Orange, together represented 12.3% of the Brazilian agricultural GDP and 8.8% of the total planted area in the country. Together, these crops accounted for 70.6% of the total value produced and 81.36% of the area planted by the agricultural sector of Brazil between 2010 and 2015.

Table 2 - Representativeness of Cultures Selected in Terms of Planted Area.

Year	2010	2011	2012	2013	2014	2015	Average
Soybean	35.70%	35.26%	36.26%	38.58%	39.76%	41.93%	37.92%
Sugarcane	14.02%	14.11%	14.09%	14.11%	13.71%	13.25%	13.88%
Maize	19.83%	19.96%	21.77%	21.69%	20.78%	20.63%	20.78%
Bean	5.59%	5.73%	4.60%	4.20%	4.46%	4.07%	4.78%
Coffee	3.31%	3.15%	3.07%	2.89%	2.63%	2.59%	2.94%
Orange	1.30%	1.20%	1.10%	0.99%	0.90%	0.89%	1.07%
TOTAL	79.75%	79.42%	80.90%	82.47%	82.25%	83.36%	81.36%

To avoid possible distortions, all data described below will be presented as municipal averages between the years 2010 and 2015. Table 16 in the appendix also shows the representativeness of each crop added by state⁴¹

4.1.1 - Soybean

Soybean is the main agricultural commodity in Brazil reaching, in 2015, almost R\$ 105 billion of production value at market prices in the country. Brazil is the world's second largest producer of grain, responsible for about one-third of all Soybean produced on the planet. The production of the crop - in terms of value - is concentrated mainly in the Midwest, responsible for almost 45% of the total produced in the country. Soon after, comes the South region, responsible for about 37%.

Table 3 - Soybean Importance (in terms of produced value) in Brazilian Regions.

Region/Year	2010	2011	2012	2013	2014	2015	Average
North	2.68%	2.73%	3.82%	3.27%	3.92%	4.02%	3.41%
Northeast	8.10%	8.38%	9.59%	6.38%	7.42%	8.89%	8.13%
Southeast	7.03%	6.05%	7.80%	6.70%	6.12%	6.53%	6.70%
South	39.38%	39.60%	29.89%	40.06%	37.10%	37.67%	37.28%
Midwest	42.80%	43.25%	48.90%	43.58%	45.44%	42.89%	44.48%

The maximum yield of the crop occurs when the accumulated precipitation throughout its productive cycle is between 450mm to 800mm and average temperature during the day around 30°C (EMBRAPA). The vegetative growth of the crop is almost null when the average temperature during the day is less than 10°C and the growth rate is highly impaired under temperatures above 40°C. Such conditions are aggravated under the occurrence of water deficits.

⁴¹ This will be important, since the computable general equilibrium model that will be used will be on the state level, so that aggregating the municipal data for the states will become necessary later.

With this, the culture has different periods of planting and harvesting throughout the Brazilian regions. In the Midwest and Northeast, the planting period runs from October to January and in the South and Southeast regions this period runs from September to January. The harvest season goes from January to May in the South, Southeast and Midwest and from February to May in the Northeast.

4.1.2 – Sugarcane

Sugarcane is considered a semi-temporary planting crop, since after planting it is cut several times before being replanted. Its productive cycle is, on average, six years (or five cuts). Brazil is currently the world’s largest producer of sugarcane, accounting for about 30% of the total area devoted to the cultivation of the product around the world (FAO, 2008).

Table 4 – Sugarcane Importance (in terms of produced value) in Brazilian Regions.

Region/Year	2010	2011	2012	2013	2014	2015	Average
North	0.66%	0.90%	0.87%	1.20%	1.10%	0.81%	0.92%
Northeast	14.27%	12.54%	10.64%	10.30%	12.90%	10.20%	11.81%
Southeast	65.26%	66.12%	66.37%	63.86%	61.17%	61.99%	64.13%
South	6.88%	5.97%	6.45%	6.32%	6.35%	6.31%	6.38%
Midwest	12.92%	14.48%	15.67%	18.32%	18.48%	20.70%	16.76%

Most of Brazil’s sugarcane production is concentrated in the southeastern region, responsible for about 64% of the national production. Next comes the Midwest and the Northeast, responsible for 16.76% and 11.8%, respectively.

The crop lacks specific climatic conditions for its development. The ideal temperature for budding of the canes varies from 32°C to 38°C. Ideal temperature conditions during the day should range from 22°C to 30°C during the plant growth period. Temperatures below 20°C tend to hinder their development.

Thus, the crop presents two distinct planting and harvesting regimes in the Brazilian regions: planting from October to March (December) in the Southeast (Center-West) and from November to January in the Northeast. Harvest from April to September (December) in the Southeast (Midwest) and September to April in the Northeast.

4.1.3 – Maize

The United States Department of Agriculture estimates that in 2017, Brazil was the 3rd largest producer of corn in the world (behind the US and China) producing about 95 thousand tons of grain in the same year.

Maize is one of the crops studied that shows the greatest regional spread in productive terms. The South and Center-West regions are each responsible for about one-third of the total produced in Brazil between 2010 and 2015. The Southeast has about 19% of this total. The plant, native to Central America and cultivated since pre-Columbian civilizations, is usually planted during the rainy season. Like sugarcane, it is considered a rainfed crop since it only requires water from the rain, while the precise determination of the dry season is fundamental for its good cultivation over time.

The maximum productivity of the crop occurs with average water consumption of about 500mm and 800mm during the growing season and lacks a minimum consumption of 350mm to develop without the need for irrigation.

In terms of temperature, the ideal is that the average during the day varies between 25°C and 30°C and average temperatures below 10°C and above 40°C cause considerable delay in germination (making the beans unusable).

Due to the great diversity of the climatic system of the Brazilian regions, the plant is cultivated in different periods in the country: it is usually planted between August and December in the South and North regions of the country and between October and December in the Southeast, Northeast and Central West regions. The harvest period also varies, going from December to June in the South, January to June in the North and from February to June in the Southeast, Northeast and Midwest.

Table 5 – Maize Importance (in terms of produced value) in Brazilian Regions.

Region/Year	2010	2011	2012	2013	2014	2015	Average
North	3.49%	2.96%	2.86%	2.72%	3.10%	3.62%	3.13%
Northeast	10.01%	10.61%	6.99%	8.23%	10.94%	8.73%	9.25%
Southeast	23.44%	19.56%	18.32%	18.10%	17.69%	16.52%	18.94%
South	40.32%	38.09%	34.50%	35.87%	34.06%	30.04%	35.48%
Midwest	22.73%	28.78%	37.33%	35.08%	34.20%	41.08%	33.20%

4.1.4 – Coffee

The coffee culture, although quite representative in Brazilian history for its commercial importance until the 1930s, currently accounts for only about 4.7% of the value produced by national agriculture. Still, according to the International Coffee Organization (ICO), the country accounted for just under a third of world production in 2017.

The production is mainly in the southeastern region of Brazil, responsible for about 88% of all national production. Because it is a permanent crop, its planting time is quite variant, but it is estimated that after planting it takes between two and three years for the plant to begin to generate grains. The coffee plant has a bi-annual production cycle: in one year it produces enough and the following year it generates a smaller quantity of grains.

In Brazil two species are cultivated: *100rabica* and *robusta*. The first one lacks the average ideal temperature between 19°C and 22°C during the germination period. This species is, however, quite sensitive to frost having growth inhibition at temperatures below 10 ° C. Arabica coffee is also a plant more susceptible to pest proliferation and risk of infection with average temperatures above 22°C. The robust coffee, in turn, is more resistant to high temperatures and diseases. It is well adapted in regions with average temperatures between 22°C and 26°C.

Table 6 – Coffee Importance (in terms of produced value) in Brazilian Regions.

Region/Year	2010	2011	2012	2013	2014	2015	Average
North	3.16%	1.91%	1.99%	2.11%	1.94%	1.91%	2.17%
Northeast	5.00%	5.30%	4.23%	5.48%	5.94%	6.93%	5.48%
Southeast	85.95%	87.35%	89.34%	88.19%	90.06%	87.24%	88.02%
South	4.94%	4.76%	3.63%	3.32%	1.36%	3.14%	3.53%
Midwest	0.95%	0.68%	0.81%	0.90%	0.70%	0.77%	0.80%

Both species react well to periods of drought not exceeding 3 months and the plant is better adapted to regions that have a uniform annual rainfall regime that accumulate between 1500mm and 1900mm of precipitation per year. Irregular rains can deform the flowering of the coffee tree, causing uneven maturity in its fruits. Its harvest period goes from May to August in the Southeast, and from May to November in the South.

4.1.5 – Bean

Beans are considered the main subsistence culture of Brazil. For this reason, it is the crop with the most homogeneous production along the Brazilian regions: the South region leads with 29.6% of the total national production, followed by the Southeast (28.2%), Central West (19.7%), Northeast (19%) and North (3.4%).

Table 7 - Bean Importance (in terms of produced value) in Brazilian Regions.

Region/Year	2010	2011	2012	2013	2014	2015	Average
North	3.86%	4.02%	3.97%	3.03%	3.26%	2.19%	3.39%
Northeast	23.10%	27.28%	10.91%	14.46%	19.89%	18.59%	19.04%
Southeast	28.22%	26.30%	34.70%	30.27%	22.56%	27.49%	28.26%
South	25.97%	25.00%	28.01%	32.27%	35.54%	30.91%	29.62%
Midwest	18.85%	17.39%	22.40%	19.97%	18.75%	20.81%	19.70%

The main species cultivated in Brazil is *Phaseolus*, which has numerous varieties of colors and flavors. The plant lacks average temperature during the day ranging from 18°C to 24°C and during the night from 15°C to 21°C. Under temperatures above 35 ° C, there is practically no growth of their pods.

During its productive cycle, the crop needs about 300mm to 400mm of well-distributed rainfall throughout its germination period. In the South region the planting period goes from August to December and the harvest period from October to March. In the Southeast, Midwest and Northeast, its planting period varies from October to December and the harvest is from January to April.

4.1.6 – Orange

Orange is the permanent culture in which Brazil is most representative on the world stage. The US Department of Agriculture estimates that in 2016 the country produced about 19.2 thousand tons of the fruit, more than 3 times that China (second place, with 6.2 thousand tons) produced in the same period.

Because it is a kind of permanent crop, its production tends to be more concentrated regionally. The Southeast was responsible for more than 3/4 of all national production between 2010 and 2015. Its production is concentrated mainly in the State of São Paulo and West of Minas Gerais.

Orange is a fruit of the genus *citrus*, which lacks annual rainfall average between 1800mm and 2400mm, with a minimum of 1200mm per year. Any deficits in these values can be remedied by means of irrigation water.

Table 8 – Orange Importance (in terms of produced value) in Brazilian Regions.

Region/Year	2010	2011	2012	2013	2014	2015	Average
North	1.73%	2.24%	4.12%	4.65%	4.18%	5.46%	3.73%
Northeast	8.89%	7.80%	10.88%	11.46%	9.81%	9.77%	9.77%
Southeast	81.68%	81.71%	72.97%	71.15%	74.89%	73.33%	75.95%
South	6.65%	7.27%	10.69%	11.37%	9.76%	10.06%	9.30%
Midwest	1.05%	0.97%	1.35%	1.38%	1.36%	1.39%	1.25%

4.2 Climate Data

The climate data, in turn, come from the National Institute of Meteorology (INMET) which provides on its website historical climate data from its 265 stations throughout Brazil. For the study in question, monthly observations of cumulative precipitation and average compensated temperature⁴² were collected between January 1994 and December 2015. Such data are spatially interpolated in order to create municipal average precipitation and temperature

⁴² According to INMET, the mean compensated temperature of a meteorological station is one that, within a one-day period, calculates a weighted average of the maximum (weight 1), minimum (weight 1), noon (weight 1) and of midnight (weight 2) within the 24-hour period.

measurements throughout all months between 1994 and 2016. This interpolation aims to create an annual panel with climatic information of each of the 5563 Brazilian municipalities between 1994 and 2015. Thus, each of the analyzed years will have information of average temperature compensated and cumulative precipitation in all its months.

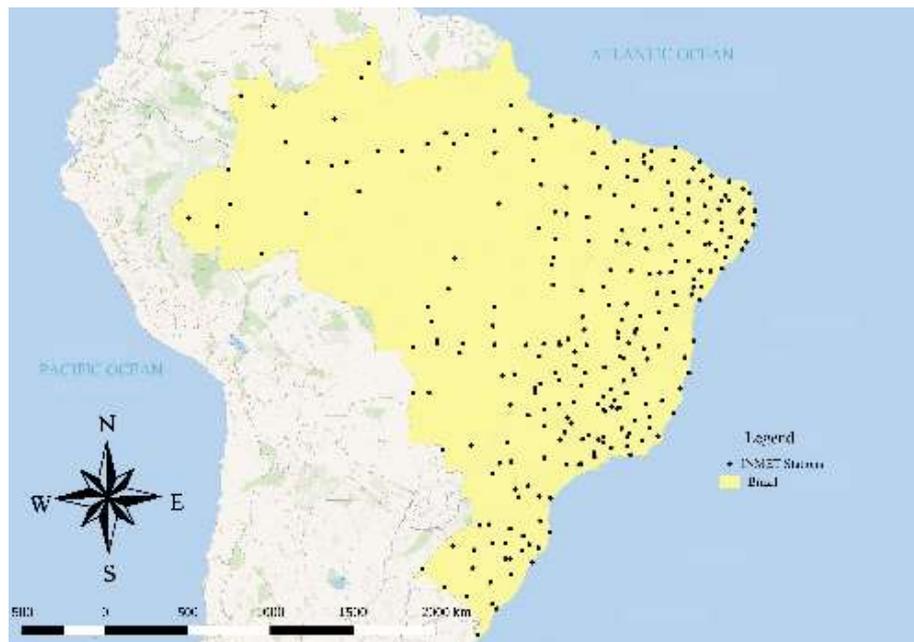


Figure 17 - INMET Meteorological Stations.

Figure 2 shows the spatial distribution of all meteorological stations that had data available in the analyzed period⁴³.

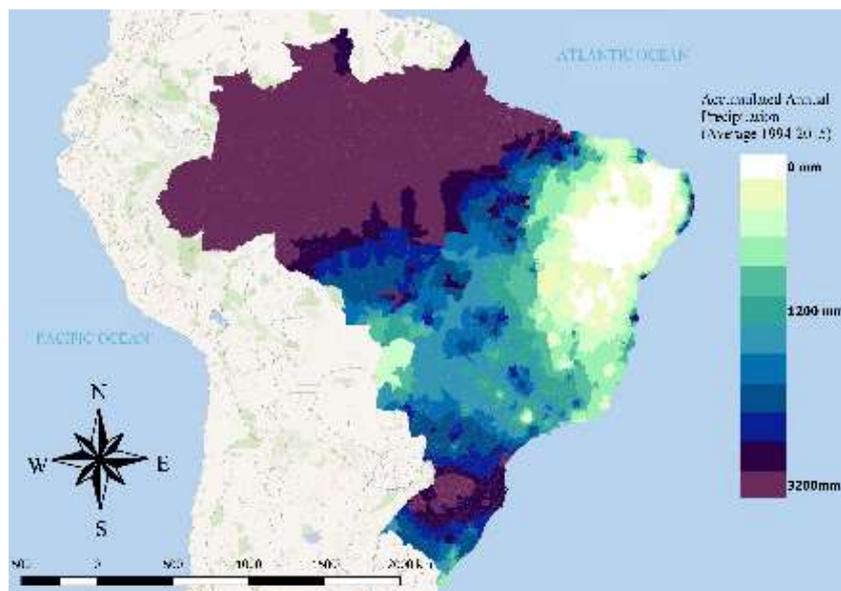


Figure 18 - Cumulative Precipitation - Annual Average (1994 - 2015).

Figure 3 shows the average annual precipitation pattern of Brazil between 1994 and 2015. Its analysis shows the different microclimatic patterns in Brazil: quite humid in the South and North of the country, quite dry in the northeastern semi-arid region and intermediate in the rest of the central- southern Brazil.

Figure 4 shows the average compensated temperature differentials across Brazil. Their analysis is straightforward: the north-central part of Brazil with higher average temperatures (over 26°C averaged over the year), the South with subtropical temperatures (below 19 °C on average over the year), and the Southeast with median temperatures (between 20°C and 23°C throughout the year).

4.3 Climate Projections

As described in section 3.2, the climate models used to generate the impacts of climate change on agricultural productivity in Brazilian municipalities are based on the IPCC's 5th Assessment Report. More specifically, the data provided by the National Center for Atmospheric Research (NCAR) climate model, which provides monthly projections for numerous

⁴³ With the exception of the state of Rondônia - the only state that does not have any meteorological station - all the units of the federation are covered by at least 3 meteorological stations well scattered throughout their territories. For this reason, the state of Rondônia was removed from all econometric analyzes. This decision is based on the absence of historical climatic information for the state, and considering that Rondônia was responsible for only 0.78% of all national agricultural production between 2010 and 2015.

atmospheric and climatic parameters for the various regions of the globe, were used. The data collected relate to the most recent outputs of the latest model developed by NCAR (CCSM-4) and are on a global scale⁴⁴.

In the field of climate change, emission scenarios are used to explore the extent to which humans can contribute to climate change given a series of uncertainties in factors such as growth and economic development, population, and the creation of new technologies. Scenarios have been used for a long time by planners and decision makers to analyze situations that have uncertain outcomes.

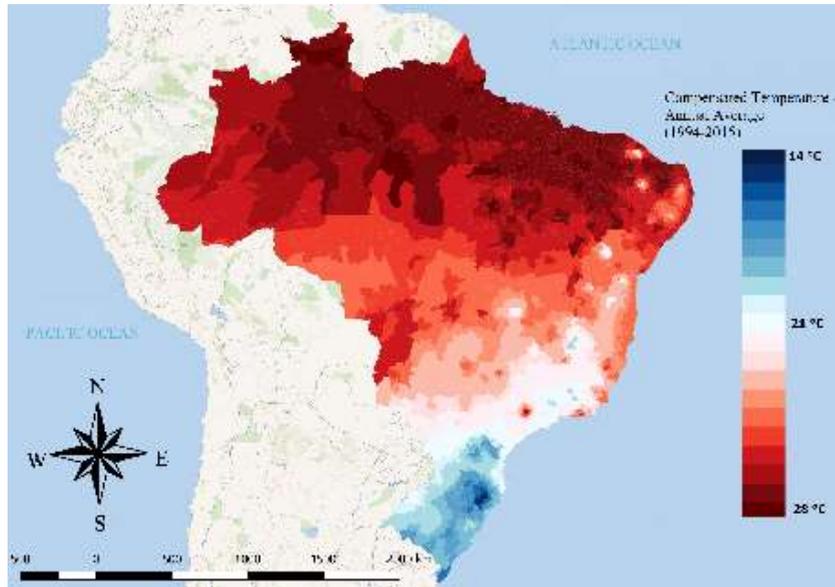


Figure 19 – Compensated Temperature – Annual Average (1994 – 2015).

Projections and scenarios of future social and environmental conditions may take into account different states of nature on the planet: for example, states in which the world is poorer and scenarios in which it is richer. The purpose of using scenarios is not to predict the future but to explore the scientific and socioeconomic implications under different plausible future situations. In developing the AR5, scientists have developed a new framework for creating and using scenarios in the context of climate change.

For the study in question, monthly temperature and precipitation projections were collected from January 2020 to December 2100. In addition, the scenarios RCP 2.6 and RCP 8.5 are considered to perform the work analyzes. It is worth remembering that the first is a scenario built on the premise that the concentration of greenhouse gases in the Earth's atmosphere will reach its peak in the middle of the century and, from there, begin to decline. It is called the low-emission scenario and was developed by the PBL Environmental Assessment Agency of the Netherlands and considers that ambitious targets for greenhouse gas emissions will be put into practice over time. Its main premises are:

- Decrease in oil use.
- Population of 9 billion people around 2100.
- Considerable growth in the use of energy generated from biomass.
- Emission reduction around 40%.
- Current CO₂ emissions remain constant at the current level by 2020 and begin to decline thereafter, becoming negative as of 2100.
- The CO₂ concentration in the atmosphere peaked in 2050, showing a slight decline by 2100.

RCP 8.5, on the other hand, assumes that the concentration of these gases increases continuously throughout the century. It is called a high-emission scenario and is consistent with a future in which no emissions reduction policy is in vogue in the world. It was developed by the Insitute of Applied Analysis of Austria and has as premises:

- CO₂ emissions three times higher than current levels by 2100.
- Rapid growth of methane emissions.
- An increasing increase in land use for agriculture that is driven by strong population growth.
- World population of 12 billion people by 2100.
- A low rate of technology growth.
- High resilience of the use of fossil fuels.

⁴⁴ Data provided by NCAR on the global scale use Gaussian quadrature to generate its estimates and provide data for equally spaced points by 1.25° longitude and 0.94° latitude. On average this corresponds to a resolution of 105km. To transform such projections on a global scale to the municipal scale, we used the same spatial interpolation method described in the previous section.

- No implementation of mitigation policies.

For this reason, each scenario leads to distinct temperature and precipitation trajectories throughout the century (including between Brazilian regions). The data used relate to the average of the 9 ensemble members of the model in question.

Figure 5 shows the average projections of annual precipitation anomalies⁴⁵ in Brazilian regions under RCP 2.6. Because it is a more conservative scenario, its results are more discrete and homogeneous over time. In essence, the tendency to decrease precipitation in the Brazilian mid-north (in the order of 10%) and a discrete increase in the southern end of the country (about 5%) stands out.

RCP 8.5, on the other hand, is much more dramatic. Figure 6 shows such projections until the end of the century. Their analysis allows to infer that, in addition to being more intense, the predicted precipitation anomaly is much more volatile in time. In the decades of 2020-2040, the average precipitation fall in Brazil is of the order of 5%, whereas at the end of the century this fall is 3 times greater. Nevertheless, the scenario predicts a worsening of the drought in the northeastern semi-arid region (a stylized fact widely accepted in the scientific community about the desertification of the Brazilian semi-arid), with a mean rainfall of up to 35%. The South of the country, in turn, will face more intense rainfall regimes, reaching an average rainfall increase of 15% at the end of the century.

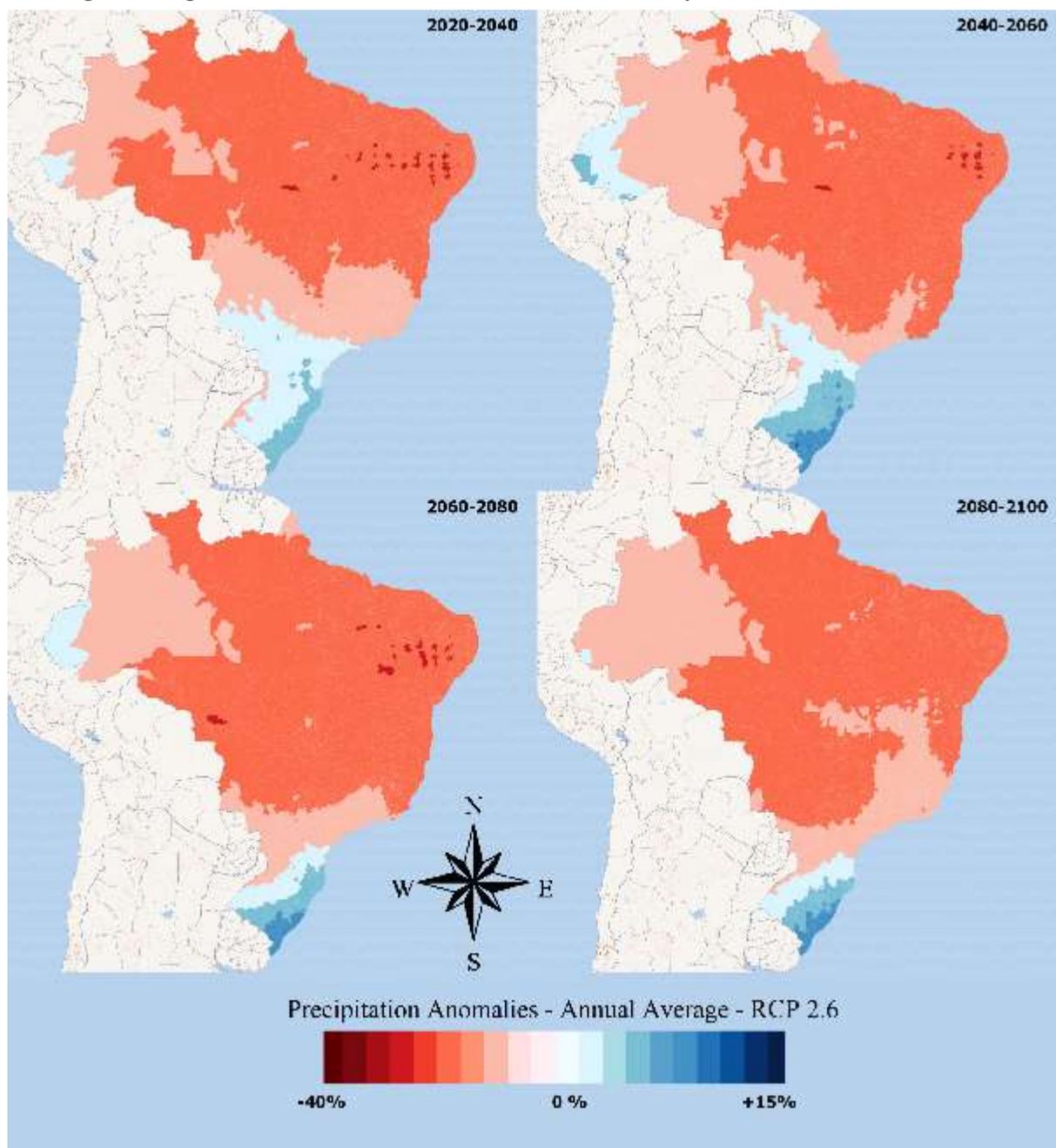


Figure 20 – Annual Precipitation Anomaly – RCP 2.6.

⁴⁵ Climatic anomaly is described in the literature as the percentage difference between the value that a given climatic variable assumes under a given scenario and a historical average of that same variable. For this study, all temperature and precipitation anomalies are calculated on the basis of the averages of the period 1960-2000.

In terms of temperature, the predicted by all scenarios is that of its increase during the century, but with different magnitudes and speeds depending on the scenario analyzed. Figure 6 denotes the mean annual temperature anomaly projections over the century under RCP 2.6. This scenario predicts a median increase of 4% (around 0.9 ° C) by the end of the century, with the South of the country being the most affected region. The figure also denotes a curious fact of this scenario: the reversal of the warming process in the states of Mato Grosso and Mato Grosso do Sul between the decades of 2040 and 2100.

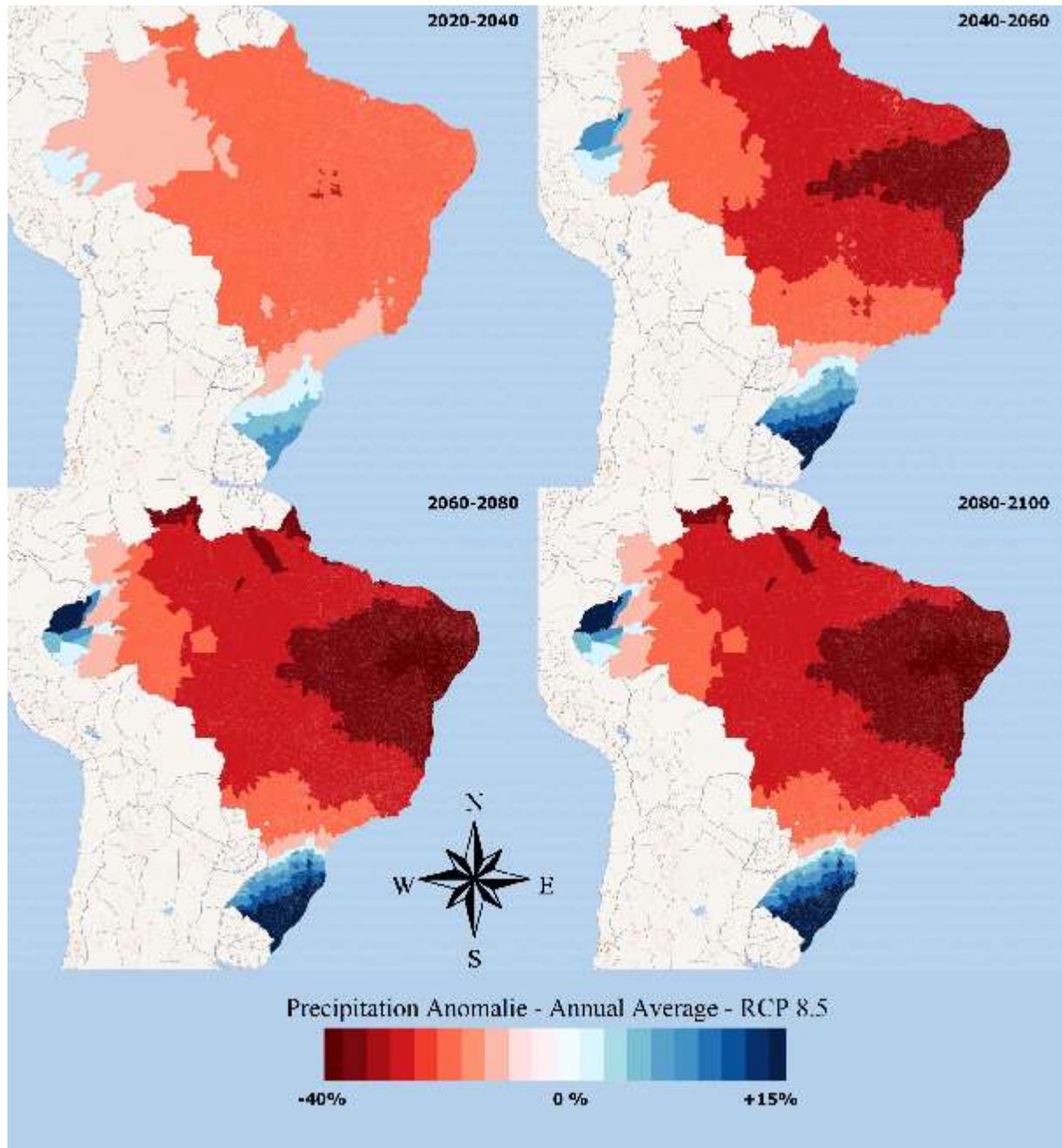


Figure 21 – Annual Precipitation Anomaly – RCP 8.5.

Under RCP 8.5, however, the changes are more intense (Figure 8). While at the beginning of the century the projected average warming is around 5% (1 ° C), by the end of the century this increase is about 17% (or 3.8 ° C), reaching 25% in the municipalities of the South.

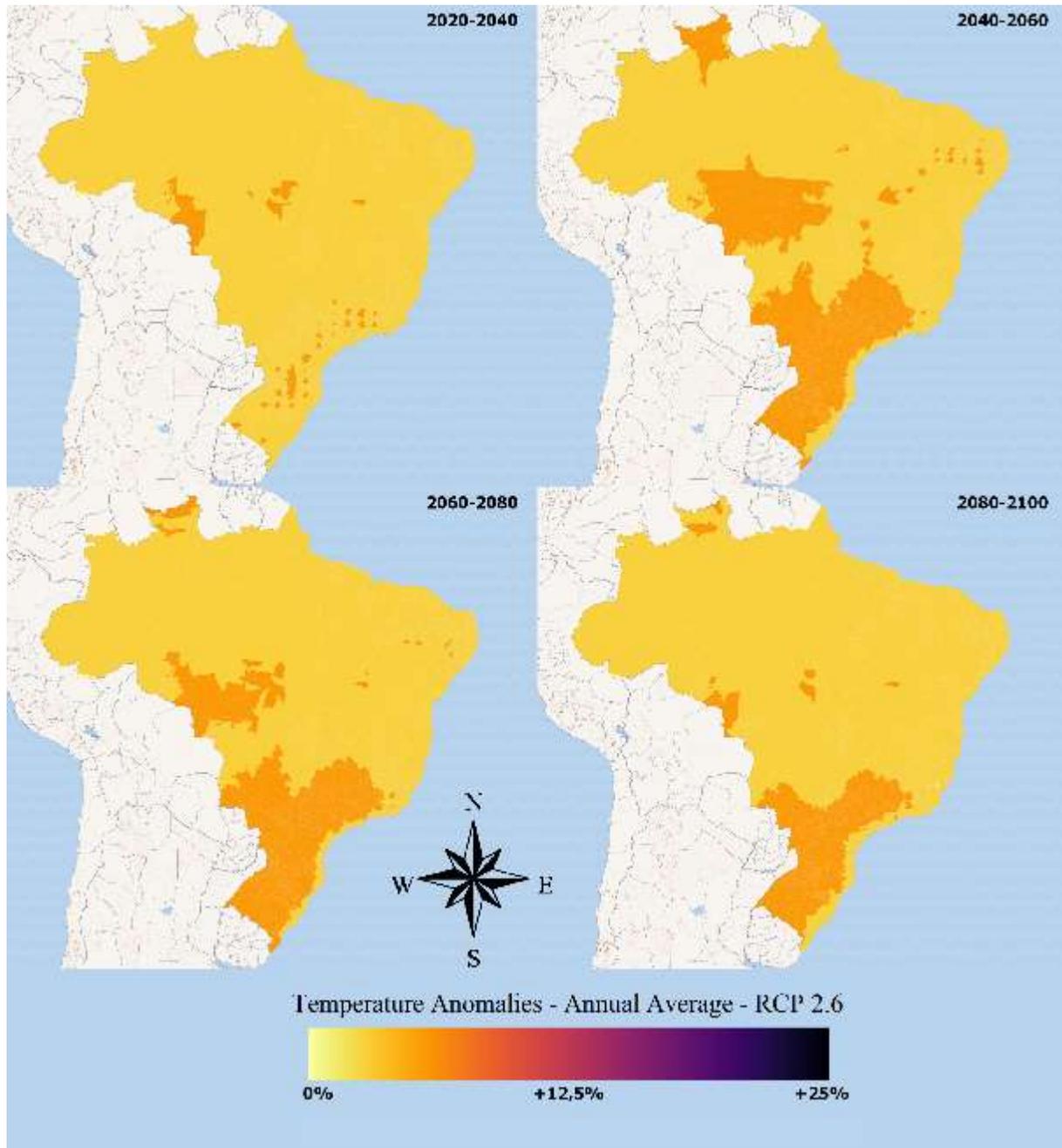


Figure 22 – Annual Temperature Anomaly – RCP 2.6.

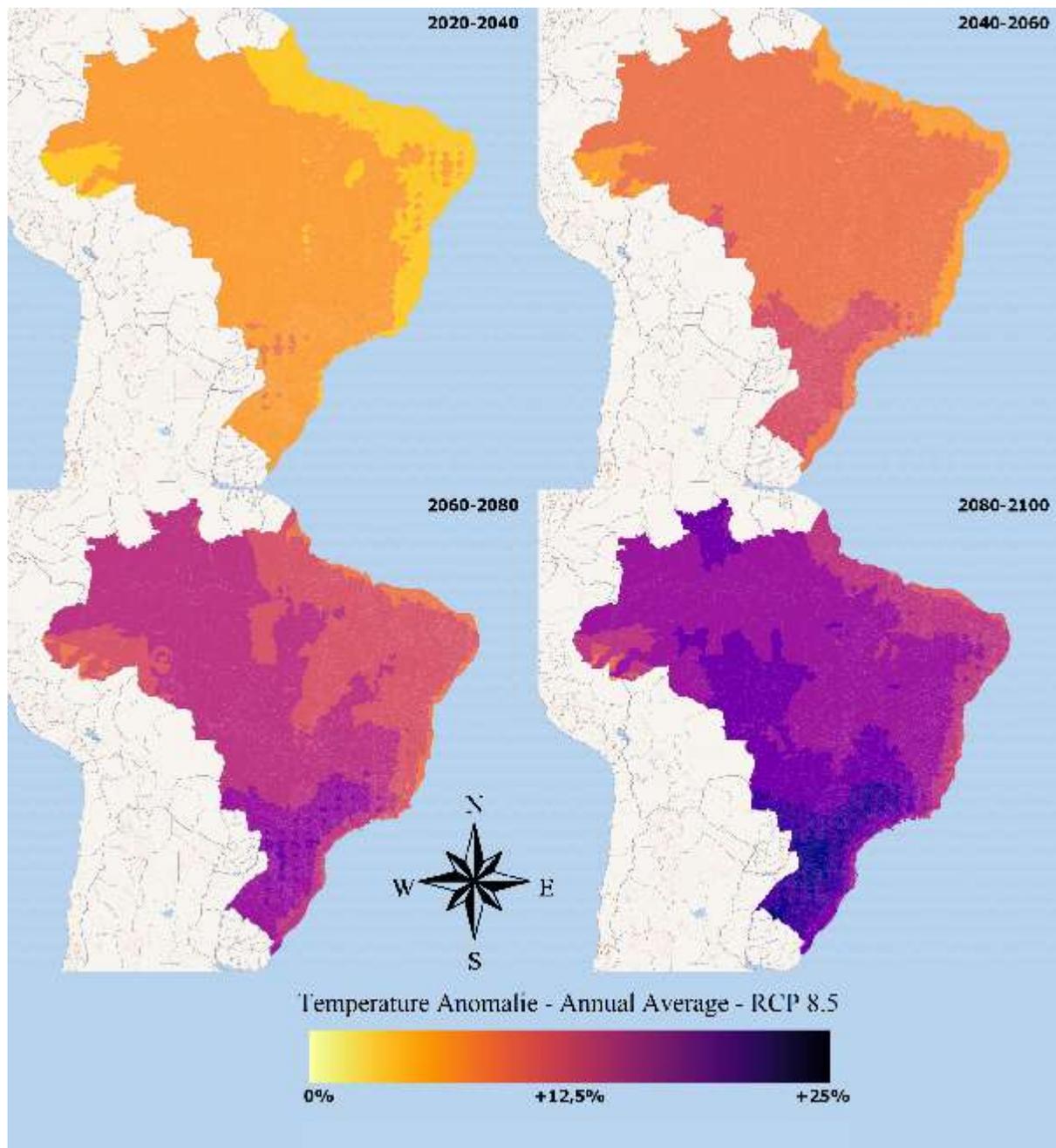


Figure 23 – Annual Temperature Anomaly – RCP 8.5.

4.4 Computable General Equilibrium

The B-MARIA 27 is a computable general equilibrium model calibrated for the Brazilian economy in the year 2011. Its functional structure tries to capture the interdependence relations of the sectors and regions of Brazil and can be understood as a photograph of the Brazilian economy that year. The model is structurally divided into 27 regions (the states of the federation plus the federal district) and is composed of 68 sectors. The construction of its database makes use of the top-down approach, which uses national aggregated results to disaggregate information in the regional dimension.

In essence, the model has a representative consumer and investor by region, regional and federal government structure, and a single external sector that can be marketed to any domestic region. The model is calibrated for 2011 and assumes that the tax structure and national tariffs can be replicated for all regions of Brazil that same year.

From the point of view of production, each sector is able to produce a particular product using the composite good specification that considers that each good is manufactured using fixed combination of primary factors and intermediate goods. The factors used in B-MARIA are Capital, Land and Labor which, in turn, combine by means of a function of elasticity constant substitution to form the compound of primary goods. The intermediate inputs, which may have domestic and foreign origin, also combine with a constant substitution elasticity function to form the compound of intermediate inputs. Finally, intermediate inputs and primary factors combine through a Leontief function to generate firm output.

As is usual in this class of models, the unknown number of parameters exceeds the number of equations to identify them. Thus, it is necessary to use the short and long-term closure approaches that allow the variation of some variables of the

model to be locked in order to allow it to become exactly identified. The short and long-term closure structure of the model is analogous to that used in the usual computable general equilibrium models: real wages and capital stock are considered exogenous in the short term and endogenous in the long run. Employment and return on capital are endogenous in the short run and exogenous in the long run. In addition, the model has a migration module, which allows capturing the effect of different exogenous shocks in the economy for the migration of people between the regions of the model. However, such migration is only possible in the long term.

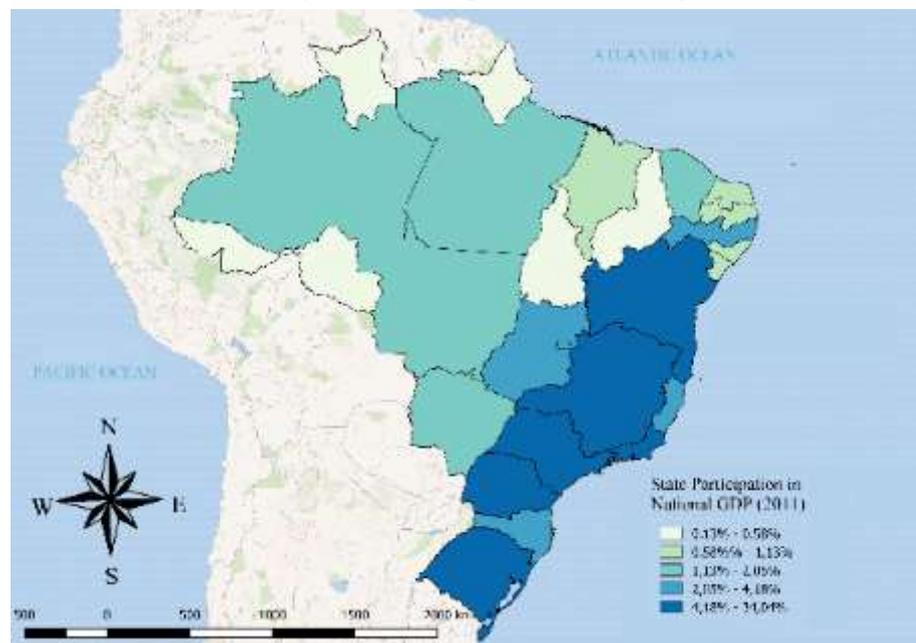


Figure 24 – State Participation in the Brazilian GDP – 2011.

Figure 9 shows part of this relation, indicating the proportion of the Gross Regional Product (PRB) of the Brazilian states in relation to the GDP of the country in 2011. The image shows the vast regional heterogeneity in the productive structure of Brazil, besides the preponderance of the axis South-Southeast in the Brazilian economy. In this sense, São Paulo accounted for about 35% of national production in 2011, while Acre accounted for only 0.16% of all that was produced in Brazil in the same year.

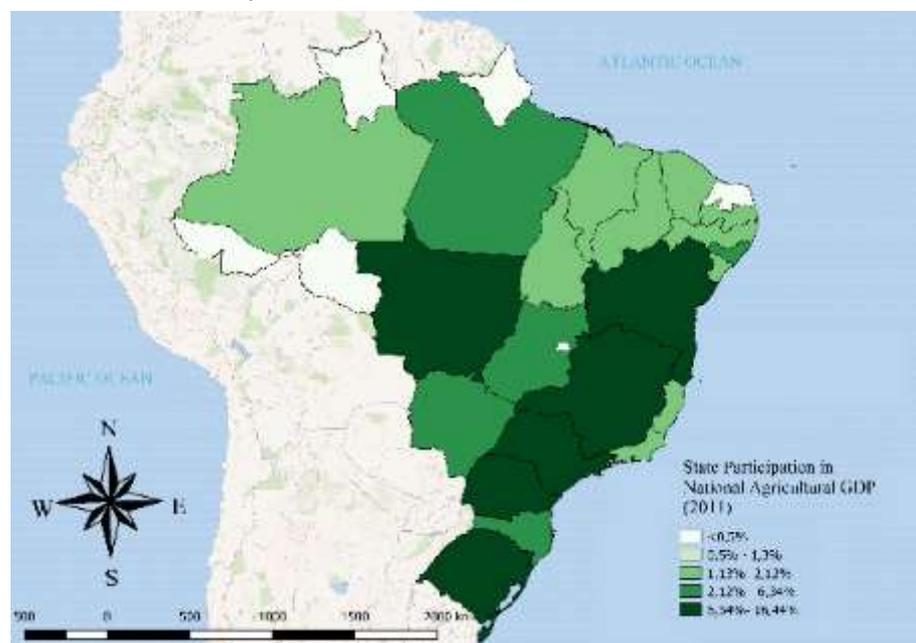


Figure 25 – State Participation in Brazilian Agricultural GDP – 2011.

Figure 10, in turn, shows the relative importance of each Brazilian state in the formation of the GDP of the country's agricultural sector. Here again, there is a regional heterogeneity in the productive structure of the country, but with a similar pattern in the concentration between the Brazilian regions, with an increase in the importance of the Central-West region. Again, São Paulo stands out, being responsible for about 16% of national agricultural production in 2011, followed by Minas Gerais, Paraná and Mato Grosso, responsible for 12.5%, 11.6% and 11.1%, respectively. At the other end, the states with the lowest relative importance in the national agricultural production are Rondônia, Acre, Roraima and Amapá, responsible for 0.35%, 0.24%, 0.05% and 0.04% respectively.

Finally, figure 11 shows the relative importance of the agricultural sector in the GDP of the states. Here again, the regional heterogeneity of such a measure is shown throughout the Brazilian regions. In this sense, the state of Mato Grosso is the one that depends most on agriculture in its productive structure (almost 18% of Mato Grosso's production in 2011 came from agriculture), followed by Alagoas (9.44%), Mato Grosso do Sul (8.95%) and Tocantins (6.5%). In the other direction, Rio de Janeiro, Federal District, Amapá and Roraima are the least dependent less on agriculture for the composition of their GDP in 2011 (with 0.18%, 0.36%, 0.63% and 1, 14%, respectively).

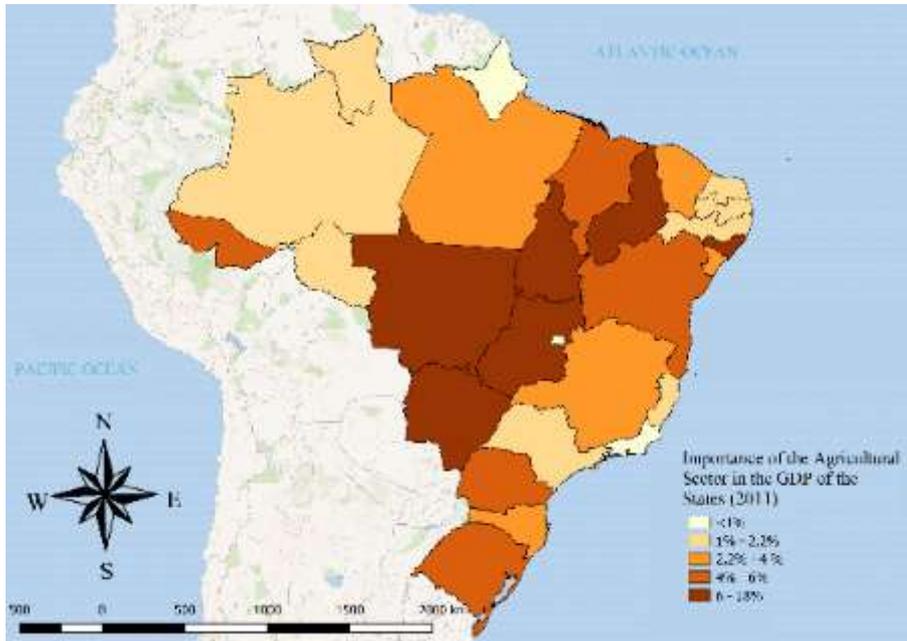


Figure 26 – Agricultural Sector Participation in the GDP of the States – 2011.

5. RESULTS

“Their cumulative effect is certainly considerable, and yet each one of them is quite possible in itself.”

Sherlock Holmes and Dr. Watson.

The Adventure of Abbey Grange

This chapter is divided into 5 subsections. The first presents the estimates of the econometric model described in section 2.1. The second uses such results to – with the help of the climatic projections described in section 3.3 – generate the projections of impact on the productivity of the crops studied. The third subsection presents the projections of direct impact that climate change will cause in the agricultural sector of the Brazilian states. The fourth subsection describes indirect impacts from the CGE model and the last subsection proposes a methodology to address the uncertainty problem explicitly.

5.1 Econometric Model

We now estimate equation (2) using the variation of climatic Anomalies for the Brazilian municipalities as an explanatory variable to the productivity differentials of the studied crops. The vector W_{cit} contains the available variables related to the municipal climatic conditions: compensated average temperature anomaly and cumulative precipitation anomaly in the month. For each year considered (1994 to 2015), monthly anomalies (January to December) were used as control variables. Following Mendelsohn et. Al. (1994), the quadratic specification for such anomaly variables was used in order to capture any non-linearities in the relationship between climate and productivity.

Thus, a municipal panel of 21 years was constructed for each of the six cultures studied. Equation 2 was thus estimated six times considering a series of specifications. For the purposes of this study, the final specification used follows Deschênes and Greenstone (2007), who use a panel of municipal fixed effects for their estimates. Thus, fixed effects of municipality were used in order to capture all the unobservable factors specific to each municipality that do not vary over time. Another possibility would be to include a fixed temporal effect that controls all the annual productivity differentials that are common to all municipalities. However, in the final specification, fixed state-year effects were used instead of fixed year effects to control for annual productivity differentials that are common to all municipalities within the same state. This, besides controlling for an important unobservable factor in determining municipal agricultural productivity (prices), the model identifies the parameter of interest θ by means of climatic anomalies observed in municipalities over time after controlling for shocks common to all municipalities within of a state⁴⁶. Control variables

46 Deschênes and Greenstone (2007) argue that such variation tends to be orthogonal to the unobservable determinants of agricultural production, providing a potential solution to alleviate the problem of bias of variable omitted.

(described in appendix 8.2) were also used, and all estimates used clusters at the state level and were weighted by the square root of the area planted in each crop⁴⁷. The results for each culture studied are presented in the appendix.

5.2 Impact Projection

With the estimates in hand, it is possible to combine them with the projections described in section 3.3 to generate predictions of impact on the productivity of the analyzed crops. The analysis of such impacts on crops reflects, to a large extent, the behavior of the climate scenarios considered and described in section 3.3: they present similar trajectories until the middle of the century but depart from 2050 with a deep aggravation under the scenario RCP 8.5 and a nearly constant path in RCP 2.6. In this way, all cultures will have different trajectories depending on the scenario considered.

Under RCP 2.6 the projected rates of change in productivity are nearly constant around zero in all crops. However, under RCP 8.5, the worsening of productive losses is evident in all crops studied. Beans, corn and soybeans show less significant annual losses, culminating in an annual production loss of approximately 16%, 22% and 30% at the end of the century, respectively. Sugarcane, Orange and Coffee, on the other hand, presented more severe loss trajectories in the house of 33%, 34% and 50%, respectively, until the end of the century.

Figures 12 to 17 show the predicted variations for the productivity of each of the crops studied between 2020 and 2100 for the two scenarios analyzed⁴⁸. In addition, consider the possibility of increasing their productivity through some kind of technical progress. To this end, each culture has an annual rate of specific technical progress accumulated over time. To estimate this rate, the average growth of the average yield of each crop in Brazil was used. Table 9 computes these averages for a series of periods from the data provided by PAM.

Table 9- Average Growth of the Productivity of the Cultures Analyzed.

Culture/Period	1974-2016	1990-2016	2000 - 2016	2011-2016
Sugarcane	1.20%	0.75%	0.62%	0.41%
Soybean	2.37%	1.94%	1.67%	0.15%
Maize	3.21%	3.46%	3.43%	0.54%
Bean	2.11%	3.27%	2.52%	1.69%
Coffee	3.94%	2.98%	1.55%	2.29%
Orange	-0.20%	-1.09%	1.71%	1.95%

For the figures below, it was considered that between 2020 and 2100 each of the crops studied will have annual technical progress rate referring to the values of the period 2011-2016.

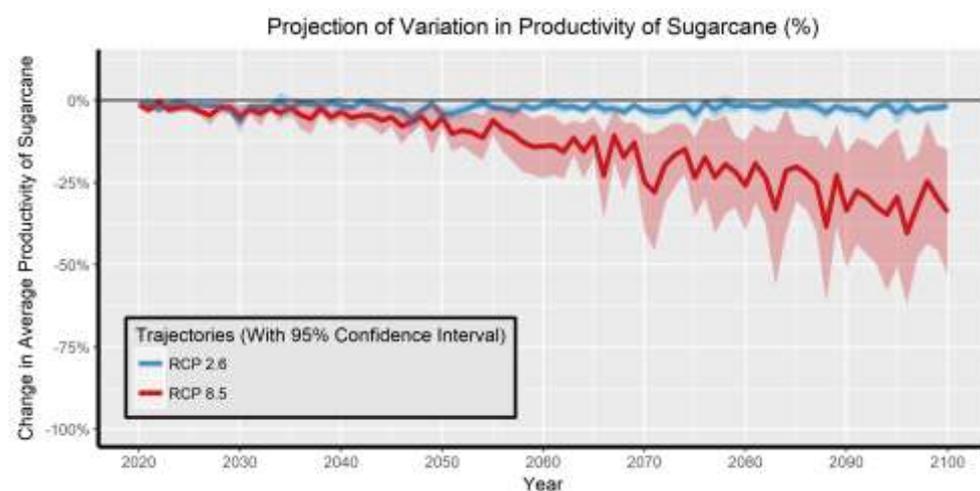


Figure 27 – Projection of Sugarcane Productivity Trajectory.

Sugarcane has a predicted productivity decrease in both scenarios. As is to be expected, however, RCP 8.5 leads to more drastic drops in average productivity, and from the 2070s onwards, sugarcane productivity would have more dramatically, even with the annual productivity growth rate of 0.41%.

47 Again, Deschênes and Greenstone (2007) argue that there are two main reasons for using weights in this context: the first is that the estimates of production and value produced tend to be more accurate in relation to cities that have a small operation of the crop in question. In addition, such weights correct for heteroskedasticity associated with differences in accuracy in such measures. Second, the weighted average of the dependent variable is equal to the mean value of this variable at the national level.

48 It is worth remembering that such trajectories are constructed from the weighted average of the trajectories of each of the Brazilian municipalities. The weight of each municipality for the calculation of this average is calculated considering the weight of the municipality in the total of the value produced by it within the country in the respective crop (again, considering the average value produced between 2010 and 2015).

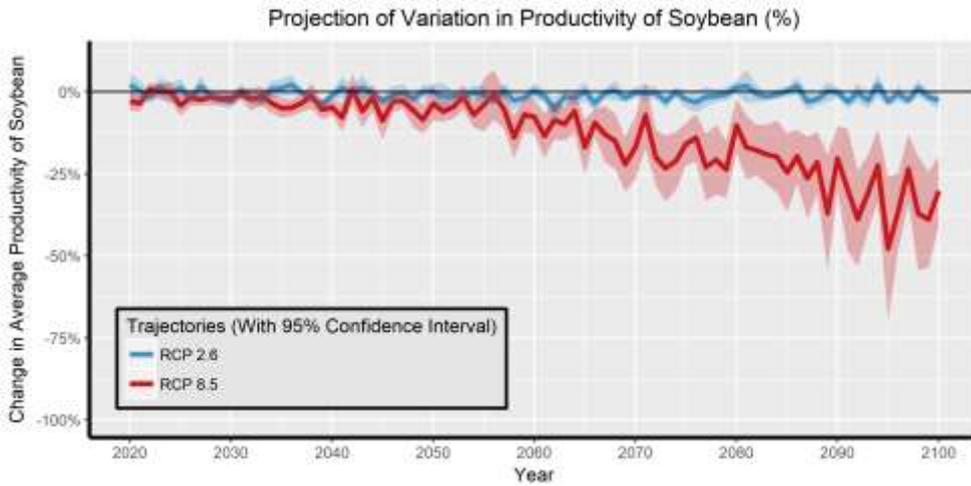


Figure 28 - Projection of Soybean Productivity Trajectory.

Soybeans, on the other hand, have constant trajectory under RCP 2.6 with annual technical progress of 0.15% per year. Under RCP 8.5, however, it is estimated that by the 1970s the average yield of soybeans in Brazil will start to fall more intensely, with almost 50% of productivity loss by the last decade of the century.

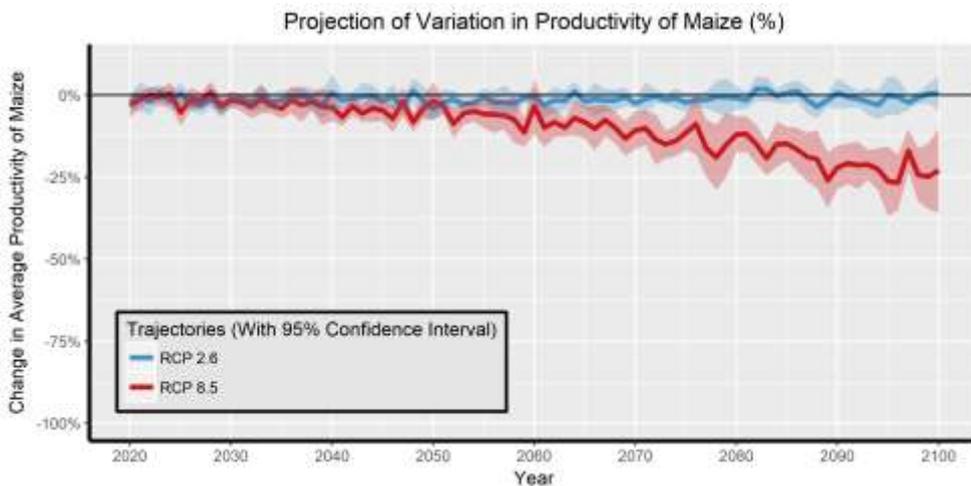


Figure 29 – Projection of Maize Productivity Trajectory.

Figure 12 shows the maize productivity variation trajectory. Again, under RCP 2.6 is expected an average variation around zero, but in the RCP 8.5 scenario the loss in productivity might reach 25%.

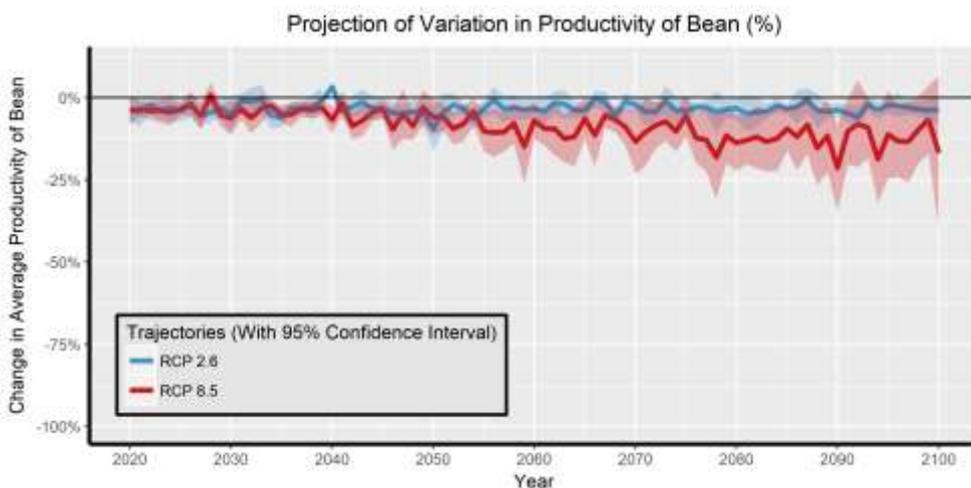


Figure 30 – Projection of Bean Productivity Trajectory.

Figures 13, 14 and 15 show a pretty similar pattern described above: not significant variation rates at RCP 2.6, and huge losses under RCP 8.5. The difference about coffee, bean and orange is that, under the more pessimistic scenario, the uncertainties are higher, leading to rates of productivity loss statistically non-different of zero.

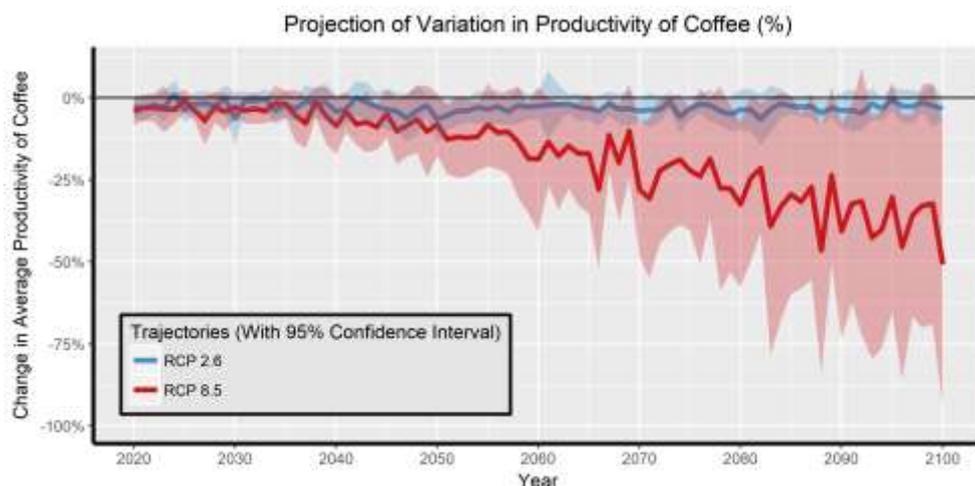


Figure 31 – Projection of the Productivity Trajectory of Coffee.

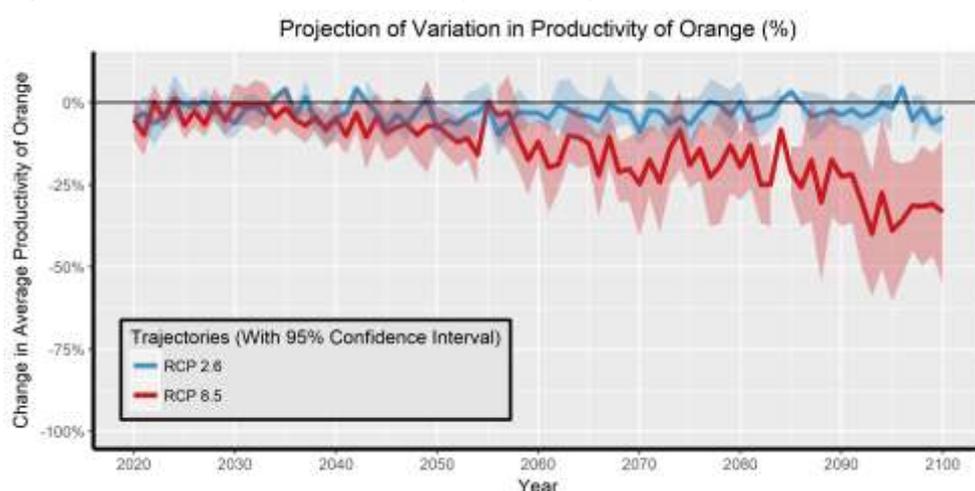


Figure 32 – Projection of the Productivity Trajectory of Orange.

5.3 Direct Impacts of Climate Changes on Present Value

This section presents estimates of the direct economic impacts of projected climate change by the end of the century. Table 30⁴⁹ in the appendix show the impacts of climate change described in section 5.2. Its total average impacts correspond to losses of R\$ 646.9 billion in current values (around 9.7% of Brazilian GDP 2017) under RCP 2.6 and R\$ 3.7 trillion (around 55.6% of the Brazilian GDP 2017) under RCP 8.5.

The most significant losses are concentrated on domestic production of sugarcane (R\$ 163.46 billion), beans (R\$ 154.2 billion) and corn (R \$ 148.8 billion) under RCP 2.6. Under RCP 8.5, the losses of maize (R\$ 1.01 trillion), sugarcane (R \$ 975.6 billion) and soybean (840.8 billion) stand out. As a basis for comparison, the value of total agricultural production in Brazil was R\$ 317.5 billion in that year. Considering only the crops studied, this value was R\$ 233.65 billion.

This implies that the direct losses due to the climatic changes in the six crops studied in this study are equivalent, in present value, to accumulated losses of about 277% of the national agricultural production under RCP 2.6. Under RCP 8.5, such losses are equivalent to stopping the country's agriculture for more than 11 years.

Under the regional aspect, the states facing the most significant losses are São Paulo, Minas Gerais and Paraná, responsible for 20.8%, 16.4% and 13.7% of losses under RCP 2.6, respectively. Under RCP 8.5, São Paulo's share of total losses jumps to 27.8%, while Paraná and Minas Gerais account for 14.1% and 13.4% of losses, respectively.

However, in order to assess the vulnerability of each state to these impacts, a vulnerability index was used that considers the direct impact of climate change on the state s (DI_s) by the weight of the total agricultural GDP of that state

Thus, the greater the importance of agriculture within a given state, the greater its vulnerability to the direct effects of climate change on its agriculture. Table 10 presents the state results under the two scenarios studied and indicates that, under both scenarios studied, the state of Mato Grosso is the most vulnerable, followed by Mato Grosso do Sul, Minas Gerais, Paraná and Goiás.

49 For calculations, discount rates of 0.1%, 1% and 3% were considered under the RCP 2.6 and 8.5 scenarios with specific technical progress. Table 30 shows only the estimates using the average discount rate (1,36% per year). All figures are in R\$ 2018.

$$VI_s^{direct} = \frac{\frac{DI_s}{\sum_{s=1}^{27} DI_s}}{\frac{GDP_s^{agriculture}}{\sum_{s=1}^{27} GDP_s^{agriculture}}}$$

In an economy without regional differentials of any order, one would expect such an index around one, so that the direct impact of the state would be proportional to its importance within the national economy. However, Table 10 shows that, at least in terms of vulnerability, the Brazilian economy is quite heterogeneous. The importance of the direct impact of the importance of the national GDP is more than 5 times higher in the states of Mato Grosso and Mato Grosso do Sul in both scenarios. On the other hand, such importance is more than 95% lower in states whose importance in the agricultural sector is low (Amazonas, Amapá and Rio de Janeiro, for example).

However, to assess the indirect impact that such direct losses will generate on the Brazilian economy, the next section draws on the framework provided by the computable general equilibrium models.

Table 10 - - Vulnerability Index

State	Importance of Agriculture in State Production	GDP	RCP 2.6		RCP 8.5	
			Direct Impact	VI_s^{direct}	Direct Impact	VI_s^{direct}
AC	10,77%	R\$ 12,265.80	-R\$ 215.26	0.51	-R\$ 658.89	0.27
AL	10,61%	R\$ 48,201.94	-R\$ 4,105.17	2.49	-R\$ 24,393.42	2.59
AM	7,38%	R\$ 137,819.48	-R\$ 220.18	0.05	-R\$ 1,008.60	0.04
AP	2,33%	R\$ 12,673.71	-R\$ 7.71	0.02	-R\$ 34.15	0.01
BA	7,94%	R\$ 315,834.63	-R\$ 13,629.49	1.26	-R\$ 49,167.30	0.80
CE	5,21%	R\$ 133,063.41	-R\$ 966.55	0.21	-R\$ 3,818.74	0.15
DF	0,41%	R\$ 219,252.28	-R\$ 816.47	0.11	-R\$ 3,538.75	0.08
ES	3,44%	R\$ 156,574.39	-R\$ 4,994.50	0.93	-R\$ 21,540.29	0.70
GO	11,18%	R\$ 205,957.23	-R\$ 21,438.27	3.04	-R\$ 118,231.67	2.93
MA	10,80%	R\$ 77,134.38	-R\$ 4,251.94	1.61	-R\$ 19,963.57	1.32
MG	6,00%	R\$ 697,183.25	-R\$ 41,755.13	1.75	-R\$ 195,404.11	1.43
MS	17,73%	R\$ 93,872.65	-R\$ 15,714.92	4.90	-R\$ 95,490.25	5.20
MT	22,22%	R\$ 129,643.16	-R\$ 26,336.47	5.94	-R\$ 145,550.49	5.74
PA	11,53%	R\$ 146,040.06	-R\$ 1,657.69	0.33	-R\$ 6,522.94	0.23
PB	4,34%	R\$ 52,831.37	-R\$ 1,360.01	0.75	-R\$ 6,059.55	0.59
PE	3,74%	R\$ 165,684.55	-R\$ 2,996.67	0.53	-R\$ 14,281.11	0.44
PI	7,56%	R\$ 37,166.82	-R\$ 2,157.74	1.70	-R\$ 9,205.32	1.27
PR	9,50%	R\$ 482,612.22	-R\$ 34,870.16	2.11	-R\$ 205,638.30	2.18
RJ	0,49%	R\$ 811,783.63	-R\$ 301.66	0.01	-R\$ 2,391.28	0.02
RN	3,29%	R\$ 62,802.51	-R\$ 609.49	0.28	-R\$ 2,870.81	0.23
RO	12,18%	R\$ 42,932.54	-R\$ 1,295.80	0.88	-R\$ 6,992.19	0.83
RR	4,22%	R\$ 9,496.90	-R\$ 49.63	0.15	-R\$ 199.71	0.11
RS	8,75%	R\$ 493,046.47	-R\$ 11,846.85	0.70	-R\$ 69,680.76	0.72
SC	6,08%	R\$ 289,487.03	-R\$ 5,935.44	0.60	-R\$ 29,456.76	0.52
SE	5,25%	R\$ 43,258.81	-R\$ 1,217.95	0.82	-R\$ 4,682.33	0.55
SP	1,81%	R\$ 2,531,333.50	-R\$ 52,943.93	0.61	-R\$ 405,490.98	0.82
TO	12,92%	R\$ 27,330.17	-R\$ 2,565.20	2.74	-R\$ 12,258.87	2.29

5.4 Indirect Impacts of Climate Changes

This section presents the results concerning the indirect economic impacts of the effect of climate change on the productivity of the crops studied. For this, as described in section 4.4, it uses a computable general equilibrium model applied to Brazil. Here again, we used a simulation strategy that considers the two climatic scenarios studied to build the necessary productivity shocks in the B-MARIA functional structure.

Thus, in order to construct the necessary productivity shocks for the model, we considered the impact trajectories described in section 5.2 (considering the rate of specific technical progress per crop). For this, the difference between the current level of productivity⁵⁰ of each crop and its projected productivity level in 2100 for each scenario. Thus, the percentage difference in crop productivity h, in city i, between the present and the end of the century will be given by:

$$\Delta prod_i^h = \frac{prod_{i,actual}^h - \widehat{prod}_{i,2100}^h}{prod_{i,actual}^h}$$

Where $prod_{i,actual}^h$ represents the current level of productivity of culture h, in city i today and $\widehat{prod}_{i,2100}^h$ the projected productivity level at the end of the century. However, since the B-MARIA model is built at the state level of disaggregation, it is necessary to aggregate the municipal data appropriately. Thus, for each municipality i within a given state S, we have:

⁵⁰ All estimates consider the current productivity level to be the average productivity of each Brazilian municipality between 2011 and 2015. Once the projected climatic projections begin in 2020, the 2011-2015 average is considered as the initial productivity level in 2020.

$$\Delta prod_S^h = \sum_{i \in S} w_i^h * \Delta prod_i^h$$

Where w_i^h represents the weight of municipality i in the total that the state S produces from culture h . Finally, given that the sectoral breakdown of the model considers only one large sector of agriculture (without product breakdown), the weight of each crop h must be considered within the total produced by the agriculture of each state S :

$$shock_S^h = p_S^h * \Delta prod_S^h$$

Where $shock_S^h$ is the productivity shock with respect to culture h in the state S and p_S^h is the importance of crop h within state S agriculture (described in table 16). Finally, consider $H = \{Cana, Soja, Milho, Feijão, Café, Laranja\}$. The state productivity shock that will be introduced in the B-MARIA structure will be given by:

$$final_shock_S = \sum_{h \in H} shock_S^h$$

Its analysis allows us to understand three different dimensions: first, the impact of the relationship between the projected change in the climate and the productivity of each crop studied. Second, how important is this impact to the agricultural sector of each state. Finally, to what extent do the scenarios differ in the two previous dimensions.

The sugarcane under RCP 2.6 presents vast heterogeneity in their shocks. Alagoas and São Paulo are the main affected states, with losses of 54.9% and 43.3%, respectively. Such magnitude is, to a large extent, influenced by the importance of culture within the agricultural sector of each state (90% in Alagoas and 60.8% in São Paulo). Under RCP 8.5 the regional pattern is the same, with only one change in magnitude of shocks.

Soybean, in turn, is the culture that presents the biggest difference between the scenarios. The culture presents a productivity gain situation under RCP 2.6 and loss under RCP 8.5. In the first case, such gain is driven by the high rate of technical progress used for the crop at the confluence with a low impact of projected climate changes under this scenario. In the second case, however, the more pronounced climate changes lead to more expressive productivity losses.

The corn, beans and coffee grains, because they are less representative crops within the states, have a less expressive magnitude of shocks in both states. The major coffee losses in Minas Gerais (shock of 29.9% in RCP 2.6 and 28.6% in RCP 8.5) are noteworthy. Orange is the crop with the least impact in both scenarios largely because of its little importance within the agricultural sector of all states.

In order to these shocks be introduced into the B-MARIA simulation structure, it was necessary to distribute them in a homogeneous way over time. Such a transformation is necessary so that these can be simulated under the long-term closure of the model, described below. In other words, it is assumed that such shocks are evenly distributed throughout the century in periods of 5 in 5 years. Thus, table 11 presents the final shocks on each state that will be introduced in the structure of the B-MARIA model in order to evaluate the indirect impacts of climate change on the Brazilian economy. Their analysis is quite clear: on average, the impacts under RCP 8.5 are much more intense than in RCP 2.6.

To conduct simulations in the B-MARIA model, long-term closure will be used, which assumes that the level of real wages, regional GDP and capital investment are endogenous while the level of employment and technology are exogenous. The productivity shocks described in table 11 will be implemented in the model structure through the parameter $a1prim$, which refers to the factor of technological increase of the primary factors (capital, labor and land). In other words, the introduction of productivity shocks into the functional structure of the model assumes that the primary factors of the agricultural sector in each of the Brazilian regions will lose efficiency following the same magnitude described in the table above.

Simulations will be conducted using the long-term closure. The choice of a particular closure reflects two different dimensions: the first is associated with the idea of the time scale of the simulation, which is the period of time that is necessary for the economic variables to adjust to a new equilibrium. The time scale hypothesis affects the way market factors are modeled. For example, in a long run simulation the possibility of variation in the stock of fixed capital of the economy is generally considered. The idea is that the capital stock takes some time⁵¹ to settle in the economy after some exogenous shock.

The second dimension for choosing a particular closure concerns the needs of a particular simulation and the researcher's view of the variables that the model does not explain. For example, B-MARIA says little or nothing about the effect of climate change on agricultural productivity. Thus, by considering the productivity of the agricultural sector as something exogenous to the model (and therefore not explained by it), it becomes possible to establish such a relation in a module outside the model (section 5.2) and to use the framework provided by it measure the indirect effect that such a change may have on the economic system.

In essence, the main differences between a short and long-term closure in the B-MARIA functional:

- Capital inventories can adjust freely to ensure fixed rates of return across sectors.
- The aggregate level of employment remains constant and what is adjusted are real wages. This is consistent with the idea that, in the long term, both the labor force and the natural rate of unemployment are determined by mechanisms exogenous to the model.

⁵¹ Horridge (2006) argues that to be considered short-term, a given simulation should generally consider the time horizon of 1 to 3 years.

- Government and consumer spending move together to accommodate the constraint that the balance of payments importance relative to GDP is constant. This idea is guided by the hypothesis that, in the long term, the rest of the world may be reluctant to finance a growing deficit.

Moreover, the model also does not provide any mechanism to explain the absolute price level, which determines, in a discretionary manner, what changes in the real exchange rate manifests or how changes in the domestic price level or change in the nominal exchange rate. Labor supply is also determined exogenously in the model so that the average (real or nominal) wage or the level of employment is exogenous depending on the closure (in the case of the long term, the level of jobs considered exogenous). Finally, changes in the size and composition of the absorption level are also not explained by the model. This implies that either one of the components of the absorption or the level of the trade balance is considered to be considered exogenous in order to arrive at a balance in the model.

Table 11 – Final Shocks Among States.

State	Total RCP 2.6	Total RCP 8.5	Difference
AC	-0,006%	-0,103%	-0,098%
AL	-5,029%	-4,504%	0,525%
AM	-0,392%	-0,632%	-0,240%
AP	0,228%	-0,589%	-0,817%
BA	-0,493%	-2,344%	-1,851%
CE	-2,151%	-2,954%	-0,804%
DF	-0,629%	-4,996%	-4,367%
ES	-0,425%	-0,398%	0,026%
GO	1,164%	-7,761%	-8,925%
MA	-0,029%	-5,082%	-5,053%
MG	-3,190%	-6,700%	-3,510%
MS	-1,264%	-11,606%	-10,342%
MT	0,257%	-8,650%	-8,907%
PA	-0,137%	-1,310%	-1,174%
PB	-2,044%	-2,124%	-0,080%
PE	-2,403%	-2,233%	0,170%
PI	-0,138%	-7,787%	-7,649%
PR	-0,023%	-8,878%	-8,855%
RJ	-0,445%	-1,085%	-0,640%
RN	-1,096%	-1,149%	-0,052%
RO	-2,020%	-4,797%	-2,777%
RR	-0,427%	-0,687%	-0,260%
RS	0,409%	-4,283%	-4,691%
SC	0,003%	-3,533%	-3,536%
SE	-3,649%	-4,847%	-1,198%
SP	-4,530%	-6,546%	-2,017%
TO	-0,859%	-7,023%	-6,164%

Finally, Table 12 presents the indirect economic impacts from the agricultural productivity shocks mentioned above for each of the scenarios. As expected, the most dramatic impacts are under RCP 8.5. For the selected aggregate variables, it is estimated that the impact under the worst case scenario is, on average, 7.4 times larger than the RCP 2.6 scenario.

Table 12 - Indirect Impacts on some Economic Aggregates (in percentage points).

Aggregate	RCP 2.6	RCP 8.5	Difference
National Consumption	-0.22403	-1.03464	-0.81062
National Investment	-0.16377	-0.76967	-0.60589
Nominal Wage paid to Workers	-0.21991	-0.99615	-0.77625
National Employment Level	-0.00057	-0.01146	-0.01088
Equivalent Relative Variation	-0.43459	-1.82902	-1.39443
Nominal GDP	-0.18396	-0.85914	-0.67519
Real GDP	-0.05499	-0.26783	-0.21284
Exports	-0.02486	-0.27009	-0.24523
Imports	-0.16738	-0.79966	-0.63228
Terms of Trade	0.01243	0.13528	0.12285

In terms of aggregate consumption and investment, the cumulative five-year variation is -0.22% and -0.16% under RCP 2.6 and -1.03% and -0.77% under RCP 8.5. In both aggregates, the impact under the second scenario is 4.6 times greater than under the former. The nominal wage level of workers accumulates fall of -0,22% and -0,99% under RCP 2.6 and 8.5, respectively.

Well-being, measured by the equivalent variation of income, fell by 0.43% and 1.82%, respectively. Among all the analyzed aggregates, this is the one that presents the greatest divergence among the scenarios: the welfare loss under RCP 8.5 becomes 20 times greater compared to RCP 2.6.

In terms of production, the results point to real losses of 0.055% every five years (0.87% of GDP by the end of the century) under RCP 2.6 and 0.26% (4.11% of GDP to the end century) under RCP 8.5. Finally, the drop in imports is about 6.7 times larger than the drop in exports under RCP 2.6 and 3 times higher under RCP 8.5.

Table 13 shows the corresponding indirect impacts by state for consumption, number of people employed and regional GDP. In terms of household consumption. Under RCP 2.6, Alagoas reigns with the highest losses, accumulating five-year losses of 0.3%, 0.18% and 0.5% for consumption, employment and GDP, respectively. In terms of the number of people employed, there is a relative balance in the sign of the effect between the regions.

Under RCP 8.5, finally, losses are more geographically dispersed in terms of GDP, especially the average five-year loss rates of 1.29% in Mato Grosso and 1.21% in Alagoas.

Table 13 – Indirect Impacts Among Brazilian States (in percentage points).

State	Family Consumption		Employment		State GDP	
	RCP 2.6	RCP 8.5	RCP 2.6	RCP 8.5	RCP 2.6	RCP 8.5
AC	-0.076565	-0.36463	0.041374	0.1362	0.034944	-1.007384
AL	-0.305117	-0.372929	-0.187502	0.127897	-0.500181	-1.214288
AM	-0.070868	-0.298825	0.047022	0.202284	0.009153	-0.874859
AP	-0.097875	-0.444129	0.02	0.05633	-0.006074	-0.941607
BA	-0.084797	-0.369844	0.03312	0.130964	0.023355	-1.006608
CE	-0.158125	-0.531866	-0.040339	-0.031788	-0.139434	-1.064214
DF	-0.100759	-0.475324	0.017098	0.024992	-0.016773	-0.922589
ES	-0.067289	-0.258174	0.05073	0.243114	0.035756	-0.832507
GO	-0.063089	-0.554765	0.054811	-0.054775	0.127301	-1.143065
MA	-0.063303	-0.398871	0.054596	0.101797	0.059472	-0.946661
MG	-0.137173	-0.444188	-0.019363	0.056279	-0.156666	-0.959394
MS	-0.098471	-0.501619	0.019388	-0.001378	-0.039808	-1.157154
MT	-0.005713	-0.322009	0.112256	0.179062	0.21802	-1.290733
PA	-0.008794	-0.070104	0.109138	0.432109	0.127005	-0.760605
PB	-0.146388	-0.518565	-0.028577	-0.018438	-0.103621	-1.011689
PE	-0.179498	-0.547608	-0.061738	-0.047603	-0.138814	-1.051433
PI	-0.079813	-0.480286	0.038194	0.020032	0.042688	-1.076131
PR	-0.119696	-0.635394	-0.001864	-0.135768	0.008465	-1.13539
RJ	-0.128007	-0.522426	-0.010186	-0.022315	-0.040038	-0.951108
RN	-0.141935	-0.599182	-0.024122	-0.099433	-0.063976	-1.18799
RO	-0.140088	-0.604868	-0.022279	-0.105121	-0.089725	-1.059716
RR	-0.093343	-0.412871	0.02455	0.087728	-0.005862	-0.945334
RS	-0.071967	-0.502215	0.045927	-0.001999	0.062598	-1.044263
SC	-0.110844	-0.582369	0.006999	-0.082517	-0.01856	-1.037022
SE	-0.17186	-0.537006	-0.054091	-0.036948	-0.195338	-1.072268
SP	-0.145154	-0.637919	-0.027315	-0.138317	-0.116949	-1.061316
TO	-0.100761	-0.518676	0.01713	-0.018533	-0.038223	-1.05669

Table 14 presents the second indirect vulnerability index (analogous to that described in the previous section) for the Brazilian states. This index, which measures the relation between the weight of the indirect impact of the states in relation to the weight of the state in terms of the agricultural GDP of the country, denotes the extreme vulnerability of Alagoas under RCP 2.6 and the relative homogeneity of the states under RCP 8.5.

Table 14 – Indirect Vulnerability Index.

State	RCP 2.6	RCP 8.5
	$V I_s^{indirect}$	$V I_s^{indirect}$
AC	-0.63	0.98
AL	9.06	1.18
AM	-0.17	0.85
AP	0.11	0.91
BA	-0.42	0.98
CE	2.53	1.03
DF	0.30	0.90
ES	-0.65	0.81
GO	-2.31	1.11
MA	-1.08	0.92
MG	2.84	0.93
MS	0.72	1.12
MT	-3.95	1.25
PA	-2.30	0.74
PB	1.88	0.98
PE	2.52	1.02
PI	-0.77	1.05
PR	-0.15	1.10
RJ	0.73	0.92

RN	1.16	1.15
RO	1.63	1.03
RR	0.11	0.92
RS	-1.13	1.01
SC	0.34	1.01
SE	3.54	1.04
SP	2.12	1.03
TO	0.69	1.03

Finally, Table 30 in the appendix presents the direct, indirect and total impacts of climate change on Brazilian states translated into 2018 values. Under RCP 2.6, the indirect negative impacts under the Brazilian economy from climate change amount to R\$ 95,4 billion while under RCP 8.5 such impacts add up to losses of R \$ 1.78 trillion. In the most optimistic scenario, Mato Grosso, Rio Grande do Sul, Goiás and Pará add indirect gains of R \$ 24.1 billion, while São Paulo, Minas Gerais, Rio de Janeiro, Pernambuco and Alagoas accumulate losses of R \$ 112.7 billion. Under RCP 8.5, indirect losses are more extensive, with São Paulo (R \$ 624.5 billion), Rio de Janeiro (R \$ 179.5 billion) and Minas Gerais (R \$ 155.5 billion) being the states that accumulate the greater losses.

Thus, it can be concluded that the indirect effects of climate change on the Brazilian economy represent 12.9% of the total effect under RCP 2.6 and 32.5% under RCP 8.5. Finally, it is estimated that the total impacts on the Brazilian economy from projected climate changes by the end of the century amount to R \$ 742.3 billion (under RCP 2.6 and 5.48 trillion (81.8% of GDP in 2017) under RCP 8.5.

However, all of the aforementioned impacts (direct and indirect) carry a series of uncertainties inherent in the methodology used. Thus, the next section proposes methodology to deal with the degree of uncertainty about state productivity shocks explicitly.

5.5 Dealing with Uncertainties

Stern (2006) argues that the science of climate changes, while reliable, deals with a number of uncertainties. One cannot say with certainty when and where particular impact will occur. There are uncertainties that hamper the accurate quantification of the economic impacts of climate change.

The econometric model used integrates two sources of uncertainty in the construction of its database. The first one concerns the reliability of the agricultural database described in section 4.1. The second is related to the uncertainty regarding information provided by INMET stations (section 4.2) and to possible friction and measurement errors in their construction. The confluence of these two factors is still added to the uncertainty regarding the econometric model itself, which produces not necessarily accurate estimates (Table 18 to Table 29).

In addition, the climate projections generated by the IPCC models themselves have their degree of uncertainty, as described in section 4.3. Stern (2006) illustrate that such models reflect a cascade of uncertainties inherent in the scenarios considered: political uncertainties, emission levels, global mitigation actions, population growth, technological progress, among others. Although we have attempted to deal with some of these uncertainties in previous sections, a broad set of climate model parameters make climate projections have a high level of intrinsic uncertainty.

Then comes the uncertainties related to the direct impact projections described in section 5.4. These involve, initially, uncertainties regarding the intertemporal discount used to evaluate them, not to mention the hypotheses of constant prices and maintenance of the pattern of the productive structure of the agricultural sector throughout the century, implicit in the methodology used.

Concerning the construction of the productivity shocks of the CGE model, described in section 5.5, the uncertainties takes into account both the projected productivity trajectories in both scenarios (Figure 12 to Figure 17) and the specific technical progress rates of each culture.

Finally, the analysis of the indirect economic impacts of climate change, besides of accumulating all the uncertainties mentioned above, involves a series of hypotheses about the regional and sectoral productive structure of the Brazilian economy, represented by the interregional input-output system used to calibrate the B-MARIA⁵².

The confluence of all these uncertainties generates a well-documented "snowball" effect in the science of the economic impacts of climate change (STERN, 2006). To try to deal with this effect, this section proposes and formalizes methodology that treats this process explicitly. To implement such method, the potential connections of a physical model with the functional structure of the CGE model are explored.

For the case in question, the idea is to conduct simulations that mimic the behavior of a given set of endogenous B-MARIA variables. Thus, it is enough to replicate the desired information within the set of exogenous variables of the model and simulate their shocks in order to achieve the best combination of effects for their endogenous variables.

In other words, we will consider the long-term closure described in the previous section, use the results described above⁵³ and put them as target for the replicate CGE model. In order to do that, the idea is to calibrate the exogenous productivity shocks in the B-MARIA structure that will endogenously generate the aforementioned target results.

⁵² For more details, see Haddad, Gonçalves Júnior and Nascimento (2017).

⁵³ In our case, the endogenous variable that will be used as target will be the GDP of the states.

The CGE model in question is included in the class of models known as Johansen models, which obtains its solutions by solving a system of linearized equations⁵⁴. Thus, consider a certain set of B-MARIA equations:

$$F(V) = 0 \quad (3)$$

Where V represents an equilibrium vector of dimension n (number of variables) and F is a function vector of order m (number of equations), which is assumed to be differentiable. For the purpose of solution, it is assumed that $n > m$, while $n - m$ variables should be considered exogenous. In addition, it is assumed that the model has a solution, that is, $\exists V = V^*$ such that $F(V^*) = 0$ and that such solution is known (the CGE model is calibrated).

Thus, Johansen's approach is to use a linearized version of (5), which can be represented as:

$$A(V)v = 0 \quad (4)$$

Where $A(V)$ is an array of order $m \times n$ that contains the partial derivatives of $F(V)$ and v represents the percentage changes in the V vector. v represents the percentage changes in the V vector consists in evaluating $A(.)$ at an initial equilibrium vector V^I and solve (6). For this, it is necessary to partition $A(.)$ and v in two parts, separating the endogenous and exogenous variables from the closure of the model. Call α the index for the endogenous variables and β the index for the exogenous. It has been that:

$$A(V^I)v = A_\alpha(V^I)v_\alpha + A_\beta(V^I)v_\beta = 0$$

Rearranging:

$$v_\alpha = -A(V^I)^{-1}A_\beta(V^I)v_\beta$$

Take $-A(V^I)^{-1}A_\beta(V^I) = B(V^I)$ such that:

$$v_\alpha = B(V^I)v_\beta \quad (5)$$

Where v_α is a $m \times 1$ vector that contains the expected percentage changes in the endogenous variables resulting from the exogenous shocks contained in the vector v_β . Now consider (7) represented as follows:

$$\begin{bmatrix} v_{\alpha 1} \\ \dots \\ v_{\alpha m} \end{bmatrix} = \begin{bmatrix} B_{11} & \dots & B_{1(n-m)} \\ \dots & \dots & \dots \\ B_{m1} & \dots & B_{m(n-m)} \end{bmatrix} \begin{bmatrix} v_{\beta 1} \\ \dots \\ v_{\beta m} \end{bmatrix}$$

It can be rearranged such that:

$$\begin{bmatrix} v_{\alpha 1} \\ \dots \\ v_{\alpha m} \end{bmatrix} = \begin{bmatrix} B_{11} \\ \dots \\ B_{m1} \end{bmatrix} v_{\beta 1} + \begin{bmatrix} B_{12} \\ \dots \\ B_{m2} \end{bmatrix} v_{\beta 2} + \dots + \begin{bmatrix} B_{1(n-m)} \\ \dots \\ B_{m(n-m)} \end{bmatrix} v_{\beta(m-n)} \quad (7')$$

Equation (7') allows one to directly see two properties that will be employed. The first is that when considering a shock in a certain exogenous variable q ($v_{\beta q}$), the effect on the vector of endogenous variables v_α will be proportional to the vector that multiplies this variable in (7'). In addition, when assessing the effect of a multidimensional shock (as in the case in question, where we will assess shocks on the 27 states of the federation), the total impact on v_α can be computed as the sum of the effects of the shocks on the separate endogenous variables.

Then suppose that a subset of K -dimension of elements of v_α is selected as target. So, you build the vector $t_{(k \times 1)}$ that contains all of these targets. Also assume that a subset of order J of the vector is identified v_β which contains exogenous variables considered relevant to influence the variables in $t_{(k \times 1)}$. Now, just rewrite (7') by zeroing all the elements of v_α That are not contained in $t_{(k \times 1)}$ and all the elements of v_β that are not in the sub-set of order j above. Call it a \widehat{v}_α the vector of endogenous variables considered for analysis and \widehat{v}_β the exogenous vector is considered important to determine them.

Using the same notation as (7):

$$\widehat{v}_\alpha = \widehat{B}\widehat{v}_\beta \quad (6)$$

Or, even:

$$\begin{bmatrix} \widehat{v}_{\alpha 1} \\ \dots \\ \widehat{v}_{\alpha k} \end{bmatrix} = \begin{bmatrix} \widehat{B}_{11} \\ \dots \\ \widehat{B}_{k1} \end{bmatrix} \widehat{v}_{\beta 1} + \begin{bmatrix} \widehat{B}_{12} \\ \dots \\ \widehat{B}_{k2} \end{bmatrix} \widehat{v}_{\beta 2} + \dots + \begin{bmatrix} \widehat{B}_{1j} \\ \dots \\ \widehat{B}_{kj} \end{bmatrix} \widehat{v}_{\beta j}$$

In essence, it is noted that \widehat{v}_α It will depend on the choice of values for the exogenous variables contained in \widehat{v}_β . So, given the values of a target t The best choice for \widehat{v}_β will be the one who solves:

$$\min_{\widehat{v}_\beta} \frac{(\widehat{v}_\alpha - t)^2}{t^2} \quad (7)$$

Translating, the best choice for exogenous shocks \widehat{v}_β will be the one that minimizes the quadratic percentage distance of the values of the selected endogenous variables with the target Selected. Finally, the solution of the equation above, \widehat{v}_β^* , will generate a corresponding endogenous variable vector, \widehat{v}_α^* .

54 For more details, see Dixon and Parmenter (1996).

In order to apply such a methodology in the context of this work, one or more channels of transmission in the functional structure of the model CGE in order to capture the impact of interest from agricultural productivity shocks. Figure 18 schematics such channels and their respective effects that will be used as *targets* in the structure of model B-MARIA.

We will use as *target* the results on regional GDP from the simulations described in the previous section. In other words, the vector of *target* it will contain the GDP variations of the States constructed from the estimates obtained from the shocks described in the table 11 for each of the scenarios studied.

The shocks contained in \widehat{v}_β will relate to the 27 productivity shocks in the agricultural sector of Brazilian states, as described in the previous section. Thus, the equation (8) will represent a vector of 27 lines (one for each state) as the multiplication of an array of order 27 (the cross-effects of the variation of the productivity of each state on the GDP of these) and a vector of 27 lines (the shocks of agricultural productivity).

To implement the method, however, an estimate is required for matrix B. To obtain it, just perform a simulation of the impact of a unit shock of agricultural productivity set in the 27 states and capture the corresponding cross-elasticities of these on the regional GDP of the Brazilian federation units.

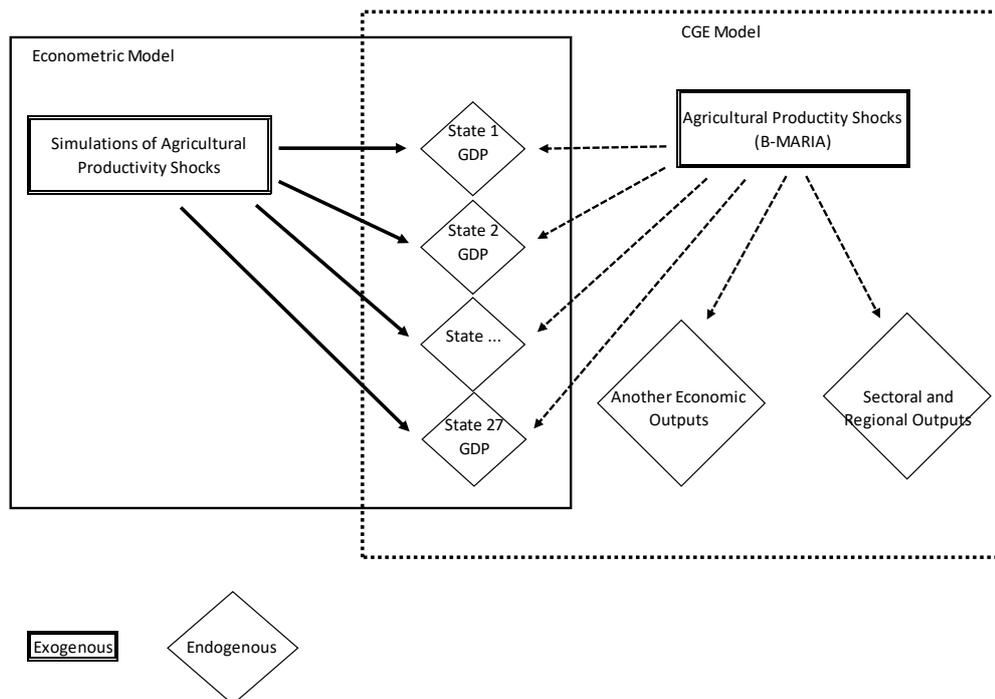


Figure 33 - Transmission Channels and the CGE Model.

Thus, given the intrinsic uncertainty in the magnitude of the agricultural productivity shocks of the states, such a method can be applied in order to integrate the results described between the sections 5.1 and 5.4 with the structure of the model B-MARIA and thus to treat the uncertainty in an explicit manner in the construction of the shocks of the agricultural productivity.

That way, we use it as *target* the impacts on the states GDP derived from the results of the simulations described in the previous section. The estimates built from the econometric model described in the section 3.1 are used as a starting point for simulations of exogenous shocks (\widehat{v}_β). For this work, we run 10000 simulations of productivity shock (\widehat{v}_β) in order to assess the one that minimizes (9).

Each simulation was built from a random draw to the state productivity shock from a Gaussian distribution with average equal to the shock described in the

Table 11 and variance calculated from the econometric estimates combined with the climatic projections described earlier.

Figure 19 shows the distribution of these simulations for each Brazilian state. Their analysis allows comparing both the magnitude and the difference of the agricultural productivity shocks between the scenarios. The comparison of the averages of the distributions of shocks of agricultural productivity allows to verify that these have smaller averages under RCP 8.5, according to what is expected in this scenario. When comparing the dispersion of these distributions, however, we can note a greater heterogeneity among the states. Roughly, Northeastern states have less variability of shocks under RCP 8.5 while states of other regions have greater dispersion under the most pessimistic scenario.

Figure 20, on the other hand, shows the effects on the state GDP \widehat{v}_α corresponding to each simulation of state agricultural productivity shock. Here, the analysis becomes more complex, with cases in which the distribution of impacts on the GDP of the states has average less worse under RCP 8.5 than RCP 2.6. However, the behavior on the dispersion of these shocks has the same pattern as those described in the previous image.

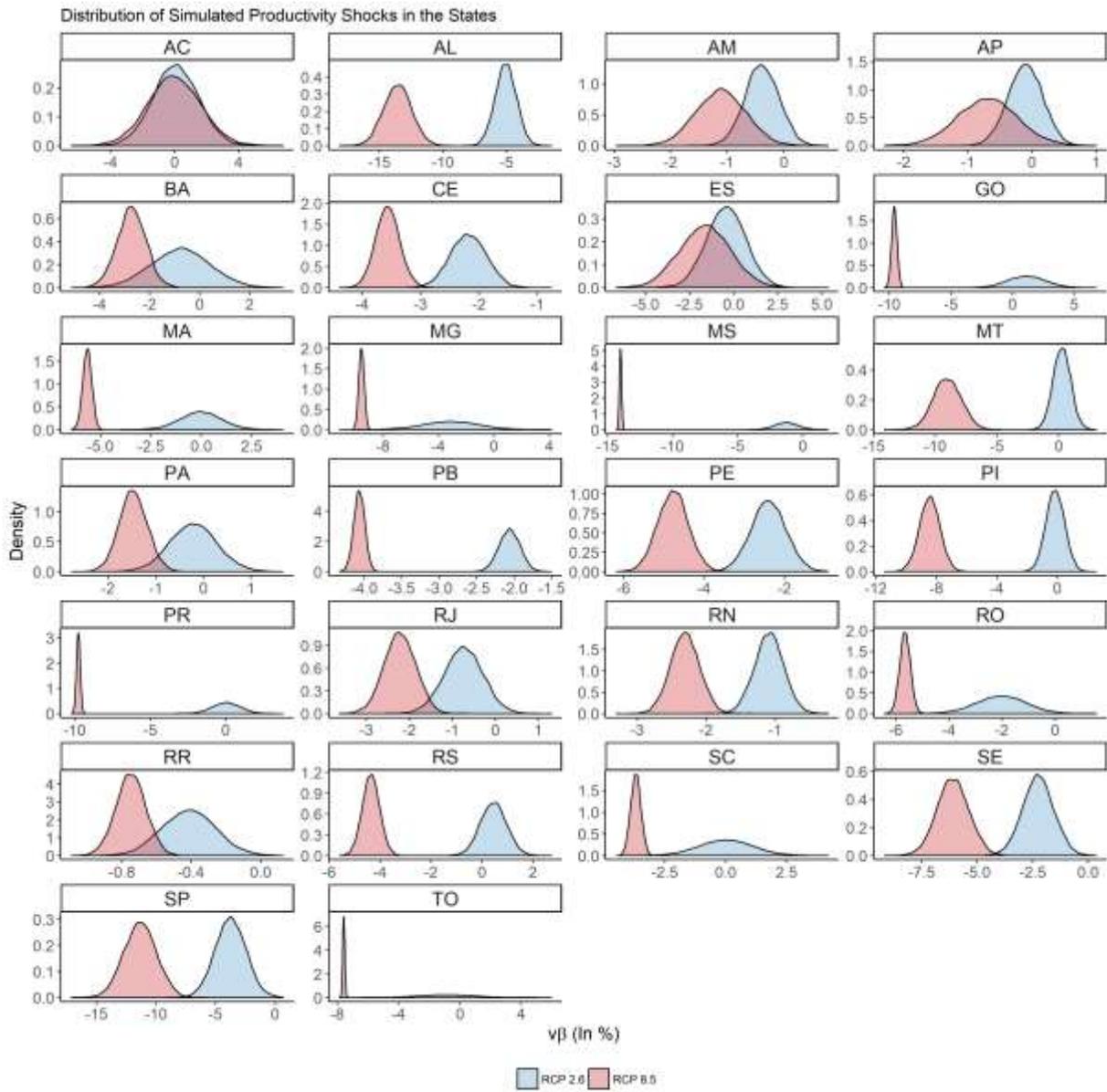


Figure 34 - Simulated Shocks Distributions.

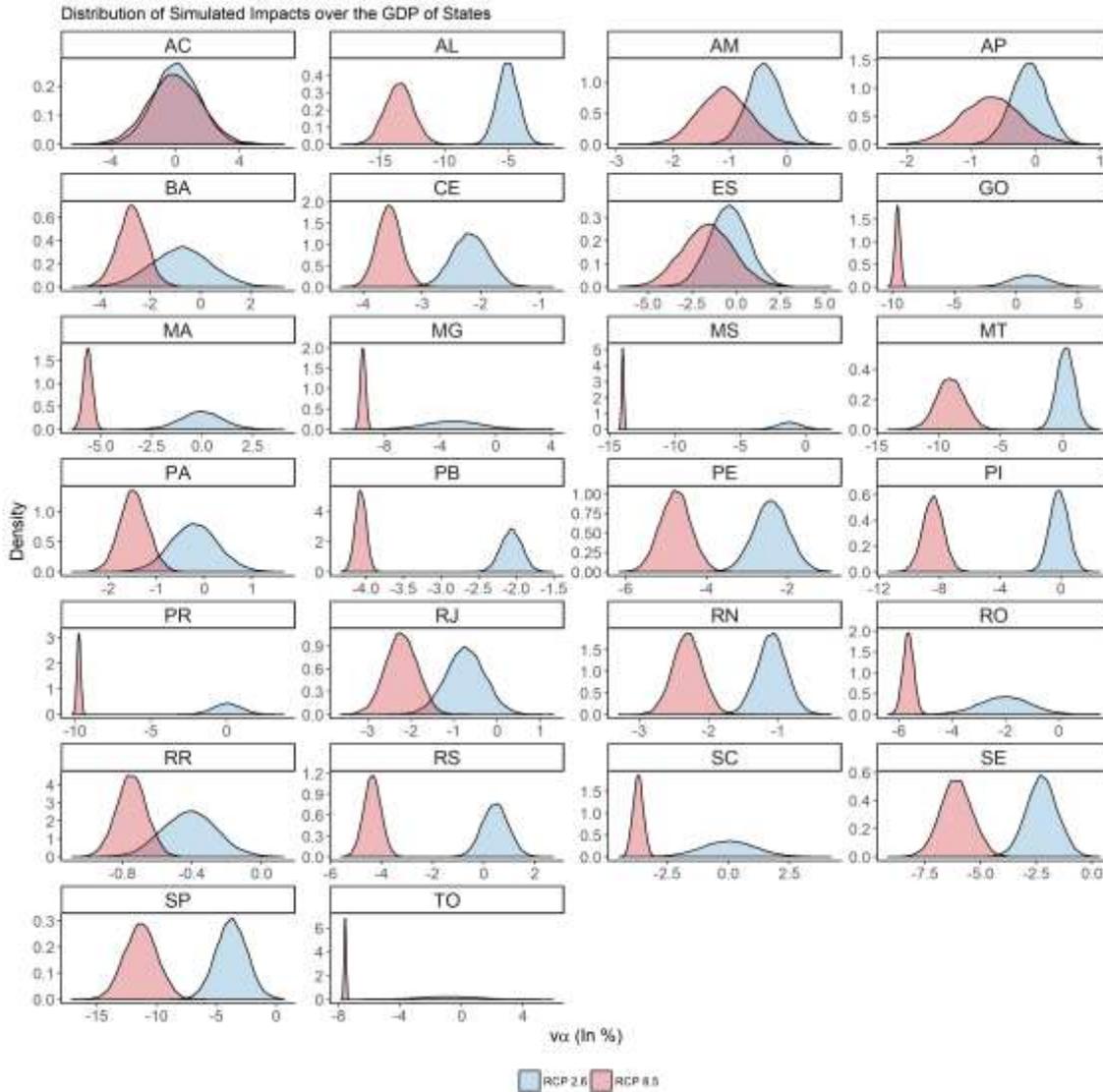
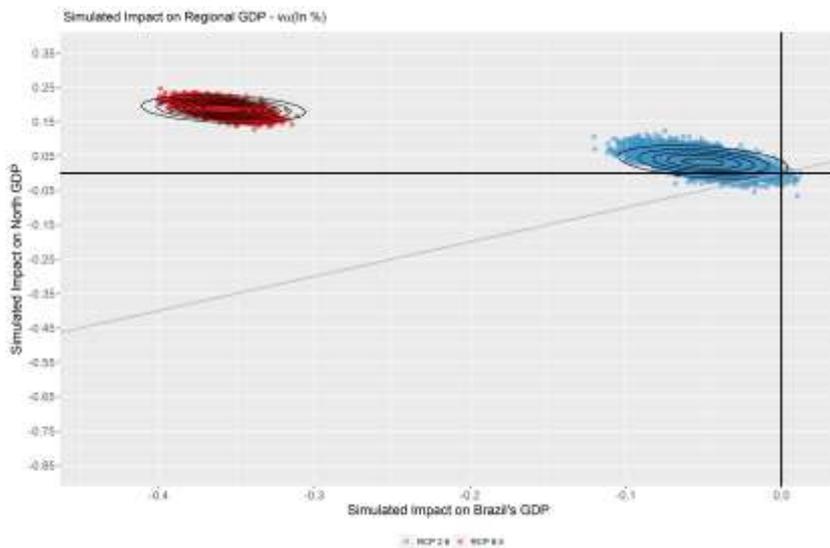


Figure 35 - Simulated Impacts over Regional GDP.

Figures 21 to 25 show the relation of the simulated impacts on the regional GDP of the five large Brazilian regions ($v\alpha$) in relation to the simulated impacts for the national GDP. The gray line represents the set of points in which such simulated variation is the same in regions and in the country.

The analysis of these images allows to infer that the effect of climate change on the GDP of the regions, besides being quite heterogeneous regionally, varies substantially depending on the scenario analyzed⁵⁵.



⁵⁵ Here again, the caveat: these impacts should be considered as the variation of average five-year production from the projected climatic changes until the end of the century.

Figure 36 - Simulated Impact on National GDP and PRB of Region North.

There are three possible dimensions to be analyzed through the images: the relationship between regional and national GDP in an isolated way, the same relation between the climatic scenarios studied, and the dispersion of these summarized impacts.

Under RCP 2.6, the relationship between regional impacts and national impacts shows a more homogeneous relation between the regions: Northeast and Southeast have modest losses (but higher than the national average) of the order of 0.15%, while North, South and Midwest show average production gains of 0.025%, 0.03% and 0.10%, respectively (better than the national average).

Under RCP 8.5, however, the effect is more complex: the North region has production gains, but little expressive in view of its small importance in the formation of national GDP (figure 21).

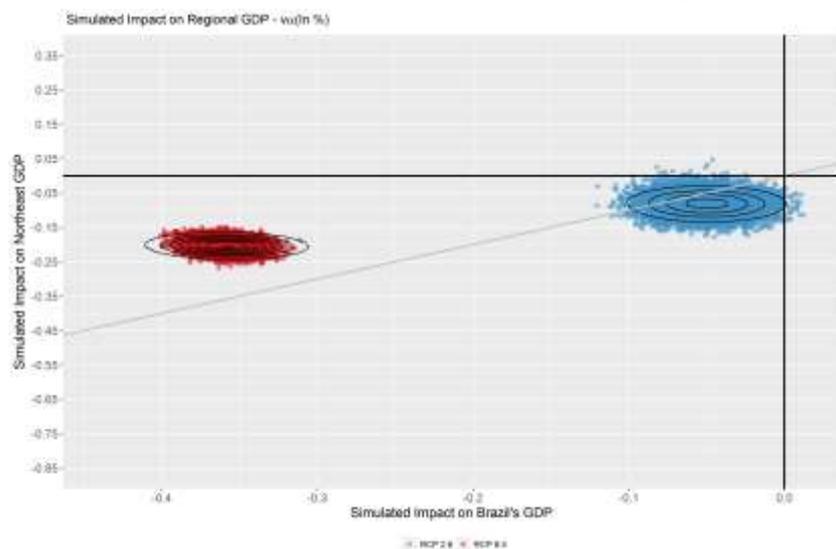


Figure 37 - Simulated Impact on National GDP and PRB of Region Northeast.

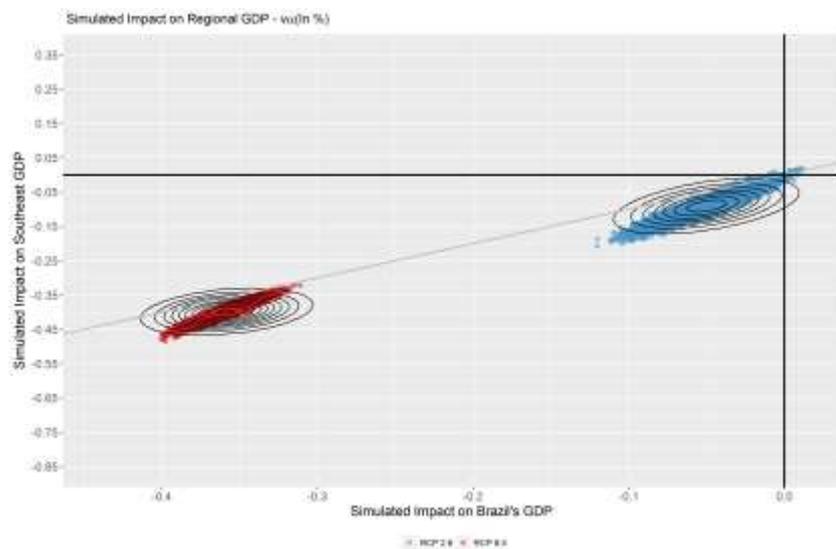


Figure 38 - Simulated Impact on National GDP and PRB of Region Southeast.

The Northeast region (figure 22), in turn, although presenting better performance than the national average (it is above the 45° gray line), presents average losses in the order of 0.2%. figure 23 shows this relationship for the Southeast region and shows that the region's impact relation to Brazil is inverted depending on the scenarios: although under RCP 2.6 the region is better than the national average, under RCP 8.5 Southeast is worse off, with simulated average impacts of around 0.45%. The southern region also presents a similar pattern to the one of the Southeast in what concerns the relation between scenarios with simulated dispersion slightly bigger.

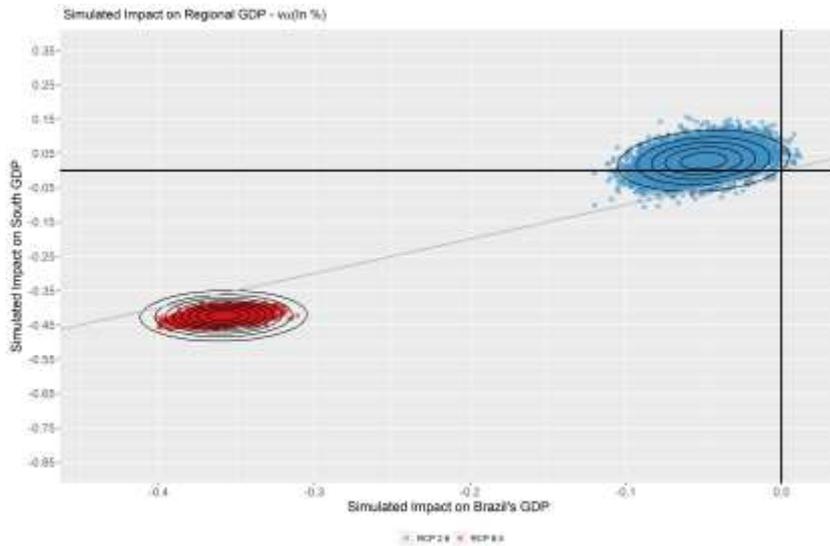


Figure 39 - Simulated Impact on National GDP and PRB of Region South.

Finally, the Center-West region is the one with the greatest dispersion of results in both scenarios. In addition, it is the one that shows more expressive losses in terms of PRB under RCP 8.5 (around 0.6%, on average), much due to its high dependence on the agricultural sector in its production.

In summary, the analysis of the above images sends a very clear message: the relative loss of the Northeast and Southeast regions compared to the rest of the country under RCP 2.6 and the relative gain of the North and Northeast regions under RCP 8.5. Two possible conjectures to explain this behavior are related to the intensity of climate change in the different scenarios and the structure of economic integration between regions: the indirect climate impacts under RCP 8.5 (much more intense than the optimistic scenario) are amplified due to the economic integration of the center-south of Brazil, making the losing regions precisely the most economically integrated.

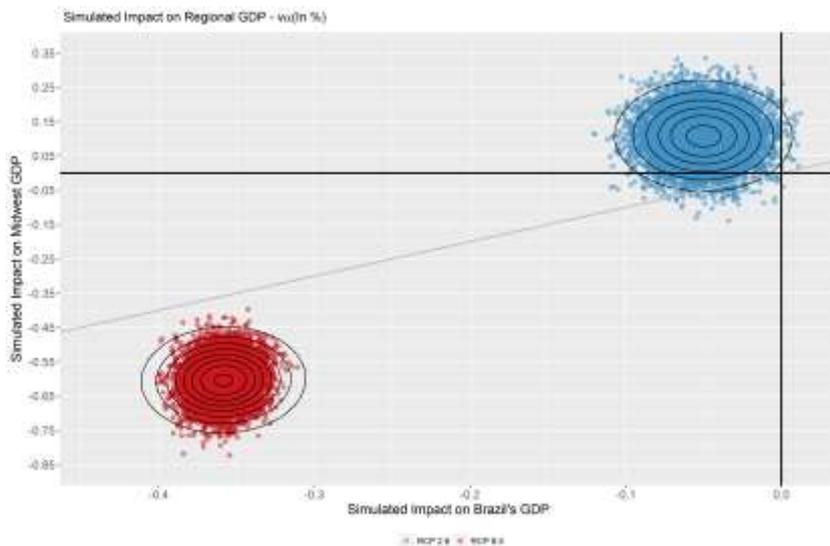


Figure 40 - Simulated Impact on National GDP and PRB of Region Midwest.

Finally, Figures 26 and 27 show the optimal simulated shocks (\widehat{v}_β^*) - calculated from the criterion described in equation (9) - and the impacts on the GDP of the corresponding states (\widehat{v}_α^*), respectively.

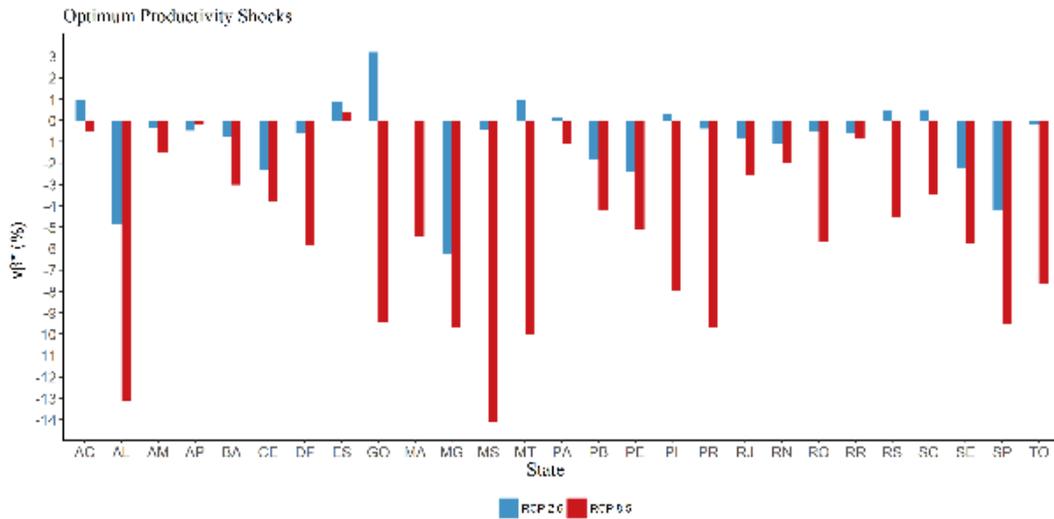


Figure 1 - Optimum Value of Simulated Productivity Shocks.

Here again, one has what is expected under each scenario: both agricultural productivity shocks and their respective effects on state GDP change tend to have more negative outcomes under RCP 8.5 in relation to RCP 2.6.

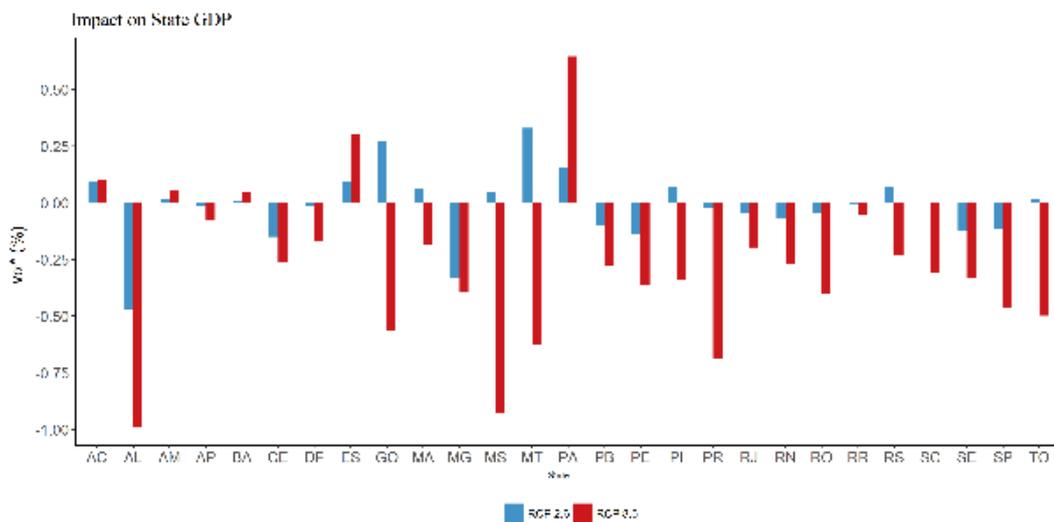


Figure 41 - Impact on State GDP.

If, instead of using equation (8) to generate the estimates for \hat{v}_α^* , we use \hat{v}_β^* as productivity shocks to run a simulation of B-MARIA, we obtain the following results for the variation of the state GDP ($\hat{v}_\alpha^{B-MARIA}$):

Table 15 - Comparison of the Simulated Impacts through Model B-MARIA with the Impacts Reconstructed from Equation (8).

State	RCP 2.6		RCP 8.5	
	$\hat{v}_\alpha^{B-MARIA}$	\hat{v}_α^*	$\hat{v}_\alpha^{B-MARIA}$	\hat{v}_α^*
RO	-0.0466	-0.0478	-0.4042	-0.4046
AC	0.0935	0.0928	0.1016	0.0987
AM	0.0122	0.0128	0.0504	0.0533
RR	-0.0072	-0.0076	-0.0505	-0.0561
PA	0.1565	0.1592	0.6555	0.6470
AP	-0.0131	-0.0136	-0.0739	-0.0745
TO	0.0164	0.0163	-0.4954	-0.4980
MA	0.0624	0.0632	-0.1849	-0.1869
PI	0.0678	0.0678	-0.3385	-0.3371
CE	-0.1490	-0.1499	-0.2569	-0.2645
RN	-0.0641	-0.0653	-0.2912	-0.2687
PB	-0.0958	-0.0964	-0.2646	-0.2786
PE	-0.1375	-0.1386	-0.3514	-0.3628
AL	-0.4703	-0.4708	-0.9790	-0.9884
SE	-0.1195	-0.1205	-0.3262	-0.3327
BA	0.0055	0.0061	0.0532	0.0490
MG	-0.3272	-0.3322	-0.3916	-0.3923
ES	0.0903	0.0907	0.2992	0.3003
RJ	-0.0406	-0.0419	-0.1969	-0.1973
SP	-0.1148	-0.1162	-0.4649	-0.4623

PR	-0.0188	-0.0186	-0.6862	-0.6845
SC	0.0020	0.0009	-0.3106	-0.3071
RS	0.0731	0.0728	-0.2370	-0.2334
MS	0.0426	0.0440	-0.9543	-0.9293
MT	0.3281	0.3299	-0.6432	-0.6274
GO	0.2783	0.2734	-0.5761	-0.5646
DF	-0.0132	-0.0143	-0.1699	-0.1699

The analysis of table 15 shows the maintenance in the order of the impacts under the state GDP in each of the scenarios (denoted by the ordering of the colors - cold for increase in GDP, hot for decrease), besides the good aptitude of the aforementioned methodology to replicate the simulated results using the B-MARIA model.

6. FINAL REMARKS

“Education never ends Watson. It is a series of lessons with the greatest for the last.”

Sherlock Holmes

The Red Circle

Projected climate change presents a serious challenge for humanity until the end of the century. Its most intense impacts will be felt in the more distant future, although the actions necessary to mitigate them in a significant way should be done today. There is a growing consensus on the idea that increasing human emissions into the atmosphere will have the potential to generate distortions in the global precipitation and temperature pattern, generating a high risk of losses to the agricultural sector of the regions. Literature on the subject, while finding ambiguous evidence about the impact that climate change may have on global agricultural productivity, agrees that its risks must be taken into account in order to better formulate adaptation and mitigation policies around the world.

In this work, we propose to estimate the impacts that the projected climatic changes up to the end of the century can have on the Brazilian economy. In addition, the objective was to analyze vulnerability and regional differentials in the face of such changes in the climate, and to address the uncertainties of the results in an explicit way.

Estimates point to a broad regional heterogeneity of direct and indirect impacts to the Brazilian economy through changes in the productivity of the country's main agricultural crops, using the more and less optimistic scenarios created by the IPCC (RCP 2.6 and 8.5, respectively). The five-year variation in agricultural productivity projected averages up to the end of the century can range from + 1.16% under the scenario of low emissions up to -11.6% under the most pessimistic scenario.

These productivity variations have the potential to generate total productive losses equivalent to 11.1% of Brazilian GDP under RCP 2.6 and up to 81.6% of GDP in the country under RCP 8.5. In addition, when analyzing the vulnerability of the Brazilian regions to such impacts, it is observed that the states of the Central-West region of Brazil are those with the highest average economic vulnerability, due to the great importance of the agricultural sector in their economy.

Finally, in dealing with the uncertainties inherent in the methodology used explicitly, it was possible to conclude that the Northeast and Southeast regions will be consistently more negatively affected under RCP 2.6, while under RCP 8.5, due to their greater regional integration, the South, Southeast and Central West regions are the most affected.

Still, there is plenty of room for refinement of the methodology and data used. The impossibility of the methodology to deal with the adaptability of the Brazilian productive structure in response to the climatic changes observed concomitant with the low availability of climatic and agricultural data are the main point of future improvement of the work. However, it is believed that the results described above can contribute to a broader and more detailed discussion of the strategies for mitigation and adaptation of the Brazilian regions for the future and, consequently, to transmit to some creature the legacy of climate change research in Brazil.

REFERENCES

- Ackerman, F. (2007). “Debating Climate Economics: The Stern Review vs. Its Critics”. Global Development and Environment Institute, Manuscript, July.
- Arrow, K. J., Cline, W. R., Maler, K. G., Munasinghe, M., Squitieri, R., & Stiglitz, J. E. (1996). “Intertemporal equity, discounting, and economic efficiency” (pp. 125-44). Cambridge, UK, New York and Melbourne: Cambridge University Press.
- Diamond, J. (1997). “Guns, Germs, and Steel: The Fates of Human Societies”. W.W. Norton & Company.
- Dixon, Peter B.; Parmenter, Brian R.; Powell, Alan A.; Wilcoxon, Peter J. (1992). “Notes and Problems In Applied General Equilibrium Economics.” In: Advanced Textbooks in Economics (volume 32). Elsevier Science B. V, Amsterdam - Lausanne - New York - Oxford - Shannon - Tokio - Singapore.
- Dixon, P. D., Parmenter, B. R. (1996). “Computable General Equilibrium Modeling for Policy Analysis and Forecasting”. In: H. M. Amman, D. A. Kendrick e J. Rust (Eds.), Handbook of Computational Economics, 1: 3-85, Amsterdam, Elsevier.
- Deschenes, O., M. Greenstone (2007). “The Economic Impacts of Climate Change: Evidence from Agricultural Output and Random Fluctuations in Weather.” American Economic Review 97(1).354-85.
- Duby, G.: “La formation des campagnes françaises des orgines à 1340”. In: Histoire de la France rurale. tomo I, Paris: Editions du Seuil, col. “Univers historique”, 1975.
- Guilhoto, J.J.M., U.A. Sesso Filho (2005). “Estimação da Matriz Insumo-Produto Utilizando Dados Preliminares das Contas Nacionais: Aplicação e Análise de Indicadores Econômicos para o Brasil em 2005”. Economia & Tecnologia. UFPR/TECPAR. Ano 6, Vol 23, Out./Dez.

Guilhoto, J.J.M., C.R. Azzoni, S.M. Ichihara, D.K. Kadota, E.A. Haddad (2010). "Matriz de Insumo-Produto do Northeast e Estados: Metodologia e Resultados". Fortaleza: Banco do Northeast do Brasil.

Haddad, E. A. (1999). "Regional Inequality and Structural Changes: Lessons from the Brazilian Experience". Ashgate, Aldershot.

Haddad, E. A. (2009). "Interregional Computable General Equilibrium Models In: Sonis M, Hewings GJD (Eds.)". Tool Kits in Regional Science: Theory, Models and Estimation, Springer, Berlin.

Haddad, E. A; Azzoni CR (2012). "Climate change and the future of regions," Chapters, in: Networks, Space and Competitiveness, chapter 6, pages 137-148 Edward Elgar Publishing.

Haddad, E. A; Porsse, A.A., Pereda, P.C. (2013). "Regional Economic Impacts of Climate Anomalies in Brazil". Revista Brasileira de Estudos Regionais e Urbanos. Vol. 07, n. 2, pp. 19-33.

Haddad, E. A. (2014a). "Spatial Perspectives of Increasing Freeness of Trade in Lebanon". Annals of Regional Science.

Haddad, E. A. (2014b). "Trade and Interdependence in Lebanon: An Interregional Input-Output Perspective". Journal of Development and Economic Policies.

Haddad, E. A., et al. (2014c). "Climate change in Lebanon: Higher-order regional impacts from agriculture". Region 1.1: 9-24.

Haddad, E. A.; Gonçalves Jr.; C. A., Nascimento, T. O (2017). "Matriz Interestadual de Insumo-Produto para o Brasil: Uma Aplicação do Método IIOAS." Revista Brasileira de Estudos Regionais e Urbanos (RBERU), Vol. 11, n. 4, pp. 424-446.

Haddad, E. A., Garber, G.; "Target Fitting and Robustness Analysis in CGE Models", in discussion texts of NEREUS.

Halsnæs, K.; et al. (2007). "Framing issues". In B. Metz; et al. Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK, and New York, N.Y., U.S.A. Retrieved 2009-05-20.

Huang, Haixiao, Madhu Khanna (2010). "An econometric analysis of US crop yield and cropland acreage: implications for the impact of climate change". AAEA annual meeting, Denver, Colorado.

IPCC (2013). "Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change" [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York.

Johansen, L. (1960). "A Multisectoral Study of Economic Growth". North-Holland, Amsterdam (second edition 1974).

Jorgenson, Dale W.; Griliches, Z. (1967). "The explanation of Productivity Change". Review of Economic Studies, 34, no 99 (July). 249-280.

Kucharik, C.J., S.P. Serbin (2008). "Impacts of Recent Climate Change on Wisconsin Corn and Soybean Yield Trends." Environmental Research Letters 3 (3). 034003.

Lobell, D.B., G.P. Asner (2003). "Climate and Management Contributions to Recent Trends in U.S. Agricultural Yields." Science 299: 1032.

Lobell, D.B., M.B. Burke, C. Tebaldi, M.D. Mastrandrea, W.P. Falcon, and R.L. Naylor (2008). "Prioritizing Climate Change Adaptation Needs for Food Security in 2030." Science 319: 607-610.

McCarl, B.A., X. Villavicencio, and X. Wu. (2008). "Climate Change and Future Analysis: Is Stationary Dying?" American Journal of Agricultural Economics 90(5). 1241-1247.

Nordhaus, W. D. (2007). "A review of the Stern review on the economics of climate change". Journal of economic literature, 45(3), 686-702.

Oury, B. (1965). "Allowing for Weather in Crop Production Model Building". Journal of Farm Economics 47 (2). 270-283.

Schlenker, W., M.J. Roberts (2009). "Nonlinear Temperature Effects Indicate Severe Damages to U.S. Crop Yields under Climate Change."

Solow, R. (1957). "Technical Change and the Aggregate Production Function", The Review of Economics and Statistics, No. 03 (Aug, 1957), pp. 312-320, The MIT Press.

Stern, N (2006). "Stern Review Report on The Economics of Climate Change."

Stocker, T. F., Qin, D., Plattner, G. K., Tignor, M., Allen, S. K., Boschung, J., ... & Midgley, P. M. (2013). "Climate change 2013: the physical science basis. Intergovernmental panel on climate change, working group I contribution to the IPCC fifth assessment report (AR5)". New York, 2013.

Toth, F.L.; et al. (2001). "Decision-making Frameworks". In B. Metz; et al. Climate Change 2001: Mitigation. Contribution of Working Group III to the Third Assessment Report of the Intergovernmental Panel on Climate Change". Cambridge University Press, Cambridge, UK, and New York, N.Y., U.S.A. Retrieved 2010-01-10.

Weyant, J. (2017). "Some Contributions of Integrated Assessment Models of Global Climate Change". Review of Environmental Economics and Policy 11:1, 115-137

Zohary, D., Hopf, M.: Domestication of Plants in the Old World, 2a ed. (Oxford University Press, Oxford, 1993).

APPENDIX

Agricultural Data

Table 16 - Representativeness of Each Culture Within State Agriculture (in percentage points).

State	Soybean	Sugarcane	Maize	Bean	Coffee	Orange
Acre	0,05	2,77	10,28	2,82	1,12	0,77
Alagoas	0,00	90,03	0,82	1,36	0,00	0,66
Amapá	0,00	0,98	1,11	0,84	0,00	7,57
Amazonas	0,03	6,70	2,15	0,95	0,55	6,20
Bahia	18,54	3,52	6,28	2,55	6,52	2,54
Ceará	0,00	4,61	20,25	19,14	0,51	0,33
Distrito Federal	25,09	0,90	21,64	12,75	1,09	0,56
Espirito Santo	0,00	5,75	1,07	0,51	69,51	0,28
Goiás	38,06	21,98	15,52	3,63	0,53	0,38
Maranhão	35,95	10,10	11,59	2,90	0,00	0,12
Mato Grosso	61,58	3,84	13,46	1,44	0,12	0,02
Mato Grosso do Sul	45,85	26,36	18,17	0,48	0,11	0,09
Minas Gerais	8,64	18,19	11,87	4,00	40,05	1,78

Pará	6,52	1,48	8,36	1,85	1,14	1,84
Paraíba	0,00	38,41	3,06	6,83	0,00	0,24
Paraná	44,43	8,86	19,27	3,98	3,18	0,96
Pernambuco	0,00	46,04	2,13	6,56	0,29	0,06
Piauí	45,54	3,07	19,31	7,64	0,00	0,09
Rio de Janeiro	0,00	18,68	0,89	0,65	7,77	3,70
Rio Grande do North	0,00	24,17	2,87	5,18	0,00	0,09
Rio Grande do Sul	37,77	0,59	10,87	0,72	0,00	1,04
Rondônia	23,65	4,63	9,83	3,71	18,65	0,13
Roraima	4,14	0,28	4,23	2,18	0,00	0,52
Santa Catarina	17,16	0,96	24,05	2,73	0,00	0,33
São Paulo	2,61	60,82	3,90	0,96	3,24	14,11
Sergipe	0,00	22,02	22,82	2,32	0,00	16,28
Tocantins	49,08	9,24	9,43	3,90	0,00	0,05

Control Variables

Table 17 – Variables used in the Econometric Model.

Variable	Source
Precipitation Anomalie	INMET
Precipitation Anomalie ²	INMET
Temperature Anomalie	INMET
Temperature Anomalie ²	INMET
Production (in tons) of culture X	PAM (IBGE)
Production (in 2000's R\$) of culture X	PAM (IBGE)
Proportion of culture X in the total produced (in R \$) by the municipality	PAM (IBGE)
Area for the cultivation of culture X	PAM (IBGE)
Proportion of the area destined to the planting of culture X in relation to the whole planted area of the municipality	PAM (IBGE)
Area for crop harvest X	PAM (IBGE)
Proportion of the area destined to the crop of the culture X in relation to all harvested area of the municipality	PAM (IBGE)

Note: "X" representa cada uma das 6 culturas analisadas, ao passo que cada um dos 6 modelos estimados utilizou as informações de produção, área plantada, área colhida e valor produzido de todas as culturas como variáveis de controle.

Econometric Results

Table 18 - Econometric Results- Precipitation - Sugarcane.

VARIABLES	(1) lprod_sugarcane	(2) lprod_sugarcane	(3) lprod_sugarcane	(4) lprod_sugarcane
PREC_JAN	0.0900*** (0.0242)	0.00216 (0.00963)	-0.00476 (0.0139)	0.000202 (0.0118)
PREC_JAN2	-0.0419*** (0.0121)	-0.00320 (0.00280)	-0.00390 (0.00346)	-0.00223 (0.00403)
PREC_FEV	0.0993*** (0.0251)	0.0172 (0.0142)	0.00827 (0.0130)	-0.00595 (0.0121)
PREC_FEV2	-0.111*** (0.0190)	0.0181 (0.0110)	0.0108 (0.00989)	0.0150 (0.00984)
PREC_MAR	0.0443 (0.0323)	0.0184 (0.0115)	0.00484 (0.00754)	0.00438 (0.00738)
PREC_MAR2	-0.0263 (0.0293)	0.00229 (0.00634)	-0.0119 (0.00835)	-0.00519 (0.00841)
PREC_ABR	0.0702*** (0.0185)	-0.00718 (0.0190)	0.00921 (0.00626)	0.00110 (0.00560)
PREC_ABR2	-0.0832*** (0.0170)	0.00820 (0.0132)	-0.00292 (0.00532)	0.00438 (0.00388)
PREC_MAI	-0.0328** (0.0123)	0.0101 (0.00752)	0.00175 (0.0105)	-0.000132 (0.00596)
PREC_MAI2	0.0285** (0.0125)	0.00511 (0.00628)	0.00567 (0.00616)	0.00126 (0.00354)
PREC_JUN	-0.0371*** (0.0114)	-0.00533 (0.00621)	0.00375 (0.00672)	0.000319 (0.00486)
PREC_JUN2	0.0148** (0.00588)	0.000666 (0.00183)	0.000412 (0.000762)	0.00134 (0.000926)
PREC_JUL	-0.00435 (0.0125)	-0.00585 (0.00671)	0.00659** (0.00306)	0.00258 (0.00202)
PREC_JUL2	0.00968** (0.00385)	0.00266** (0.00117)	5.02e-05 (0.000880)	-0.000617 (0.000402)
PREC_AGO	-0.0441*** (0.00968)	-0.0137 (0.0135)	0.00439 (0.00586)	0.00377 (0.00563)
PREC_AGO2	0.0194***	0.00129	-0.000786	-0.000683

PREC_SET	(0.00586) 0.00347	(0.00309) 0.00784	(0.00152) 0.00907	(0.00100) 0.00522
PREC_SET2	(0.0125) -0.0135	(0.00632) 0.00104	(0.00699) 0.000207	(0.00740) 0.00275
PREC_OUT	(0.00836) 0.0293	(0.00217) 0.0201	(0.00265) 0.00745	(0.00262) 0.00274
PREC_OUT2	(0.0206) -0.0148	(0.0223) -0.00575	(0.0115) -0.00427*	(0.00600) -0.00194
PREC_NOV	(0.0126) 0.0339*	(0.00394) -0.00948	(0.00239) -0.0177	(0.00131) -0.0149
PREC_NOV2	(0.0176) -0.0703**	(0.0146) -0.00398	(0.0180) 0.00817	(0.0153) 0.000154
PREC_DEZ	(0.0311) 0.0472**	(0.00628) -0.0136	(0.00484) 0.00474	(0.00543) -0.00605
PREC_DEZ2	(0.0183) -0.161*	(0.0129) 0.0199	(0.0143) 0.0170*	(0.0125) 0.0194**
Constant	(0.0927) 4.279***	(0.0190) 4.217***	(0.00871) 4.090***	(0.00919) 3.967***
	(0.0609)	(0.0295)	(0.0254)	(0.0445)
Observations	75,239	75,239	75,239	75,239
R-squared	0.219	0.763	0.797	0.858
City FE	Não	Sim	Sim	Sim
Year FE	Não	Sim	Sim	Sim
STATE-YEAR FE	Não	Não	Sim	Sim
Controls	Não	Não	Não	Sim

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 19 - Econometric Results - Variáveis de Temperatura - Sugarcane.

VARIABLES	(1) lprod_sugarcane	(2) lprod_sugarcane	(3) lprod_sugarcane	(4) lprod_sugarcane
TEMP_JAN	-1.232*** (0.218)	-0.575*** (0.180)	-0.365 (0.249)	-0.317 (0.195)
TEMP_JAN2	20.99*** (5.485)	2.155 (2.361)	2.928 (2.493)	-1.369 (1.849)
TEMP_FEV	0.891* (0.458)	0.215 (0.234)	0.345 (0.251)	0.0179 (0.167)
TEMP_FEV2	-22.95*** (5.778)	-1.152 (2.557)	4.655** (1.674)	1.861 (1.860)
TEMP_MAR	0.272 (0.341)	0.485* (0.237)	-0.0922 (0.210)	0.0839 (0.239)
TEMP_MAR2	-21.02*** (5.934)	-8.245** (3.383)	-10.24** (4.190)	-9.697** (3.761)
TEMP_ABR	1.043*** (0.355)	0.263 (0.162)	0.229 (0.149)	0.207 (0.125)
TEMP_ABR2	5.604 (4.079)	1.464 (1.773)	1.997 (2.029)	1.265 (1.661)
TEMP_MAI	-0.195 (0.176)	0.126 (0.157)	-0.104 (0.178)	-0.0204 (0.119)
TEMP_MAI2	-3.301 (5.550)	-0.622 (1.831)	-2.672 (1.589)	-2.283 (1.455)
TEMP_JUN	-0.0813 (0.131)	-0.360*** (0.125)	0.205 (0.134)	0.0809 (0.119)
TEMP_JUN2	6.518 (5.580)	-0.151 (1.216)	-1.063 (0.927)	-1.901*** (0.625)
TEMP_JUL	0.461*** (0.145)	0.318*** (0.103)	0.128** (0.0498)	0.116 (0.106)
TEMP_JUL2	-3.325 (2.614)	0.584 (0.601)	0.354 (0.671)	0.812 (0.809)
TEMP_AGO	-0.371* (0.201)	0.0592 (0.123)	0.185 (0.158)	-0.00149 (0.178)
TEMP_AGO2	-5.533 (3.811)	-1.268 (1.351)	-2.368** (1.143)	-0.229 (1.171)
TEMP_SET	-0.378 (0.235)	-0.0723 (0.131)	-0.232 (0.158)	-0.154 (0.147)
TEMP_SET2	5.510 (3.310)	-1.894 (2.077)	2.115 (2.137)	4.419** (2.006)
TEMP_OUT	-0.524** (0.242)	0.0672 (0.161)	0.292 (0.211)	0.221 (0.145)

TEMP_OUT2	26.71*** (8.193)	-1.200 (1.388)	-2.077 (2.072)	-0.850 (1.457)
TEMP_NOV	1.460*** (0.324)	-0.294 (0.196)	-0.0304 (0.261)	-0.151 (0.196)
TEMP_NOV2	-24.32* (12.25)	0.969 (2.679)	-2.316 (2.684)	-1.756 (2.003)
TEMP_DEZ	-0.982* (0.486)	-0.318 (0.298)	-0.416* (0.214)	-0.317 (0.219)
TEMP_DEZ2	-2.604 (6.980)	5.747* (3.048)	9.403*** (2.063)	1.973 (1.965)
Constant	4.279*** (0.0609)	4.217*** (0.0295)	4.090*** (0.0254)	3.967*** (0.0445)
Observations	75,239	75,239	75,239	75,239
R-squared	0.219	0.763	0.797	0.858
EF de Cidade	Não	Sim	Sim	Sim
Year FE	Não	Sim	Sim	Sim
STATE-YEAR FE	Não	Não	Sim	Sim
Controls	Não	Não	Não	Sim

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 20 - Econometric Results - Precipitation - Soybean.

VARIABLES	(1) lprod_soybean	(2) lprod_soybean	(3) lprod_soybean	(4) lprod_soybean
PREC_JAN	0.0734** (0.0263)	0.0849*** (0.0226)	0.0352*** (0.0113)	0.0174* (0.0100)
PREC_JAN2	-0.0765*** (0.0270)	-0.0385 (0.0336)	-0.0235 (0.0164)	-0.0177* (0.0102)
PREC_FEV	0.0968*** (0.0215)	0.0671*** (0.0214)	0.0453** (0.0162)	0.0234* (0.0135)
PREC_FEV2	-0.160*** (0.0276)	-0.0627*** (0.0204)	-0.0222 (0.0173)	-0.0102 (0.0146)
PREC_MAR	0.133*** (0.0278)	0.0512** (0.0208)	-0.0142 (0.0200)	-0.00272 (0.0176)
PREC_MAR2	-0.113*** (0.0209)	-0.0596*** (0.0167)	-0.00680 (0.0147)	-0.0157 (0.0109)
PREC_ABR	0.00515 (0.0241)	-0.0153 (0.0193)	-0.000149 (0.0157)	-0.00691 (0.0149)
PREC_ABR2	0.0256 (0.0180)	0.0166 (0.0131)	0.00757 (0.00585)	0.00562 (0.00402)
PREC_MAI	-0.0446*** (0.0136)	-0.0103 (0.00969)	-0.00272 (0.0102)	-0.00877 (0.00540)
PREC_MAI2	0.0159** (0.00661)	0.00306 (0.00365)	-0.000861 (0.00382)	0.00320* (0.00156)
PREC_JUN	0.00501 (0.00958)	0.0214** (0.0102)	0.00906 (0.00808)	0.00972 (0.00751)
PREC_JUN2	-0.000734 (0.00159)	-0.00186 (0.00123)	-0.000827 (0.00101)	-0.00106 (0.000855)
PREC_JUL	0.0187 (0.0164)	-0.0110 (0.0124)	0.00165 (0.0118)	0.00100 (0.00866)
PREC_JUL2	-0.00177 (0.00221)	0.00177 (0.00154)	-0.000279 (0.00132)	-0.000169 (0.00119)
PREC_AGO	-0.000170 (0.0131)	0.00355 (0.0144)	-0.0122** (0.00473)	0.00353 (0.00373)
PREC_AGO2	0.00126 (0.00374)	-0.00423 (0.00310)	0.000743 (0.000990)	-0.00226** (0.00101)
PREC_SET	0.00735 (0.0210)	0.0267* (0.0141)	0.00957 (0.00656)	0.00153 (0.00519)
PREC_SET2	-0.00339 (0.0123)	-0.0175* (0.00876)	-0.00529 (0.00349)	-0.00550 (0.00457)
PREC_OUT	-0.0339 (0.0237)	-0.0430*** (0.0115)	-0.00981 (0.0176)	-0.00174 (0.0139)
PREC_OUT2	-0.0107 (0.0181)	0.0166 (0.0119)	0.00819 (0.00795)	0.00812 (0.00689)
PREC_NOV	0.0320 (0.0241)	-0.0105 (0.00883)	0.00328 (0.00972)	0.0138 (0.00993)
PREC_NOV2	-0.0472*** (0.0131)	0.0346** (0.0145)	0.0107 (0.00970)	0.0122 (0.0104)
PREC_DEZ	-0.0187	-0.0217**	0.00398	0.00516

	(0.0186)	(0.0105)	(0.0117)	(0.0157)
PREC_DEZ2	-0.00987	0.0596***	0.0178*	0.00876
	(0.0211)	(0.0125)	(0.00935)	(0.0135)
Constant	1.019***	0.787***	0.733***	0.777***
	(0.0427)	(0.0188)	(0.0322)	(0.0349)
Observations	33,190	33,190	33,190	33,190
R-squared	0.312	0.687	0.785	0.847
EF de Cidade	Não	Sim	Sim	Sim
Year FE	Não	Sim	Sim	Sim
STATE-YEAR FE	Não	Não	Sim	Sim
Controls	Não	Não	Não	Sim

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 21 - Econometric Results - Temperature - Soybean.

VARIABLES	(1)	(2)	(3)	(4)
	lprod_soybean	lprod_soybean	lprod_soybean	lprod_soybean
TEMP_JAN	-1.090**	-0.156	-0.274	-0.110
	(0.430)	(0.494)	(0.386)	(0.125)
TEMP_JAN2	41.21	0.590	0.678	-0.747
	(25.30)	(9.772)	(5.801)	(4.418)
TEMP_FEV	0.333	-0.00679	-0.830	-0.352
	(0.615)	(0.472)	(0.518)	(0.534)
TEMP_FEV2	-14.57**	-6.891**	-0.637	1.114
	(6.448)	(3.291)	(5.554)	(4.422)
TEMP_MAR	0.607	-0.751*	-0.120	0.181
	(0.471)	(0.374)	(0.532)	(0.471)
TEMP_MAR2	-20.59***	-1.307	3.814	0.816
	(6.722)	(3.031)	(4.277)	(2.290)
TEMP_ABR	0.728***	0.186	-0.410	-0.380
	(0.210)	(0.257)	(0.406)	(0.374)
TEMP_ABR2	10.21*	4.927**	-0.309	2.020
	(5.066)	(2.057)	(2.116)	(1.349)
TEMP_MAI	-0.155	-0.0818	0.0854	-0.188
	(0.136)	(0.0955)	(0.262)	(0.165)
TEMP_MAI2	-11.88***	0.0384	0.240	-0.702
	(1.297)	(1.157)	(1.810)	(1.148)
TEMP_JUN	0.278**	-0.205	-0.107	-0.142
	(0.104)	(0.146)	(0.242)	(0.256)
TEMP_JUN2	-2.213	-1.046	-0.0232	-0.223
	(2.266)	(0.933)	(1.186)	(1.143)
TEMP_JUL	0.126	0.419***	0.240*	0.144
	(0.140)	(0.0566)	(0.139)	(0.121)
TEMP_JUL2	-6.339***	-1.523**	0.164	0.0610
	(0.655)	(0.545)	(0.372)	(0.222)
TEMP_AGO	-0.340***	-0.324**	0.133	0.0171
	(0.0630)	(0.145)	(0.124)	(0.162)
TEMP_AGO2	4.859***	5.449***	-0.371	-0.628
	(0.690)	(1.134)	(0.989)	(0.703)
TEMP_SET	0.105	-0.0566	0.312	0.0746
	(0.370)	(0.248)	(0.219)	(0.182)
TEMP_SET2	1.640	-5.383***	-1.067	0.228
	(2.911)	(0.818)	(1.896)	(1.062)
TEMP_OUT	0.398*	0.597**	0.659***	0.482*
	(0.222)	(0.282)	(0.126)	(0.269)
TEMP_OUT2	0.594	3.652	3.678	2.058
	(8.152)	(3.143)	(4.156)	(3.861)
TEMP_NOV	0.00459	-0.567***	0.00741	0.104
	(0.355)	(0.173)	(0.426)	(0.283)
TEMP_NOV2	-5.992	-2.775	-1.910	0.642
	(5.991)	(3.919)	(2.766)	(2.061)
TEMP_DEZ	-0.0324	-0.125	0.234	0.282
	(0.362)	(0.253)	(0.359)	(0.277)
TEMP_DEZ2	-10.59	5.065	9.453***	5.477*
	(6.973)	(4.579)	(2.869)	(3.051)
Constant	1.019***	0.787***	0.733***	0.777***
	(0.0427)	(0.0188)	(0.0322)	(0.0349)
Observations	33,190	33,190	33,190	33,190

R-squared	0.312	0.687	0.785	0.847
EF de Cidade	Não	Sim	Sim	Sim
Year FE	Não	Sim	Sim	Sim
STATE-YEAR FE	Não	Não	Sim	Sim
Controls	Não	Não	Não	Sim

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 22 - Econometric Results - Precipitation - Maize.

VARIABLES	(1) lprod_maize	(2) lprod_maize	(3) lprod_maize	(4) lprod_maize
PREC_JAN	0.0385 (0.0285)	0.0662*** (0.0174)	0.0371 (0.0222)	0.0217 (0.0135)
PREC_JAN2	-0.0896*** (0.0272)	-0.00860 (0.00909)	-0.0329*** (0.0117)	-0.0156* (0.00757)
PREC_FEV	0.0396 (0.0272)	-0.0281** (0.0117)	0.0263 (0.0198)	0.00767 (0.0140)
PREC_FEV2	-0.0967** (0.0455)	0.00711 (0.0162)	-0.0324** (0.0121)	-0.0286*** (0.00767)
PREC_MAR	0.101** (0.0407)	0.0308* (0.0175)	0.0151 (0.0264)	0.0363** (0.0168)
PREC_MAR2	-0.0480 (0.0354)	-0.00133 (0.0251)	-0.00833 (0.0166)	-0.00861 (0.00981)
PREC_ABR	0.171*** (0.0313)	0.0399* (0.0200)	0.0473*** (0.0135)	0.0287** (0.0137)
PREC_ABR2	0.00275 (0.0245)	-0.0173 (0.0118)	-0.0196** (0.00939)	-0.0196** (0.00705)
PREC_MAI	-0.0714* (0.0376)	0.0240*** (0.00760)	0.0212 (0.0146)	0.00476 (0.00801)
PREC_MAI2	0.0378*** (0.0113)	-0.0217* (0.0107)	-0.0160** (0.00739)	-0.00416 (0.00390)
PREC_JUN	0.00395 (0.0169)	0.00682 (0.00910)	0.000275 (0.0108)	0.0136 (0.00832)
PREC_JUN2	0.00453 (0.00409)	-0.00186 (0.00218)	0.00161 (0.00195)	0.000552 (0.00123)
PREC_JUL	0.0502 (0.0308)	-0.000471 (0.0171)	-0.0328* (0.0166)	-0.0206* (0.0102)
PREC_JUL2	-0.000152 (0.00399)	0.00110 (0.00349)	0.00497** (0.00207)	0.00343** (0.00141)
PREC_AGO	-0.0534** (0.0220)	0.0121 (0.0150)	-0.00858 (0.0105)	-0.00572 (0.00850)
PREC_AGO2	0.0249*** (0.00518)	-0.00547 (0.00329)	0.000662 (0.00169)	-4.58e-05 (0.00156)
PREC_SET	0.0331 (0.0303)	-0.0215 (0.0178)	0.0306* (0.0151)	0.0300*** (0.00872)
PREC_SET2	-0.0170 (0.0207)	0.0183*** (0.00563)	0.000665 (0.00480)	-0.00102 (0.00336)
PREC_OUT	0.0210 (0.0347)	-0.0238 (0.0176)	0.0237 (0.0197)	0.0112 (0.0180)
PREC_OUT2	-0.0471** (0.0183)	-0.00361 (0.00451)	-0.0114* (0.00567)	-0.00867* (0.00472)
PREC_NOV	0.160*** (0.0288)	0.0111 (0.0165)	-0.0143 (0.0292)	0.00461 (0.0168)
PREC_NOV2	-0.185*** (0.0480)	0.0302 (0.0230)	0.00108 (0.00746)	-0.00825 (0.00519)
PREC_DEZ	0.0169 (0.0391)	-0.0166 (0.0255)	0.00122 (0.0257)	-0.00128 (0.0190)
PREC_DEZ2	-0.161** (0.0666)	-0.0106 (0.0294)	0.00473 (0.0147)	0.0149 (0.0107)
Constant	1.342*** (0.0452)	1.030*** (0.0290)	0.659*** (0.0335)	6.098*** (1.743)
Observations	73,196	52,875	73,196	73,196
R-squared	0.170	0.725	0.836	0.885
EF de Cidade	Não	Sim	Sim	Sim
Year FE	Não	Sim	Sim	Sim
STATE-YEAR FE	Não	Não	Sim	Sim
Controls	Não	Não	Não	Sim

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 23 - Econometric Results - Temperature - Maize.

VARIABLES	(1) lprod_maize	(2) lprod_maize	(3) lprod_maize	(4) lprod_maize
TEMP_JAN	-1.611*** (0.509)	1.044*** (0.203)	-0.285 (0.393)	-0.156 (0.316)
TEMP_JAN2	38.63** (16.19)	-14.21* (7.491)	-0.302 (3.354)	-1.370 (2.185)
TEMP_FEV	0.480 (0.929)	-1.412*** (0.329)	-0.285 (0.540)	-0.440 (0.390)
TEMP_FEV2	-10.35 (6.805)	4.282 (4.748)	5.562 (3.704)	5.791** (2.700)
TEMP_MAR	0.621 (0.693)	0.0945 (0.533)	0.537 (0.565)	0.392 (0.450)
TEMP_MAR2	-8.130 (11.76)	-6.401 (8.516)	-2.684 (3.318)	-3.071 (3.062)
TEMP_ABR	1.537*** (0.539)	-0.549 (0.543)	-0.385 (0.528)	-0.348 (0.392)
TEMP_ABR2	-10.73 (8.087)	-2.046 (2.585)	1.869* (0.920)	1.567** (0.580)
TEMP_MAI	-0.725 (0.491)	0.300 (0.238)	-0.409** (0.159)	-0.195 (0.144)
TEMP_MAI2	-9.291*** (1.966)	3.453* (1.778)	-2.239** (1.015)	-1.710*** (0.496)
TEMP_JUN	1.203** (0.498)	-0.101 (0.131)	0.344 (0.274)	0.0745 (0.132)
TEMP_JUN2	6.776 (5.842)	-0.682 (1.629)	1.158 (2.123)	2.003 (1.597)
TEMP_JUL	0.599*** (0.183)	0.232 (0.173)	0.0427 (0.214)	0.165 (0.133)
TEMP_JUL2	-2.296 (2.320)	-0.951 (1.955)	0.944 (0.732)	-0.0605 (0.373)
TEMP_AGO	-0.343 (0.212)	0.149 (0.267)	-0.0155 (0.108)	0.156 (0.125)
TEMP_AGO2	4.597* (2.571)	3.983 (2.589)	-2.053** (0.866)	-0.649 (0.744)
TEMP_SET	0.889 (0.694)	0.744** (0.277)	0.335 (0.209)	0.0941 (0.157)
TEMP_SET2	-4.583 (3.840)	-5.824** (2.634)	-0.235 (1.756)	-0.574 (1.088)
TEMP_OUT	-0.257 (0.386)	-0.142 (0.312)	0.277 (0.311)	0.234 (0.268)
TEMP_OUT2	28.13*** (9.153)	5.028 (3.379)	-1.866 (3.841)	-0.242 (2.094)
TEMP_NOV	1.350*** (0.343)	0.189 (0.241)	0.0403 (0.402)	0.0797 (0.269)
TEMP_NOV2	-10.84 (10.95)	-5.789** (2.284)	1.179 (1.754)	-2.588*** (0.796)
TEMP_DEZ	0.430 (0.257)	-0.698 (0.426)	-0.486 (0.547)	-0.141 (0.331)
TEMP_DEZ2	12.76 (12.60)	12.88** (4.726)	4.236 (3.263)	5.999** (2.275)
Constant	1.342*** (0.0452)	1.030*** (0.0290)	0.659*** (0.0335)	6.098*** (1.743)
Observations	73,196	52,875	73,196	73,196
R-squared	0.170	0.725	0.836	0.885
EF de Cidade	Não	Sim	Sim	Sim
Year FE	Não	Sim	Sim	Sim
STATE-YEAR FE	Não	Não	Sim	Sim
Controls	Não	Não	Não	Sim

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 24 - Econometric Results - Precipitation - Bean.

VARIABLES	(1) lprod_bean	(2) lprod_bean	(3) lprod_bean	(4) lprod_bean
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PREC_JAN	0.0454* (0.0222)	0.00624 (0.0169)	0.00126 (0.0188)	0.0190* (0.00994)
PREC_JAN2	-0.00881 (0.0430)	-0.0367 (0.0224)	-0.0273** (0.0123)	0.00172 (0.0111)
PREC_FEV	-0.0639** (0.0304)	-0.0206 (0.0166)	0.00982 (0.0190)	-0.0193 (0.0153)
PREC_FEV2	0.0827*** (0.0280)	0.0355*** (0.0125)	0.0271** (0.01000)	0.0197*** (0.00416)
PREC_MAR	0.0706*** (0.0213)	0.0204 (0.0130)	0.00792 (0.0170)	0.0193 (0.0156)
PREC_MAR2	-0.0413** (0.0192)	0.0126 (0.0249)	-0.0163 (0.0212)	-0.0208 (0.0182)
PREC_ABR	0.0112 (0.0194)	0.00241 (0.00865)	-0.0118 (0.0112)	-0.0135** (0.00559)
PREC_ABR2	0.0417* (0.0209)	-0.0155 (0.0125)	-0.000662 (0.00309)	0.00568 (0.00427)
PREC_MAI	-0.0667*** (0.0206)	-0.0274 (0.0168)	-0.0171 (0.0236)	-0.0114 (0.0177)
PREC_MAI2	0.00503 (0.0124)	0.00370 (0.00549)	-0.00111 (0.00767)	0.00442 (0.00729)
PREC_JUN	-0.0242 (0.0275)	0.0117 (0.00915)	-0.00775 (0.0115)	0.0307*** (0.00869)
PREC_JUN2	0.00609 (0.00436)	-0.00200 (0.00171)	-0.000121 (0.00249)	-0.000774 (0.00107)
PREC_JUL	-0.0120 (0.0276)	0.00869 (0.0137)	0.0155 (0.0150)	-0.00369 (0.00830)
PREC_JUL2	0.00971* (0.00509)	0.000177 (0.00235)	-0.000797 (0.00240)	0.000636 (0.00105)
PREC_AGO	-0.0427* (0.0249)	0.0116 (0.0101)	0.0278** (0.0126)	-0.00471 (0.00894)
PREC_AGO2	0.0231** (0.00837)	-0.00459* (0.00250)	-0.00613*** (0.00188)	0.00134 (0.00150)
PREC_SET	0.0124 (0.0153)	-0.00996 (0.0131)	-0.0296* (0.0164)	-0.0110 (0.0157)
PREC_SET2	0.0266*** (0.00942)	-0.00188 (0.00791)	0.0123 (0.00858)	0.00836 (0.00607)
PREC_OUT	-0.0185 (0.0158)	0.00265 (0.0115)	0.00799 (0.0162)	0.00696 (0.0131)
PREC_OUT2	0.0172 (0.0170)	-0.00356 (0.00328)	0.000148 (0.00417)	-0.00350 (0.00490)
PREC_NOV	0.0638*** (0.0196)	0.00578 (0.0265)	0.0185 (0.0231)	0.0522*** (0.00971)
PREC_NOV2	-0.0896** (0.0327)	-0.00159 (0.0184)	-0.0244 (0.0234)	-0.0254* (0.0130)
PREC_DEZ	-0.0234 (0.0240)	0.0325* (0.0181)	0.0210 (0.0221)	0.00235 (0.00913)
PREC_DEZ2	-0.0620 (0.0629)	-0.0178 (0.0217)	-0.00482 (0.0226)	-0.0199 (0.0166)
Constant	0.425*** (0.0516)	0.282*** (0.0403)	0.558*** (0.0577)	1.707*** (0.0768)
Observations	21,356	21,356	21,356	21,356
R-squared	0.136	0.705	0.754	0.832
EF de Cidade	Não	Sim	Sim	Sim
Year FE	Não	Sim	Sim	Sim
STATE-YEAR FE	Não	Não	Sim	Sim
Controls	Não	Não	Não	Sim

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 25 - Econometric Results - Temperature - Bean.

VARIABLES	(1) lprod_bean	(2) lprod_bean	(3) lprod_bean	(4) lprod_bean
TEMP_JAN	0.0278 (0.422)	0.761* (0.391)	0.282 (0.712)	-0.108 (0.400)
TEMP_JAN2	35.29*** (10.14)	15.00** (7.243)	7.394 (4.667)	3.209 (2.854)
TEMP_FEV	-0.505 (0.705)	-0.384 (0.451)	-0.478 (0.550)	-0.684 (0.420)
TEMP_FEV2	-13.01**	-5.457	-2.230	1.377

	(4.708)	(3.399)	(2.952)	(1.872)
TEMP_MAR	0.751**	0.0471	0.243	0.344
	(0.295)	(0.243)	(0.505)	(0.208)
TEMP_MAR2	-3.516	-1.906	-2.959	0.942
	(4.961)	(4.824)	(5.818)	(4.005)
TEMP_ABR	0.569*	0.265	0.265	0.274
	(0.331)	(0.314)	(0.599)	(0.344)
TEMP_ABR2	-4.998	2.740	1.926	-0.451
	(3.703)	(1.914)	(3.945)	(1.881)
TEMP_MAI	0.0483	-0.658***	-0.311	-0.132
	(0.311)	(0.165)	(0.215)	(0.158)
TEMP_MAI2	-9.453**	-1.038	-1.491	-2.431**
	(3.738)	(2.540)	(2.398)	(0.879)
TEMP_JUN	-0.103	-0.248	-0.294	-0.0856
	(0.187)	(0.180)	(0.188)	(0.110)
TEMP_JUN2	-2.259*	-0.632	1.422*	2.130***
	(1.275)	(0.750)	(0.712)	(0.232)
TEMP_JUL	0.0349	0.0424	-0.135	-0.0560
	(0.228)	(0.0849)	(0.165)	(0.130)
TEMP_JUL2	-0.850	-0.0252	-0.194	-0.517
	(1.528)	(0.396)	(1.357)	(0.623)
TEMP_AGO	0.0507	-0.102	-0.477	-0.0608
	(0.170)	(0.225)	(0.403)	(0.136)
TEMP_AGO2	3.037	0.929	0.0336	0.210
	(2.060)	(1.339)	(2.195)	(0.842)
TEMP_SET	0.279	0.0389	0.327*	0.215
	(0.398)	(0.221)	(0.191)	(0.151)
TEMP_SET2	0.465	-0.251	0.889	-0.626
	(2.929)	(1.106)	(2.065)	(2.427)
TEMP_OUT	-0.470**	-0.272	-0.535	-0.584***
	(0.219)	(0.187)	(0.345)	(0.0930)
TEMP_OUT2	7.463*	0.907	-2.062	-0.700
	(4.313)	(2.105)	(2.275)	(1.959)
TEMP_NOV	0.405	-0.789**	-0.479	0.264
	(0.502)	(0.358)	(0.568)	(0.442)
TEMP_NOV2	-10.78***	-5.589*	-8.805***	-6.807***
	(3.581)	(3.026)	(1.800)	(2.078)
TEMP_DEZ	-0.259	0.716**	0.306	0.200
	(0.187)	(0.325)	(0.553)	(0.393)
TEMP_DEZ2	12.16*	-5.568	-2.949	4.210**
	(7.005)	(4.801)	(5.227)	(2.033)
Constant	0.425***	0.282***	0.558***	1.707***
	(0.0516)	(0.0403)	(0.0577)	(0.0768)
Observations	21,356	21,356	21,356	21,356
R-squared	0.136	0.705	0.754	0.832
EF de Cidade	Não	Sim	Sim	Sim
Year FE	Não	Sim	Sim	Sim
STATE-YEAR FE	Não	Não	Sim	Sim
Controls	Não	Não	Não	Sim

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 26 - Econometric Results - Precipitation - Coffe.

VARIABLES	(1) lprod_coffe	(2) lprod_coffe	(3) lprod_coffe	(4) lprod_coffe
PREC_JAN	-0.0425**	-0.00332	-0.0267	-0.0481***
	(0.0165)	(0.0221)	(0.0225)	(0.0132)
PREC_JAN2	-0.0906*	-0.0191	0.0124	0.0446**
	(0.0470)	(0.0496)	(0.0358)	(0.0175)
PREC_FEV	0.0791***	0.0950***	0.101**	0.0370**
	(0.0174)	(0.0228)	(0.0384)	(0.0133)
PREC_FEV2	-0.0584***	-0.0234	-0.0205	-0.00680
	(0.0103)	(0.0189)	(0.0129)	(0.00822)
PREC_MAR	-0.0316	0.0173	0.0146	0.00323
	(0.0207)	(0.0178)	(0.0229)	(0.0111)
PREC_MAR2	-0.0336	-0.0223	-0.000815	0.00603
	(0.0247)	(0.0171)	(0.0271)	(0.0132)
PREC_ABR	-0.0789***	-0.0119	-0.0468**	-0.0235
	(0.0241)	(0.0235)	(0.0194)	(0.0175)

PREC_ABR2	0.0336 (0.0265)	0.00373 (0.00917)	0.0197 (0.0137)	-0.00362 (0.0108)
PREC_MAI	-0.0164 (0.0188)	0.0275 (0.0160)	0.00778 (0.0106)	0.00920 (0.0137)
PREC_MAI2	-0.0163 (0.0116)	-0.0334*** (0.00679)	-0.0250*** (0.00576)	-0.0135** (0.00557)
PREC_JUN	-0.0195 (0.0140)	0.00173 (0.0109)	0.0202 (0.0169)	0.00265 (0.00754)
PREC_JUN2	0.0128** (0.00529)	-0.000472 (0.00311)	-0.00316 (0.00257)	-0.00175 (0.00179)
PREC_JUL	-0.0378*** (0.00938)	-0.00204 (0.0194)	0.0140 (0.00834)	-0.00629 (0.0168)
PREC_JUL2	0.0137*** (0.00287)	0.00220 (0.00292)	-0.000479 (0.000806)	0.00200 (0.00297)
PREC_AGO	0.0121 (0.0212)	0.0213* (0.0119)	0.0460 (0.0355)	-0.00129 (0.00540)
PREC_AGO2	0.0247*** (0.00666)	0.00617** (0.00234)	0.00118 (0.00568)	0.00334*** (0.000986)
PREC_SET	0.00853 (0.0377)	0.0208 (0.0330)	0.0249 (0.0476)	-0.00997 (0.0298)
PREC_SET2	0.0110 (0.0278)	-0.00694 (0.00759)	-0.0121 (0.00940)	-0.0116*** (0.00324)
PREC_OUT	-0.0348 (0.0321)	0.0632** (0.0251)	0.0702** (0.0280)	-0.00699 (0.0147)
PREC_OUT2	0.0554*** (0.0125)	-0.00261 (0.00715)	-0.0157 (0.0103)	0.00133 (0.00778)
PREC_NOV	-0.0402 (0.0296)	-0.0401*** (0.0137)	-0.0559* (0.0297)	-0.0528*** (0.0160)
PREC_NOV2	0.100** (0.0425)	0.0488* (0.0236)	0.0607* (0.0302)	0.0439** (0.0187)
PREC_DEZ	-0.0352 (0.0274)	0.00225 (0.0354)	0.0365 (0.0284)	0.0301* (0.0171)
PREC_DEZ2	0.00621 (0.0122)	-0.00293 (0.0170)	-0.0156 (0.0181)	-0.00585 (0.00877)
Constant	0.412*** (0.00794)	0.592*** (0.0383)	-0.484 (0.804)	-0.874** (0.319)
Observations	17,703	17,703	17,703	17,703
R-squared	0.136	0.494	0.543	0.785
EF de Cidade	Não	Sim	Sim	Sim
Year FE	Não	Sim	Sim	Sim
STATE-YEAR FE	Não	Não	Sim	Sim
Controls	Não	Não	Não	Sim

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 27 - Econometric Results - Temperature - Coffe.

VARIABLES	(1) lprod_coffe	(2) lprod_coffe	(3) lprod_coffe	(4) lprod_coffe
TEMP_JAN	0.179 (0.132)	-0.381 (0.288)	0.326 (0.213)	0.400* (0.213)
TEMP_JAN2	-18.91** (8.628)	-16.73* (9.582)	-22.61*** (4.024)	-9.310*** (0.486)
TEMP_FEV	2.434*** (0.224)	0.398 (0.449)	0.0913 (0.358)	-0.0775 (0.230)
TEMP_FEV2	-20.71*** (6.217)	-14.25** (6.074)	-9.268* (5.247)	-2.004 (3.760)
TEMP_MAR	-1.551*** (0.379)	1.365*** (0.167)	1.164** (0.518)	0.340 (0.276)
TEMP_MAR2	12.10** (4.758)	1.340 (5.711)	3.624 (6.730)	-3.181 (3.635)
TEMP_ABR	-0.747* (0.374)	-0.784* (0.424)	-0.591*** (0.153)	-0.0732 (0.191)
TEMP_ABR2	19.37** (8.858)	-5.357** (2.537)	-1.855 (1.981)	-1.975 (2.571)
TEMP_MAI	0.211 (0.386)	-0.830*** (0.245)	-0.463** (0.175)	-0.0355 (0.156)
TEMP_MAI2	-9.159*** (2.289)	1.593 (2.565)	-0.788 (3.103)	-0.494 (1.983)
TEMP_JUN	0.408**	0.416	0.613	0.578**

TEMP_JUN2	(0.162) -13.06***	(0.271) -1.058	(0.476) -6.648*	(0.246) -4.795*
TEMP_JUL	(3.160) -0.342	(4.279) -0.0761	(3.602) -0.868*	(2.382) -0.356
TEMP_JUL2	(0.233) 2.194	(0.289) -0.871	(0.439) 3.110	(0.251) 1.783
TEMP_AGO	(1.418) -0.218	(1.924) 0.414	(4.668) 0.843	(2.205) -0.123
TEMP_AGO2	(0.289) -8.704**	(0.364) 4.611	(0.555) 7.355***	(0.531) 4.844***
TEMP_SET	(4.067) 0.0717	(2.698) -0.300	(0.819) -0.0971	(0.658) 0.0474
TEMP_SET2	(0.180) 10.40**	(0.375) 6.654**	(0.180) 2.988	(0.217) 2.329
TEMP_OUT	(4.746) -0.659**	(2.413) -0.237	(3.410) -0.515	(1.960) -0.646**
TEMP_OUT2	(0.291) 11.22*	(0.375) 2.930	(0.545) -2.250	(0.295) 2.475
TEMP_NOV	(5.391) -0.608	(3.825) -0.470	(2.091) -0.140	(2.168) 0.00907
TEMP_NOV2	(0.446) -13.06**	(0.409) -6.182	(0.367) -2.395	(0.205) -6.988
TEMP_DEZ	(5.621) 0.762	(4.986) -0.161	(6.305) -0.0858	(4.358) -0.102
TEMP_DEZ2	(0.473) 9.133***	(0.387) 15.26***	(0.603) 5.579	(0.117) 7.399
Constant	(2.940) 0.412*** (0.00794)	(4.839) 0.592*** (0.0383)	(5.667) -0.484 (0.804)	(6.149) -0.874*** (0.319)
Observations	17,703	17,703	17,703	17,703
R-squared	0.136	0.494	0.543	0.785
EF de Cidade	Não	Sim	Sim	Sim
Year FE	Não	Sim	Sim	Sim
STATE-YEAR FE	Não	Não	Sim	Sim
Controls	Não	Não	Não	Sim

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 28 - Econometric Results - Precipitation - Orange.

VARIABLES	(1) lprod_orange	(2) lprod_orange	(3) lprod_orange	(4) lprod_orange
PREC_JAN	0.341*** (0.0610)	0.0216 (0.0302)	0.0713** (0.0313)	0.0496** (0.0203)
PREC_JAN2	-0.153*** (0.0228)	-0.00700 (0.0104)	-0.0192 (0.0154)	-0.00964 (0.0103)
PREC_FEV	0.0850 (0.263)	-0.00408 (0.0288)	0.0502 (0.0296)	0.0234 (0.0196)
PREC_FEV2	0.0241 (0.0976)	0.0197 (0.0219)	-0.00775 (0.0284)	0.00289 (0.0175)
PREC_MAR	-0.508** (0.191)	0.0356 (0.0270)	0.0290 (0.0172)	0.0389* (0.0201)
PREC_MAR2	0.0552 (0.123)	-0.00257 (0.0153)	0.00157 (0.0111)	0.0113 (0.00729)
PREC_ABR	-0.323* (0.172)	-0.00157 (0.0152)	0.0309** (0.0115)	0.0185 (0.0285)
PREC_ABR2	-0.201* (0.0997)	-0.0372 (0.0316)	-0.0759** (0.0297)	-0.0382*** (0.0130)
PREC_MAI	0.145 (0.115)	0.000355 (0.0107)	0.0143* (0.00812)	-0.0118 (0.0137)
PREC_MAI2	-0.266*** (0.0808)	-0.00540 (0.00805)	-0.0177** (0.00682)	-0.00624 (0.00642)
PREC_JUN	-0.116 (0.0700)	0.0163 (0.0105)	0.00612 (0.00719)	-0.00926 (0.0160)
PREC_JUN2	0.111*** (0.0376)	-0.00771 (0.00497)	-0.00238 (0.00167)	0.00715 (0.00648)
PREC_JUL	-0.415*** (0.0455)	0.00630 (0.0136)	-0.0241 (0.0152)	-0.0235 (0.0155)
PREC_JUL2	0.0722***	0.00674	0.00752	0.00907

PREC_AGO	(0.0197) -0.0574	(0.00611) 0.00219	(0.00604) -0.0177*	(0.00716) -0.00441
PREC_AGO2	(0.0397) 0.0733***	(0.0111) -0.00246	(0.00987) 0.00495	(0.0148) 0.00228
PREC_SET	(0.0198) 0.00598	(0.00808) 0.0300***	(0.00614) 0.0346**	(0.00192) 0.0206*
PREC_SET2	(0.0576) 0.0154	(0.0106) -0.0329***	(0.0146) -0.0224*	(0.0106) -0.00595*
PREC_OUT	(0.0715) 0.00836	(0.0104) -0.0286	(0.0124) -0.0422	(0.00329) -0.0313
PREC_OUT2	(0.0772) -0.116*	(0.0259) 0.000399	(0.0299) 0.00401	(0.0289) 0.00188
PREC_NOV	(0.0597) -0.120	(0.00642) -0.0188	(0.00738) -0.0332	(0.00696) -0.0454
PREC_NOV2	(0.114) 0.101	(0.0257) 0.0103	(0.0261) 0.00435	(0.0284) 0.00393
PREC_DEZ	(0.0820) 0.168***	(0.0170) -0.0298	(0.0186) 0.00442	(0.0179) -0.0417**
PREC_DEZ2	(0.0439) -0.201***	(0.0237) -0.0166**	(0.00531) 0.00639	(0.0201) 0.0179*
Constant	(0.0539) 3.551***	(0.00670) 4.603***	(0.00707) 5.124***	(0.00959) 5.146***
	(0.0964)	(0.0644)	(0.0565)	(0.157)
Observations	65,839	65,839	65,839	65,839
R-squared	0.481	0.923	0.932	0.950
EF de Cidade	Não	Sim	Sim	Sim
Year FE	Não	Sim	Sim	Sim
STATE-YEAR FE	Não	Não	Sim	Sim
Controls	Não	Não	Não	Sim

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 29 - Econometric Results - Temperature - Orange.

VARIABLES	(1) lprod_orange	(2) lprod_orange	(3) lprod_orange	(4) lprod_orange
TEMP_JAN	10.97*** (2.482)	0.765 (0.590)	0.626 (0.640)	-0.411 (0.296)
TEMP_JAN2	11.01 (16.51)	6.586 (5.394)	8.965* (4.359)	-0.906 (5.514)
TEMP_FEV	0.661 (5.137)	-0.944 (0.554)	0.553 (0.750)	-0.0313 (0.413)
TEMP_FEV2	-37.40 (24.16)	4.823 (5.362)	1.429 (3.030)	5.845** (2.217)
TEMP_MAR	-2.326 (1.653)	0.554 (0.554)	-0.482 (0.415)	-0.0362 (0.286)
TEMP_MAR2	4.036 (25.42)	-10.27* (5.886)	-12.16*** (2.890)	-6.268** (2.933)
TEMP_ABR	-16.03*** (3.066)	-0.483 (0.320)	-0.844 (0.597)	-0.791 (0.653)
TEMP_ABR2	98.69*** (20.23)	2.179 (5.356)	-4.228 (5.518)	-2.177 (4.448)
TEMP_MAI	5.805*** (0.875)	0.419 (0.335)	0.747*** (0.143)	0.694*** (0.108)
TEMP_MAI2	-21.08 (18.35)	-2.446 (6.094)	4.733 (5.691)	-1.271 (3.661)
TEMP_JUN	-5.635*** (1.204)	0.0893 (0.172)	0.197 (0.345)	-0.168 (0.320)
TEMP_JUN2	-19.05** (7.659)	-0.899 (1.691)	2.578 (2.308)	0.0116 (2.801)
TEMP_JUL	-4.156*** (1.259)	-0.127 (0.128)	-0.271 (0.305)	-0.164 (0.190)
TEMP_JUL2	15.02*** (3.721)	-0.119 (1.202)	-3.461 (2.445)	-1.564 (1.492)
TEMP_AGO	0.847 (1.019)	-0.165 (0.169)	0.0978 (0.611)	-0.136 (0.261)
TEMP_AGO2	-20.41* (10.73)	-0.955 (1.200)	1.368 (5.077)	-0.976 (2.687)
TEMP_SET	0.943 (0.788)	0.253 (0.230)	0.120 (0.163)	1.079** (0.420)

TEMP_SET2	-2.259 (12.63)	1.795 (1.576)	2.234 (5.080)	5.728 (3.386)
TEMP_OUT	6.410*** (2.240)	0.248 (0.237)	0.423** (0.194)	0.832*** (0.283)
TEMP_OUT2	3.390 (16.62)	4.760** (2.096)	1.918 (1.677)	-1.232 (1.097)
TEMP_NOV	-10.65*** (2.413)	-0.447 (0.299)	-0.597*** (0.179)	-1.599*** (0.462)
TEMP_NOV2	7.792 (21.01)	-1.399 (3.361)	1.352 (2.389)	2.611 (2.885)
TEMP_DEZ	0.443 (1.248)	0.562 (0.343)	0.104 (0.244)	-0.536 (0.494)
TEMP_DEZ2	-86.29** (33.72)	7.910 (7.339)	-4.102 (5.450)	-9.279 (5.802)
Constant	3.551*** (0.0964)	4.603*** (0.0644)	5.124*** (0.0565)	5.146*** (0.157)
Observations	65,839	65,839	65,839	65,839
R-squared	0.481	0.923	0.932	0.950
EF de Cidade	Não	Sim	Sim	Sim
Year FE	Não	Sim	Sim	Sim
STATE-YEAR FE	Não	Não	Sim	Sim
Controls	Não	Não	Não	Sim

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, *

Table 30 - Direct Impacts of Climate Changes on the Selected Cultures by State (in RS billions of 2018).

State	RCP 2.6						RCP 8.5					
	Sugarcane	Soybean	Maize	Bean	Coffe	Orange	Sugarcane	Soybean	Maize	Bean	Coffe	Orange
AC	-R\$ 179.24	-R\$ 8.69	R\$ 0.00	R\$ 244.06	-R\$ 592.83	-R\$ 10.98	-R\$ 736.21	-R\$ 298.66	R\$ 0.00	R\$ 1,512.91	-R\$ 2,099.68	-R\$ 54.72
AL	-R\$ 5,987.53	-R\$ 4,321.74	R\$ 0.00	-R\$ 46.85	-R\$ 88.34	R\$ 0.00	-R\$ 28,482.26	-R\$ 33,020.45	R\$ 0.00	-R\$ 93.57	-R\$ 465.90	R\$ 0.00
AM	-R\$ 269.48	-R\$ 185.06	R\$ 0.00	-R\$ 58.67	-R\$ 36.82	-R\$ 10.15	-R\$ 1,016.63	-R\$ 1,304.15	R\$ 0.00	-R\$ 106.79	-R\$ 112.64	-R\$ 25.88
AP	-R\$ 6.51	-R\$ 4.74	R\$ 0.00	-R\$ 5.59	-R\$ 2.78	R\$ 0.00	-R\$ 27.72	-R\$ 30.09	R\$ 0.00	-R\$ 11.75	-R\$ 17.32	R\$ 0.00
BA	-R\$ 1,779.28	-R\$ 1,191.76	-R\$ 17,503.53	-R\$ 6,484.83	-R\$ 971.41	-R\$ 6,745.57	-R\$ 8,493.60	-R\$ 11,117.34	-R\$ 66,106.75	-R\$ 11,853.07	-R\$ 6,645.34	-R\$ 20,876.22
CE	-R\$ 492.47	-R\$ 525.56	-R\$ 82.42	-R\$ 910.02	-R\$ 344.12	-R\$ 104.51	-R\$ 1,957.20	-R\$ 2,865.92	-R\$ 278.88	-R\$ 1,368.87	-R\$ 2,977.93	-R\$ 266.90
DF	-R\$ 24.38	-R\$ 11.84	-R\$ 154.65	-R\$ 1,008.11	-R\$ 787.85	-R\$ 90.45	-R\$ 159.23	-R\$ 111.38	-R\$ 2,280.41	-R\$ 2,142.39	-R\$ 3,957.12	-R\$ 352.81
ES	-R\$ 381.13	-R\$ 52.39	-R\$ 7.78	-R\$ 368.34	-R\$ 14.13	-R\$ 11,883.34	-R\$ 1,909.94	-R\$ 2,161.90	-R\$ 43.06	-R\$ 697.82	-R\$ 303.80	-R\$ 49,686.66
GO	-R\$ 12,538.34	-R\$ 3,537.99	-R\$ 17,923.46	-R\$ 16,659.43	-R\$ 3,298.83	-R\$ 585.57	-R\$ 70,617.02	-R\$ 57,198.07	-R\$ 110,152.95	-R\$ 43,279.51	-R\$ 17,328.99	-R\$ 2,230.57
MA	-R\$ 1,353.54	-R\$ 865.26	-R\$ 5,662.03	-R\$ 2,670.05	-R\$ 254.40	-R\$ 12.57	-R\$ 6,533.04	-R\$ 8,109.03	-R\$ 27,531.23	-R\$ 7,106.30	-R\$ 1,473.41	-R\$ 38.65
MG	-R\$ 15,053.18	-R\$ 2,474.14	-R\$ 6,970.34	-R\$ 22,878.13	-R\$ 5,171.80	-R\$ 53,686.56	-R\$ 86,060.35	-R\$ 69,183.42	-R\$ 41,688.47	-R\$ 51,847.11	-R\$ 29,110.13	-R\$ 219,261.10
MS	-R\$ 10,581.11	-R\$ 5,488.13	-R\$ 11,063.57	-R\$ 12,466.25	-R\$ 299.38	-R\$ 83.76	-R\$ 69,067.49	-R\$ 60,193.23	-R\$ 80,757.95	-R\$ 30,935.47	-R\$ 1,614.97	-R\$ 378.86
MT	-R\$ 4,274.80	-R\$ 2,315.68	-R\$ 38,502.83	-R\$ 19,867.97	-R\$ 1,833.11	-R\$ 211.32	-R\$ 21,574.52	-R\$ 19,820.17	-R\$ 268,443.60	-R\$ 50,762.00	-R\$ 9,101.34	-R\$ 610.49
PA	-R\$ 243.53	-R\$ 130.69	-R\$ 1,477.19	-R\$ 2,000.85	-R\$ 212.21	-R\$ 153.06	-R\$ 979.46	-R\$ 1,134.30	-R\$ 7,505.53	-R\$ 5,652.39	-R\$ 985.67	-R\$ 338.42
PB	-R\$ 1,165.60	-R\$ 1,407.22	-R\$ 711.72	-R\$ 150.27	-R\$ 25.35	R\$ 0.00	-R\$ 4,390.12	-R\$ 8,306.22	-R\$ 2,112.79	-R\$ 231.42	-R\$ 376.27	R\$ 0.00
PE	-R\$ 3,212.30	-R\$ 3,514.02	-R\$ 515.64	-R\$ 139.97	-R\$ 209.16	-R\$ 33.09	-R\$ 12,434.64	-R\$ 20,669.34	-R\$ 1,800.54	-R\$ 230.38	-R\$ 1,110.46	-R\$ 88.89
PI	-R\$ 260.43	-R\$ 218.06	-R\$ 2,736.92	-R\$ 1,939.23	-R\$ 335.12	R\$ 0.00	-R\$ 1,205.50	-R\$ 1,675.75	-R\$ 14,345.13	-R\$ 4,284.24	-R\$ 1,909.71	R\$ 0.00
PR	-R\$ 14,016.53	-R\$ 6,484.66	-R\$ 20,549.02	-R\$ 34,202.61	-R\$ 9,665.99	-R\$ 3,798.47	-R\$ 103,277.17	-R\$ 81,898.21	-R\$ 190,938.49	-R\$ 79,420.53	-R\$ 48,898.41	-R\$ 18,755.79
RJ	-R\$ 478.52	R\$ 38.48	R\$ 0.00	-R\$ 47.70	-R\$ 9.70	-R\$ 270.05	-R\$ 2,447.91	-R\$ 2,282.28	R\$ 0.00	-R\$ 95.94	-R\$ 74.84	-R\$ 1,182.98
RN	-R\$ 678.48	-R\$ 834.35	R\$ 0.00	-R\$ 28.78	-R\$ 9.07	R\$ 0.00	-R\$ 2,795.02	-R\$ 4,300.30	R\$ 0.00	-R\$ 43.36	-R\$ 165.28	R\$ 0.00
RO	-R\$ 299.05	-R\$ 155.98	-R\$ 931.25	-R\$ 955.14	-R\$ 421.92	-R\$ 533.46	-R\$ 1,283.70	-R\$ 1,595.76	-R\$ 7,416.98	-R\$ 2,192.79	-R\$ 1,193.66	-R\$ 4,106.76
RR	-R\$ 5.73	-R\$ 4.69	-R\$ 71.12	-R\$ 27.76	-R\$ 16.96	R\$ 0.00	-R\$ 22.43	-R\$ 30.51	-R\$ 299.36	-R\$ 65.83	-R\$ 89.99	R\$ 0.00
RS	-R\$ 1,577.70	-R\$ 715.57	-R\$ 15,399.14	-R\$ 10,909.90	-R\$ 1,538.66	R\$ 0.00	-R\$ 9,812.45	-R\$ 6,818.54	-R\$ 130,083.15	-R\$ 22,935.23	-R\$ 7,633.64	R\$ 0.00
SC	-R\$ 3,132.32	-R\$ 1,523.72	-R\$ 1,568.16	-R\$ 7,028.60	-R\$ 1,766.19	-R\$ 82.06	-R\$ 19,659.67	-R\$ 14,796.79	-R\$ 17,411.38	-R\$ 14,357.45	-R\$ 8,416.27	-R\$ 302.85
SE	-R\$ 692.28	-R\$ 437.93	R\$ 0.00	-R\$ 1,826.39	-R\$ 142.14	R\$ 0.00	-R\$ 3,483.92	-R\$ 3,842.61	R\$ 0.00	-R\$ 3,869.94	-R\$ 716.40	R\$ 0.00

SP	-R\$ 84,203.95	-R\$ 27,156.77	-R\$ 2,355.22	-R\$ 10,908.95	-R\$ 1,884.66	-R\$ 8,191.34	-R\$ 514,570.72	-R\$ 425,950.12	-R\$ 19,082.95	-R\$ 24,744.55	-R\$ 9,140.35	-R\$ 38,168.64
TO	-R\$ 576.62	-R\$ 296.83	-R\$ 4,677.00	-R\$ 845.53	-R\$ 130.46	R\$ 0.00	-R\$ 2,594.41	-R\$ 2,113.68	-R\$ 23,039.72	-R\$ 2,617.70	-R\$ 823.72	R\$ 0.00
TOTAL	-R\$ 163,464.05	-R\$ 63,825.00	-R\$ 148,862.97	-R\$ 154,191.85	-R\$ 30,063.39	-R\$ 86,486.31	-R\$ 975,592.32	-R\$ 840,828.23	-R\$ 1,011,319.35	-R\$ 359,433.50	-R\$ 156,743.24	-R\$ 356,727.18

Direct, Indirect and Total Impacts under the Brazilian Economy.

Table 30 - Direct, Indirect and Total Impacts under the Brazilian States (in millions of R\$, 2018).

State	RCP 2.6			RCP 8.5		
	Direct Impact	Indirect Impact	Total Impact	Direct Impact	Indirect Impact	Total Impact
AC	-R\$ 547,68	R\$ 99,64	-R\$ 448,03	-R\$ 1.676,36	-R\$ 2.872,61	-R\$ 4.548,96
AL	-R\$ 10.444,45	-R\$ 5.605,02	-R\$ 16.049,48	-R\$ 62.062,18	-R\$ 13.607,29	-R\$ 75.669,47
AM	-R\$ 560,18	R\$ 293,26	-R\$ 266,92	-R\$ 2.566,09	-R\$ 28.030,72	-R\$ 30.596,81
AP	-R\$ 19,62	-R\$ 17,90	-R\$ 37,52	-R\$ 86,89	-R\$ 2.774,34	-R\$ 2.861,22
BA	-R\$ 34.676,39	R\$ 1.714,85	-R\$ 32.961,55	-R\$ 125.092,32	-R\$ 73.910,43	-R\$ 199.002,75
CE	-R\$ 2.459,11	-R\$ 4.313,33	-R\$ 6.772,44	-R\$ 9.715,69	-R\$ 32.921,01	-R\$ 42.636,71
DF	-R\$ 2.077,28	-R\$ 854,95	-R\$ 2.932,23	-R\$ 9.003,35	-R\$ 47.025,99	-R\$ 56.029,34
ES	-R\$ 12.707,10	R\$ 1.301,53	-R\$ 11.405,57	-R\$ 54.803,18	-R\$ 30.303,60	-R\$ 85.106,78
GO	-R\$ 54.543,62	R\$ 6.095,29	-R\$ 48.448,33	-R\$ 300.807,12	-R\$ 54.731,02	-R\$ 355.538,14
MA	-R\$ 10.817,86	R\$ 1.066,46	-R\$ 9.751,39	-R\$ 50.791,66	-R\$ 16.975,71	-R\$ 67.767,37
MG	-R\$ 106.234,15	-R\$ 25.392,61	-R\$ 131.626,76	-R\$ 497.150,60	-R\$ 155.499,69	-R\$ 652.650,29
MS	-R\$ 39.982,19	-R\$ 868,75	-R\$ 40.850,94	-R\$ 242.947,97	-R\$ 25.253,17	-R\$ 268.201,14
MT	-R\$ 67.005,71	R\$ 6.571,00	-R\$ 60.434,71	-R\$ 370.312,12	-R\$ 38.901,97	-R\$ 409.214,09
PA	-R\$ 4.217,54	R\$ 4.312,00	R\$ 94,46	-R\$ 16.595,78	-R\$ 25.823,60	-R\$ 42.419,38
PB	-R\$ 3.460,16	-R\$ 1.272,70	-R\$ 4.732,85	-R\$ 15.416,83	-R\$ 12.425,80	-R\$ 27.842,63
PE	-R\$ 7.624,18	-R\$ 5.346,89	-R\$ 12.971,06	-R\$ 36.334,25	-R\$ 40.499,46	-R\$ 76.833,71
PI	-R\$ 5.489,76	R\$ 368,85	-R\$ 5.120,92	-R\$ 23.420,33	-R\$ 9.298,36	-R\$ 32.718,69
PR	-R\$ 88.717,29	R\$ 949,75	-R\$ 87.767,53	-R\$ 523.188,61	-R\$ 127.388,13	-R\$ 650.576,74
RJ	-R\$ 767,49	-R\$ 7.556,11	-R\$ 8.323,60	-R\$ 6.083,95	-R\$ 179.496,39	-R\$ 185.580,34
RN	-R\$ 1.550,68	-R\$ 934,07	-R\$ 2.484,75	-R\$ 7.303,95	-R\$ 17.345,04	-R\$ 24.649,00
RO	-R\$ 3.296,80	-R\$ 895,54	-R\$ 4.192,34	-R\$ 17.789,65	-R\$ 10.576,98	-R\$ 28.366,63
RR	-R\$ 126,26	-R\$ 12,94	-R\$ 139,21	-R\$ 508,12	-R\$ 2.087,15	-R\$ 2.595,26
RS	-R\$ 30.140,97	R\$ 7.175,20	-R\$ 22.965,77	-R\$ 177.283,02	-R\$ 119.697,02	-R\$ 296.980,04
SC	-R\$ 15.101,05	-R\$ 1.249,09	-R\$ 16.350,13	-R\$ 74.944,40	-R\$ 69.791,52	-R\$ 144.735,93
SE	-R\$ 3.098,73	-R\$ 1.964,48	-R\$ 5.063,21	-R\$ 11.912,87	-R\$ 10.783,59	-R\$ 22.696,46
SP	-R\$ 134.700,89	-R\$ 68.822,66	-R\$ 203.523,55	-R\$ 1.031.657,32	-R\$ 624.567,92	-R\$ 1.656.225,24
TO	-R\$ 6.526,44	-R\$ 242,86	-R\$ 6.769,30	-R\$ 31.189,24	-R\$ 6.713,91	-R\$ 37.903,15
TOTAL	-R\$ 646.893,57	-R\$ 95.402,05	-R\$ 742.295,62	-R\$ 3.700.643,83	-R\$ 1.779.302,44	-R\$ 5.479.946,28

SS00_6. Forty under Forty

1063 THE IMPACTS OF BLACKOUTS ON MICRO, SMALL MANUFACTURING ENTERPRISES PERFORMANCE: EVIDENCE FROM INDONESIA

ABSTRACT

Indonesia, home to more than 3.5 million micro-, small-sized enterprises (MSEs) in the manufacturing industry, is struggling to provide reliable electricity supply in some regions. While some people may be pessimistic on the role of MSEs in the economy, in Indonesia MSEs are essential mainly because they create large employment and are among priorities of the Indonesian government. Nevertheless, little is known about how blackouts affect MSE's performance. This paper estimates the impact of power blackouts on the productivity of Indonesia's manufacturing MSEs. We employ a pseudo-panel dataset covering six cohorts and 21 PLN-electricity company working areas for the period 2010–2015. The pseudo-panel data are constructed from repeated cross-sectional surveys on MSEs by grouping enterprises into cohorts based on factor intensity (labour, capital and resource) and size (micro, small), then tracking them over time. Our identification strategies involve examining blackouts determinants and controlling for factors that potentially affect productivity and are potentially correlated with blackouts. We find that under-investment in the power sector and PLN poor governance are among reasons why Indonesia has blackouts. We then use these factors as instruments for blackouts and conduct IV dynamic-panel fixed effects estimations while controlling for cohort characteristics, infrastructure, and weather factors. The IV estimates suggest that blackouts reduce the average labour productivity by 5.5 percent. This result robust to a set of robustness check.

Comparing the IV results with those of dynamic-panel FE estimates, we find that instrumenting blackouts helps to address endogeneity problems. Moreover, this study shows that adopting a captive generator, as one way to cope with unreliable power supply, is positively associated with productivity. MSEs that have a captive generator are benefited more when the power supply is poor. With this in mind, it is crucial to improving PLN electricity supply reliability. This paper also provides a discussion on the role of the government in addressing blackouts problem, such as by the introduction of a regulatory initiative. Our findings will be able to assist policy makers to prioritize relative to other economic disadvantages that MSEs face. To our knowledge, ours is among a few paper that uses extensive data on MSEs and provides the first known estimates of the impact of blackouts on MSEs in Indonesia. The estimates add to findings from other countries, which mostly focused on larger firms.

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1277 SOCIAL INTEGRATION: INDIVIDUAL SOCIAL CAPITAL FORMATION AND THE STATE IDEOLOGY INDOCTRINATION COURSES IN INDONESIA

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ABSTRACT

Indonesia is the largest archipelagic and multi-ethnic country in the world that has been facing a challenge to glue the nation together across various ethnic groups and well spatially distributed. The Soeharto regime had implemented a state ideology courses that taught norms and values of the social capital element which considered by scholars as the most pervasive effort in Indonesian history. This paper investigates the potential role of the Indonesian state ideology indoctrination courses during the period 1978–1998 on the long-run development social integration by mean of individuals' social capital formation. The reform in 1998 offers a setting to exploit a fuzzy regression discontinuity design focused on the effect of the termination of the courses on social capital. The results suggest that the course had limited impact on the individual social capital of. While it is shown that the expected adolescence period's participation is statistically significant between control and treatment cohort, the course the course did not alter changes in the individual social skills and social capital measures. Citizens aged 13 or older in 1998 who were exposed to the courses do not have statistically different social capital measures compared to citizens aged 12 or younger in 1998. The results are robust to the use of various bandwidth, the inclusion of predetermined socio-economic outcomes, and subsampling the observation by gender and location. The results suggest that the role of state ideology indoctrination courses of the type seen in Suharto's Indonesia might on social integration be limited. The implication for a policy context is that a further refinement is needed for any similar proposed program in the future both in Indonesia and elsewhere in the world with a similar background.

Keywords: state ideology courses, social capital, Indonesia

JEL Classification: D71, I25

1 INTRODUCTION

Is it possible to build the element social capital at the individual level? A large body of literature empirically tests the importance of *community development program* to build social capital acknowledging the notion of social capital as a measure at the community level (Dale and Newman 2010; Olken 2010; Torres-Vitolas 2017; Woodhouse 2001; Woolcock and Narayan 2000). More rarely it investigated how social capital formation is formed at the individual level (Glaeser 2001). Our investigation is about the potential role of education on individual social capital. Our focus is an individual educational experience that promotes collective action and so creates social capital at the individual level during their adolescence. Specifically, we test the impact of students' exposure to state ideology courses in Indonesia within the period of New Order Era on their social skills or personality traits related to social capital such as openness, extraversion and trust. The investigation will complement the mainstream analysis of return to education which often focuses on labour market outcome. Also, it will serve as cost-effectiveness analysis of the type of program for social capital formation against the standard social capital formation at the community level.

Social capital influences the key economic outcomes, such as poverty (Cleaver 2005; Narayan and Pritchett 1999), income (Zhang and Anderson 2011) and food security (Levien 2015; Martin et al. 2004). Beyond what is known as standard physical capital, the notion of social capital has demanded attention in the development analysis due to its nature of participatory, sustainability and the contextualization of the social dimension of development (Bebbington et al. 2004). Despite the important role of social capital for economic development, the definition and concept of social capital itself, however, have been evolved and covered a wide range of views and interpretations.

One of the definition, among others, is by Pierre Bourdieu: "the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalised relationships of mutual acquaintance or recognition" (Bourdieu 1986). Other scholars emphasise the element of possession of social ties and collective action as the definition of social capital (Bloch, Genicot, and Ray 2007; Fukuyama 2001). Or, social capital simply can be defined as community resources that increase the welfare of that community (Glaeser 2001). The bottom line of the role of social capital is thus can be inferred coming from collective action's function in improving efficiency (Ostrom 1994).

Indeed, some empirical tests, have shown that collective actions improve social outcomes by correcting market failures such as correcting information asymmetry for local decision making (Olken 2010) and monitoring local governance for public goods provision (Olken 2007) and improve social targeting precision (Alatas et al. 2012). The role of social capital is also found in securing income fluctuation by informal insurance from friends, neighbour and the community to maintain welfare (Munshi and Rosenzweig 2016).

Specifically, empirical studies also show that individual social capital plays a significant role to improve food security. These include improving food availability (Matuschke and Qaim 2009) and improving income-the economic access to food (Narayan and Pritchett 1999; Simmons, Winters, and Patrick 2005) or establishment of food banks for the nutritional need of hungry people (Riches 2002). The author shows that the size of the individual social network increases their likelihood to adopt a more productive seed after isolating the peer effects among wheat farmers in India. Matuschke and Qaim (2009) demonstrates the evidence of the causal impact of village social capital on agricultural income and largely through the adoption of improved agricultural practices and better access to insurance in Rural

Tanzania. Still in the context of agricultural income improvement; Narayan and Pritchett (1999) show that participation in contracts farming induced by association with the farmer's social group yields better income than not participating.

There has been abundance literature examines the role of social capital on social outcomes. However, the opposite, the analysis that puts social capital on the left-hand side, i.e. a question about social capital formation is relatively thin. One among few is the framework introduced by Glaeser (2001) who postulated the investment toward individual social capital as an analogue to investment in individual human capital. He suggests two possible intervention to promote social capital formation at the individual level: (i) education and (ii) environment, i.e. ethnicity heterogeneity. The conventional view of community-level social capital formation, on the other hand, is in favour of the community development-type intervention. This approach argues that social capital is an aggregate outcome at the community level which can be enhanced by stimulating the community to perform a collective action. Conventional community development programs take a form such as *Kecamatan Development Program* (KDP) in Indonesia (Prasta et al. 2004) and *Prodepine* in Ecuador (Bebbington et al. 2004). These programs, however, is not free from criticism and caveats resulted from some project implementation. The program has the mixed result whether it promotes community social capital (Labonne and Chase 2011), has limited ability to maintain local social structure, and results in other problems such as corruption such as elite capture (Woodhouse 2001) or unfavourable to the vulnerable group (Torres-Vitolas 2017).

This article emphasises the role of the specific type of education to build individual social capital. The argumentation is coming from the fact that the size of resource dedicated to the program was not trivial and account for opportunity cost of time for students for other beneficial activities. Moreover, the unintended positive effect of education on social capital is thinly examined. If investing the public fund through education also could create improvement in other social outcomes by social capital; we need to take it as another form of the return on this specific education. In contrary, if the program is not effective, a refinement of the design and lesson learned from the program itself is the worthwhile investigation.

Education in general or in a specific form such as citizenship education or moral education is one of the non-targeted programs that could play a role in enhancing, for example, food security through a social capital variable. The programs have a clear consequence on individual views on society, civic engagement and their political view (Heggart 2015; Print and Coleman 2003). These individual attributes are the elements of the social capital about the possibility of conducting a collection action, at the individual level.

The main question addressed in this article is whether the state ideology indoctrination courses seen in Indonesia's Soeharto era had an impact on individual social capital. Indonesia is among countries in the world which experienced a natural experiment. It is exposing adolescence period with the strong social environment that differ with the rest of time of their life. Other countries are China with its national movement to send urban junior and senior high school graduates to rural areas (Gong, Lu, and Xie 2015; Meng and Gregory 2002) or some post-Soviet countries with the communist environment (Alesina and Fuchs-Schündeln 2007; Nejad and Kochanova 2017). Indonesia introduced a pervasive and intensive effort in promoting citizenship education in the 1980s followed by an implementation of state ideology (indoctrination) courses known as P4. The P4 program in Indonesia, with the translation of "The Guidelines for Understanding and Practices of Pancasila (the state ideology)" is a program aimed at standardising citizen's understanding of the state's ideology during the New Order Era (Nishimura 1995). Among citizenship education appears in many developing or developed countries, P4 is notably as one of the programs with massive support devoted to it. The amount of budget dedicated is as comparable to Soviet's Communist Agency.

The unexpected discontinuation of P4 training in 1998 due to the political reform (*reformasi*) provides a natural experiment that allows us to test the effect of the program on individual social capital. The birth cohort exposed and non-exposed at around the cut-off year of a birth cohort of the discontinuation is valid treatment and counterfactual group to test the long-run impact of the courses taught in the P4 program on elements of individual social capital.

The result suggests that the program effect does not last in the long-run to affect individual social capital. While the course increases inter-faith and inter-ethnic trust, the course did not alter changes in the level of trust for practical matters and civic participation. The channel analysis supports the main outcome analysis. Indeed, the program did not change any latent personal skills related to social capital. The measures of extraversion, openness and trust are not different between the treatment and the control group. Also, the heterogeneous impact estimates show that it is a bit clearer for a subpopulation living in urban with idea level outcomes but not practical-related outcomes. It suggests that a combination of the course itself and the real-life facilitating environment could make the program is more effective. We conclude that the role of state ideology indoctrination courses of the type seen in Suharto's Indonesia on the individual social capital formation is limited. It will be limited to general social capital formation but relatively effective for promoting bridging social capital at the cognitive level. We infer that the non-targeted program's (within the area of education) role to build individual social capital, in the long run, is limited. This finding contributes to the literature into a debate whether the government can affect the formation of social capital through education.

This study is different to the previous literature in the sense that we focus on the large scale and education-embedded intervention to build individual social capital. Education is merely not intended as the substitute for a community development project-type approach to building social capital, but rather as an alternative perspective to compare 'a cost-effective' sense between the two approaches. The rest of the paper is organized as follow. Section 2 explains the framework and background of the (P4) program, Section 3 formulates empirical strategy, Section 4 describes the data, Section 5 presents the results and Section 6 concludes.

2 FRAMEWORK AND BACKGROUND

2.1 Social Skill Formation at Adolescence Time

We outline the stock of individual elements of social skills (X_t) formation in the spirit of (Cunha and Heckman 2007) as the following. X_t comprises both cognitive (such as a knowledge that one should trust others) and non-cognitive skills (such as extroversion and agreeableness). Let assume that X_t is formed in a multistage technology during individuals' period in the life cycle for example early childhood, adolescence, adulthood, etc. and each stage can have different technologies. The input in every stage are a parental investment, schooling, social environment, individual investment (such as participating in the social club) or policy intervention to produce outputs i.e. social skills at the next stage. The production function of such skill at time t is

$$X_{t+1} = f_t(X_t, I_t) \quad (1)$$

For all past inputs, the current stock of social skills for individual born with the initial condition of X_1 is

$$X_{t+1} = f_t(X_1, I_1, I_2, I_t) \quad (2)$$

We further assume a positive and diminishing return on investment in every stage, i.e. the production function f_t is increasing and concave with respect to I_t . However, every stage may have different productivity, such as the same non-cognitive skills investment made at adolescence yields higher return than at adulthood. If period t^* is a 'golden period' for producing non-cognitive skill X_{t+1} , then holding other constant, intervention that affect this outcome are more profound than in other stages ($s \neq t$).

$$\frac{\partial X_{t+1}}{\partial I_s} < \frac{\partial X_{t+1}}{\partial I_t}, \text{ for all } s \neq t \quad (3)$$

In an empirical application, we test the assumption that there a possibility of interaction between inputs over time. For example, the education intervention could yield higher X_{t+1} = *inter-ethnic trust* for individuals with better past inputs such as living in more heterogeneous ethnic than individual with the homogeneous environment. There would be also other input that matters such as gender dimension and parental investment for the interaction assumption. In this study, we test the gender interaction dimension as well. The opposite effect could also arise such as social tension arises from ethnic diversity. In Indonesia, ethnic tension is not surprising events such as in Maluku Province, hence, we test the possibility of such ethnic heterogeneity effect toward to the extent the lasting of the program effect.

2.2 Background

In 1978, the Indonesian government governed by late President Soeharto introduced a state ideology indoctrination course in Indonesian education system. Preceded by the compulsory education program in 1974, the government emphasise the program's importance by the massive school construction (Duflo 2001). The New Order government at the time, took the opportunity of a period of change of social-political from Soekarno regime. The government attempt to include the new 'interpretation' of the state ideology as teaching materials in schools, not only public but also a private school. They tried to ensure the state ideology became citizen's social norm and values inherently (Nishimura 1995).

The practical guidance of the state ideology which consists of 36 items derived from the five pillars of the state ideology, Pancasila, was used as the material of education (indoctrination). Some of the items in P4 emphasise the norm to enhance social engagement, trust, and collective actions which are the elements of social capital. The program was abandoned in 1998 at the same time of the fall of Soeharto regime along with the demand for national reform, the *reformasi*. Therefore, from 1978 to 1998, any Indonesian citizen entered formal education at junior, senior high school and university, i.e. *adolescence* period, was likely participating in a week, intensive workshop, known as *penataran P4*. Some scholars acknowledge that the training was also expanded in the non-education sector on an ad-hoc basis for civil servant recruit orientation days, farmers' association events and so on (Nishimura 1995), however, this paper does not focus on this type of program due to its difficulty to identify the participants.

We argue that this workshop can form long-term individual's social skills not only because it contains norms and values encouraging collective actions but also it happens at the 'golden time' period, i.e. adolescence time and in a 'well-supported environment'. The program was so intense in the sense that it supported by a strong environment of the dictatorship government which was fully backed up by the military. The social environment situation, for example, is illustrated by most of the media campaign were engineered by the regime to support the regime's development program effectiveness (G. J. Aditjondro 1994; G. Aditjondro and Kowalewski 1994). For these reasons, one would expect a quite effective effect to cast individual's non-cognitive skills. It was politically incorrect for Indonesian in the New Order period to criticise the norms and values during the course, otherwise social sanction will apply. The program, thus, is considered as a massive and intensive effort seen in the history of Indonesia. Our word frequency analysis on the P4 text shows that words such as attitude, cooperation, respect, mutual and unity are among words that appear in the most twenty percent word repeated in the text (Table 1). In addition to this, the jargon (*gotong-royong*) which means collective action and (*Bhinneka tunggal ika*) which means unity in diversity is also considered as a phrase that frequently used during the courses.

Table 1. Summary Statistics

IFLS 5 Variables	Control (P4 Training=0)			Treatment (P4 Training=1)			Total		
	mean	sd	#of obs.	mean	sd	#of obs.	mean	sd	#of obs.
Gender (male=1)	0.45	0.50	2558	0.44	0.50	2572	0.45	0.50	5130
Age	28.34	1.76	2558	30.45	1.29	2572	29.40	1.87	5130
Year of Schooling	9.56	3.42	2515	11.87	2.48	2553	10.72	3.20	5068
Location(Urban=1)	0.51	0.50	2558	0.64	0.48	2572	0.58	0.49	5130
<i>Religion</i>									
Islam	0.91	0.29	2558	0.90	0.30	2572	0.90	0.30	5130
Catholic	0.03	0.18	2558	0.04	0.20	2572	0.04	0.19	5130
Protestant	0.01	0.08	2558	0.01	0.11	2572	0.01	0.10	5130
Hindu	0.05	0.22	2558	0.05	0.21	2572	0.05	0.21	5130
Buddha	0.00	0.03	2558	0.00	0.04	2572	0.00	0.04	5130
Social Skill Index	-0.04	0.39	2558	0.03	0.37	2572	-0.01	0.38	5130
Trust Index	-0.04	0.43	2558	-0.04	0.41	2572	-0.04	0.42	5130
Social Participation Index	0.10	0.10	2558	0.11	0.10	2572	0.10	0.10	5130
<i>Predetermined socio-economic outcome at age 12</i>									
Number of Room in the house	3.61	1.55	2558	3.96	1.74	2571	3.79	1.65	5129
Household size in person	6.00	2.27	2557	6.01	2.58	2572	6.01	2.43	5129
Biological parents still married	0.91	0.29	2474	0.92	0.27	2492	0.91	0.28	4966
Live with biological mother	1.28	0.95	2558	1.26	0.92	2572	1.27	0.94	5130
Live with biological father	1.40	1.08	2558	1.38	1.08	2572	1.39	1.08	5130
Have electricity=1	0.71	0.45	2558	0.83	0.38	2572	0.77	0.42	5130
Have Piped Water=1	0.15	0.36	2558	0.19	0.39	2572	0.17	0.38	5130
Have Pumped Water=1	0.18	0.38	2558	0.21	0.41	2572	0.20	0.40	5130
Have Well Water=1	0.48	0.50	2558	0.44	0.50	2572	0.46	0.50	5130
Have Mineral Water=1	0.02	0.13	2558	0.02	0.14	2572	0.02	0.13	5130
Household head is self-emp.=1	0.25	0.43	2558	0.21	0.41	2572	0.23	0.42	5130
Household head is gov. emp.=1	0.06	0.24	2558	0.13	0.34	2572	0.10	0.29	5130
Household head is private emp.=1	0.17	0.37	2558	0.19	0.39	2572	0.18	0.38	5130
SUSENAS 2012									
<i>Variables</i>									
Gender(Male=1)	0.48	0.5	17010	0.48	0.5	11429	0.48	0.5	28439
Age	26.24	1.93	17010	28.52	1.13	11429	27.15	2	28439
Location(Urban=1)	0.37	0.48	17010	0.54	0.5	11429	0.43	0.5	28439
Year of Schooling	8.26	4.25	17010	11.68	2.69	11429	9.64	4.06	28439

Despite this strong circumstance to support the existence of the long-term effect, the euphoria arises aftermath the program termination to disregard and abandon all life aspects associated with the New Order since the *reformasi* can against the direction of the long-term effect. This euphoria could undermine the impact as the euphoria effect offsets the build-up effect. We take into account this consideration and interpret the estimate as the lower bound of the treatment effect.

3 EMPIRICAL STRATEGY

3.1 General Framework

P4 introduction in 1978 and its unexpected discontinuation in 1998 both were a natural experiment which provides an opportunity to implement a regression discontinuity design. In 1978, the regime pervasively introduced the program for the whole citizen started with the civil servants and government official. In 1998, the program was forcedly stopped due to the political reform, the *reformasi*. The discontinuation, especially, provides an exogenous shock as none of Indonesian anticipated this termination event. Thus, the birth cohorts belong to the implementation period are the treatment, and the cohorts belong to pre and post-program are the counterfactual group of the program.

Therefore, there are two options of cut-off for an RD design, the year of 1978 and 1998. The year of 1998 setting is less problematic for RD setting than the year of 1978. The introduction of P4 in 1978 was confounded by other major policies such as massive school construction (SD INPRES started in 1973) and compulsory education program (*WAJAR*) announced in 1984). These policies' effect, was deemed to be asymmetrically applied only to the treatment cohorts and not the control cohort. The cut-off will represent multi-treatment than the only P4 program. As for the case of the year 1998 cut- off, it seems less confounding appeared. As mentioned above, there had been euphoria to disregards norms and values associated with the New Order era. The euphoria seems to be uniformly experienced by most adult Indonesian who witnessed the reform, but not for young Indonesian. Its relevance to our analysis is that the euphoria will not invalidate our comparative analysis of the

program effect as long as we do not mix the control group with young Indonesian who did not acquire the euphoria. In another word, the correct use of bandwidth will be crucial for comparability purpose. Also, other event accompanied the political turmoil was the 1998 economic crisis that might also confound the estimate. We argue that the bias due to this case is less pronounced as the economic crises' effects are at national level and it should be symmetrically distributed across all cohorts.

To our best knowledge, there is no survey data that asked individual participation in the P4 program. Fortunately, the age and education specific component of the natural experiment provides us with the opportunity to extract available information in the survey data to reveal the expected, not the actual, treatment status of an individual. If an individual happens to be in the first year of junior, senior high school or university level during the period 1978-1998, put aside absenteeism at the time of the workshop, he/she should have participated in the program, i.e. treated. Under this approach, therefore, what we measure is the intention to treat-effect (ITT) and not the actual treatment on the treated-effect (ATE).

Accordingly, the set-up of a fuzzy-regression discontinuity is the following. In the first stage, we estimate the probability of individual being in either treatment or control group D_i on a dummy equals one if the normalised birth cohort is above the cut-off and 0 otherwise T_i . In the second stage, we estimate the outcome variable (i.e. social capital measure S_i) on \bar{D}_i . The estimating equations is defined as:

$$\text{First stage: } D_i = \alpha + \beta T_i + f(yob_i) + \varepsilon_{1i} \quad (4)$$

$$\text{Second stage: } S_i = \gamma_1 + \delta \bar{D}_i + f(yob_i) + \varepsilon_{2i} \quad (5),$$

and $f(yobi)$ is the polynomial function of the birth cohort (the running variable).

An indicator of whether an individual belongs to above or below the birth cohort cut-off serves as an excluded instrument in the two-stage least square (2SLS) regression of expected participation in the program on the outcomes (Aguero and Bharadwaj 2014; Klaauw 2002; Parinduri 2016). In our dataset context, the birth cohort before and after the program implementation exclusively affects the formation of individual social capital through their expected participation in P4 training. Given the fact that we produce a very high F-test when we implement this setup, we also run a sharp RD design of the following which does not alter significant changes in the estimated coefficient. The large F-test is as a result of perfect prediction for the treatment coefficient (β) for T=0 but not for T=1 or because perfect compliance was detected on at least one side of the threshold. This case is applied when we use the national representative survey data (SUSENAS), but not when we use IFLS 5 data .

$$S_i = \gamma_2 + \delta T_i + f(yob_i) + \varepsilon_{3i} \quad (6)$$

3.2 Estimate Particulars

Running variable and cut-off definition. Indonesian government changed the start of academic calendar from January to July in mid-1978 (Parinduri 2016), just at the same year when the P4 program was started. Accordingly, the academic calendar during the period of P4 implementation, i.e. the period of 1978-1998 follows July to August of the consecutive year-scheme. Furthermore, Indonesia's education system requires child aged minimum seven years old in July for elementary school admission. Thus, to approximate a time when an individual's spent for their first year in either the junior high school, senior high school or university, we employ information of the date of birth, what age did they enter each school level, and their education profile, i.e. school level completed. From this information, we can extract whether the time spent was within 1978-1998 in which P4 was implemented.

We define the running variable as the quarter birth cohort with the normalised value (equals to 0) at 1985-Q3 (third quarter). We also reverse the values for ease of graphical representation. The P4- program was discontinued in 1998 and the standard starting year for junior high school is 13 years old. Consequently, if individuals entered school with no early admission and younger than 13 years old in 1998 (born in 1985 or later) should not experience P4-program and in contrary, those who born before 1985 with no delay in school admission, should participate the P4 program. Their expected exposure to the program is conditionals to the education level experienced.

Optimal bandwidth. As it is general in RD design, greater bandwidth leads to greater efficiency but at the risk of including the observations that are not comparable. We calculate the optimal bandwidth using data-driven bandwidth selectors based on the recent work of Imbens and Kalyanaraman (2012) and (Calonico, Cattaneo, and Titiunik 2014). Then we interpret the optimal bandwidth by the circumstance of treatment intensity and cohort effect. The data-driven selectors provide justifiable optimal bandwidth on this ground. We separate the calculation of optimal bandwidth for each group of treatment category accommodating the possibility of differences in characteristics due to age. Then we take the minimum as suggested by Imbens and Lemieux (2008). To check the sensitivity of the result to the choice of bandwidth, we conduct the estimates with bandwidth from $h^* - 5$ to $h^* + 5$.

Standard error. The standard errors in the estimates are clustered at the birth cohort level to rule out the sampling error and obtain a conservative statistical inference.

Falsification tests. We do some falsification tests including the density-manipulation test (Cattaneo, Jansson, and Ma 2016) and using different cut-off, i.e. by omitting the observation with a year of birth 1985 and 1984. We follow the approach of Aguero and Bharadwaj (2014) for this falsification test.

Selection to education. The participation of the P4 program is a selective mechanism through education. In this context, there is a potential unobserved confounder of ability if we use the OLS approach for equation 6. Ability and individual social capital are likely to be correlated. Thus a selection to education might create bias due to the presence of ability bias as a standard problem in estimates dealing with education (Willis and Rosen 1979). However, the fuzzy RD setting ensures that ability in ε , is not correlated with ε . Therefore, the selection to education is solved using birth cohort as the instrumental variable as in the fuzzy RD setting.

Varying Treatment Intensity. The combination of education specific component of the program and age makes a heterogeneous treatment intensity. Individual P4-training dummy of D_i masks three cases of treatment intensities: an individual with one, two and three occasions of experiencing P4 training.

These three cases correspond to the group of individuals aged 13 to 15; aged 16 to 18; and aged 19-22 respectively due to their education level in 1998. Individual aged 13 to 15 were only able to get once P4 training even though they can pursue to higher education as the program terminated in 1998. It is not the case for two other groups of older individuals. The use of P4-training dummy has not incorporated these varying intensities. Hence, to incorporate the heterogeneous treatment intensity effect we use a standard fuzzy estimate with an interaction term (Stancanelli and Soest 2012).

4 DATA AND VARIABLE

We use both Indonesia Family Life Survey (IFLS) 5 of Rand Corporation, the latest wave of the longitudinal survey and SUSENAS Social and Culture Module data (2012) of National Bureau of Statistics (BPS) nationally representative sample of the Indonesian population. The datasets contain information on social capital and cohort of birth which allows us to perform the analysis. The IFLS data, especially, has the advantage to construct a finest running variable at the date of birth whereas SUSENAS at the year of birth only. On the other hand, SUSENAS is rich in the size of observation as it covers all of the Indonesian provinces than IFLS which only covers thirteen provinces. Both datasets are used for robustness purpose.

The treatment status and running variable. The treatment status (intention to treat) is equal to 1 if an individual experience first year of junior high school, senior high school or university level during the period of 1978-1998 and 0 otherwise. We impute this value from education-section of the survey combined with the information on year of birth, specifically from the question 'what age did you enter [junior high school/senior high school/University]' combined with the information of the birth of date in IFLS. In SUSENAS, however, we can impute the expected treatment status only from age and education profile, i.e. at year level. Hence, we have two different sets of running variable: birth quarter in IFLS and birth year in SUSENAS.

Outcome variable. We utilise three sections of IFLS 5 data: section personality (PSN), section trust (TR) and section community participation (PM) to generate the outcome variables. We divide the program effect into two parts. The first order-effect which covers effect on personality trait (section PSN) or we call it social skills (X'') in our theoretical framework; and the second order-effect which

includes individual trust (section TR) and individual social participation in club or group at the community level (section PM). All of these outcomes for second order-effect are considered as part of bridging social capital. Again, we relate the personality trait variable with the P4 program by the fact that P4 program in the context of our study happened in the adolescence period. Personality trait are formed throughout multiple stages over the life cycle and there are noticeable changes at different points of life such as early childhood, early adolescence and early adulthood (Roberts, Wood, and Smith 2005; Skirbekk, Blekesaune, and Staudinger 2015; Soto and Tackett 2015). Our main interest is to look at the program effect on personality trait which unravel the main program effect. Thus, we follow the analysis to look at whether at the more downstream outcome such as trust and community level it matters or not.

Section personality (PSN) of IFLS 5 becomes available in the latest wave of IFLS but not the previous waves. It covers fifteen questions related to the five-factor model. The five-factor model is a well- accepted taxonomy of non-cognitive skills that has been widely used in the recent psychology and economics literature. Elements in the five-factor model are considered as the individual trait that strongly determines social outcomes jointly with social capital. In the case of job market finding, for example, Baay et al. (2014) argue that the big five personality factors cause some individuals to use their network more intensively or effectively than others. For each factor, IFLS-5 asks three questions on a five-point Likert-type scale, with one indicates being strongly disagreed and five indicates strongly agree. We rescale some question to make it parallel with others and compute an averaged z- score for each of the five factors. We use the factor of extroversion, openness to experience and agreeableness are social skill at individual personality trait that we argue as the element of individual social capital. The summary statistics of key variables and pre-determined variables are presented in Table 2.

Table 2a. Questions to assess social capital measure in IFLS 5 data

Measures	IFLS 5 Survey Questions
Personal Skill Factor	how much you agree or disagree with each statement using the following scale (1. Disagree strongly 2. Disagree a little 3. Neither agree nor disagree 4. Agree a little 5. Agree Strongly)
Conscientiousness	Does a thorough job. Tends to be lazy (reversed). Does things efficiently.
Openness to experience	Is original, comes with new ideas. Has an active imagination. Values artistic, aesthetic, experiences.
Extraversion	Is talkative. Is reserved (reversed) Outgoing, sociable.
Agreeableness	Has a forgiving nature. Is considerate and kind to almost everyone. Is sometime rude to others (reversed).
Emotion Stability	Worries a lot. Get nervous easily. Is relaxed, handles stress well.
Trust dimension	We want to ask you about trust in this village TR01-I am willing to help people in this village if they need it. TR02-In this village I have to be alert or someone is likely to take advantage of me. TR03-Taking into account the diversity of ethnicities in the village, I trust people with same ethnicity as mine more. TR04-I would be willing to leave my children with my neighbours for a few hours if I cannot bring my children with along. TR05-I would be willing to ask my neighbours to look after their house if I leave for a few days?
Community participation	We would like to ask you about some community or government activities and programs that may have taken place in this village during the past 12 months (1. Yes 0. No) Community Meeting Cooperatives Voluntary Labour Improve the Village/Neighbourhood Youth Groups Activity Religious Activities Village Library Village Saving and Loans Health Fund PNPM Political Party Neighbourhood Security Organization (Siskamling) Water for Drinking System/Supply System for garbage disposal Women's Association Activities (PKK) Community Weighing Post (Posyandu) Community Weighing Post Lansia (Posyandu Lansia)

Source: IFLS 5 Section PSN, Section PM and Section TR.

Table 2b. Questions to assess social capital measure in SUSENAS data

Variable	Question	Category
Social participation	Do you participate in any of the following social activity in the last three months?	Bridging capital
	1. religious	
	2. skill	
	3. sport	
	4. art	
	5. saving (<i>arisan</i>)	
	6. funeral	
	7. art	
	8. other	
Trust [4=strongly trust; =no trust]	1. In general, do you trust that the head of village do his/her job properly?	Bridging capital
	2. In general, do you trust that the village leaders can do something to solve community member?	
	3. In general, do you trust that the religious leader acts as a moral role model in the village?	
	4. Do you trust your neighbour in entrusting your house when you are away?	
	5. Do you trust your neighbour in entrusting your children when you are away?	

Source: SUSENAS of Social and Culture Module 2012

Section trust (TR) was introduced in IFLS 4 and is continued in IFLS 5. It covers questions on about trust of neighbours and people in the village, and questions on tolerance of people of different faiths that we consider as the outcomes variable for our interest. We infer that the trust questions in this section are oriented toward a heterogeneous people as it put a context for example trust to other people by various dimensions such as ethnicity and religion. By this, the trust questions represent bonding social capital. Similar to questions in the section PSN, trust questions are a Likert-type scale that we convert into z-score to allow for comparison between questions.

Social or community participation can be seen both as an investment of social capital at the individual level because an individual can develop social skill in a group or club, and as a manifestation of social capital at the community level because an individual might participate in collective action in it.

Section social participation (PM) allows us to measure bridging social capital by counting the number of type of community activity that an individual engages with them. The participation represents bonding social capital as it deals with heterogeneous people both at the village and beyond village level. Activities such as community meeting, cooperatives, voluntary labour are such examples of the types to measure the network size.

From SUSENAS data, we use two measures of social capital to represent bridging capital, number of type of social activities (religious, skill, sport, art, saving, funeral, art and other) that an individual participates; and trust to various external parties (village head, village leader, local religious leader and 148neighbor). The first measure is extracted from individual and household head level and the second measure is from household head only. We use the sum of the Z-score of the Likert scale to obtain the trust score and the help assertiveness score. At the raw value, the trust score ranges from 1 to 20, in which 1 represent the lowest trust level and 20 is the highest. Table 2b lists the detail of questions to measure the social capital from SUSENAS data.

5 EMPIRICAL RESULTS

5.1 Graphical Evidence

To motivate our estimation strategy, we first describe the relationship between the running variable (birth cohort), treatment variable (participation of the P4 training) and the outcome variables (social skills, trust and community participation) using graphical representation. Figure 1a and 1b show the correlation between expected participation of the P4 training and the two cohort groups (treatment and control) using IFLS data and SUSENAS data respectively. Indeed, both figures show a large number of individuals exposed to the program than those who were not in the treatment cohort. Both show that on average the expected participation is about eighty percent (IFLS) and about seventy percent (SUSENAS) higher for treatment than the control group. Despite this high jump in the expected participation in the program, however, Figure 2 shows a non-discontinuity in social skill as the main channel of the program effect. Hence, we would expect that there will be no effect on outcome variables of social capital measures (trust and social participation). Figure 3a and Figure 3b show a non-discontinuity in a variable of trust. Figure 4a and Figure 4b show a non-discontinuity in community participation variable.

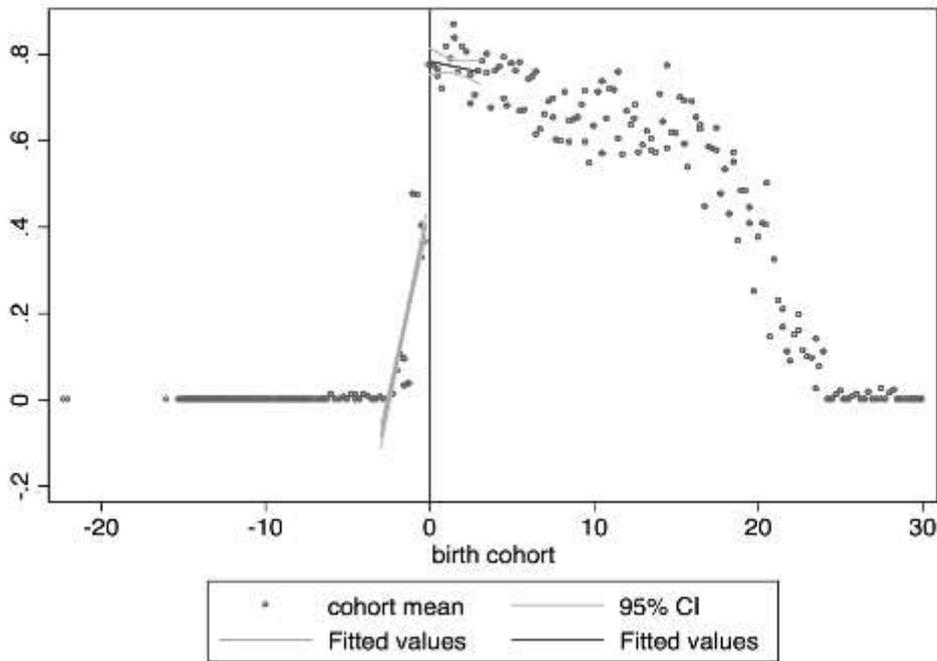


Figure 1a. Cohort Means of the P4 Training Participation: IFLS 5

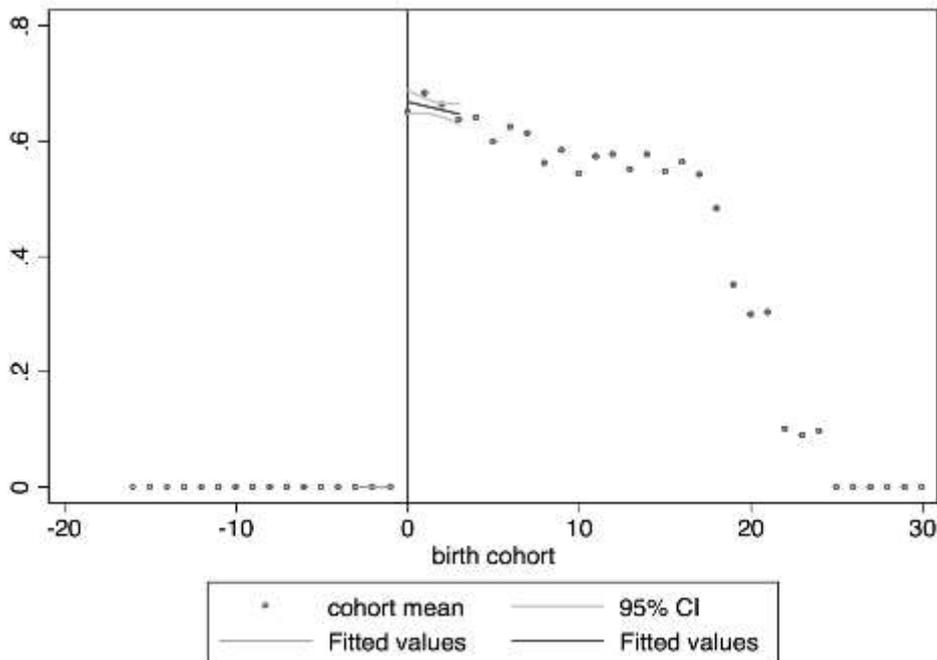


Figure 1b. Cohort Means of the P4 Training Participation: SUSENAS Social and Culture Module 2012

Note: Figure 1a and 1b plot the relation between the expected P4 training participation and birth cohort. Circles represent the average participation rate by bin (birth quarter). The solid lines indicate the fitted values from linear local regression and the dashed lines are the 95 percent confidence interval for observation within the optimum bandwidth (minimum value of 3 obtained from *rdwselect* command). The vertical line indicates the cut-off point (normalized to 0).

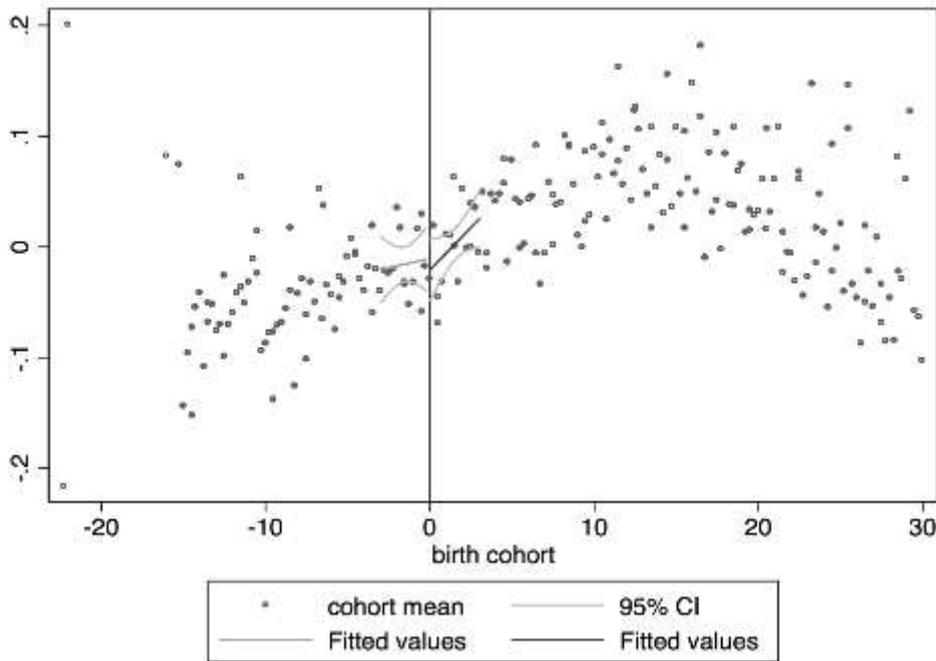


Figure 2. Effect of the P4 training on social skills index: IFLS 5

Note: Figure 2 describes the non-discontinuity in social skills index (consciousness, agreeableness, extraversion, emotion stability and openness). Circles represent the average value of the index by bin (birth quarter). The solid lines indicate the fitted values from linear local regression and the dashed lines are the 95 percent confidence interval for observation within the optimum bandwidth (minimum value of 3 obtained from *rdwselect* command). The vertical line indicates the cut-off point (normalized to 0).

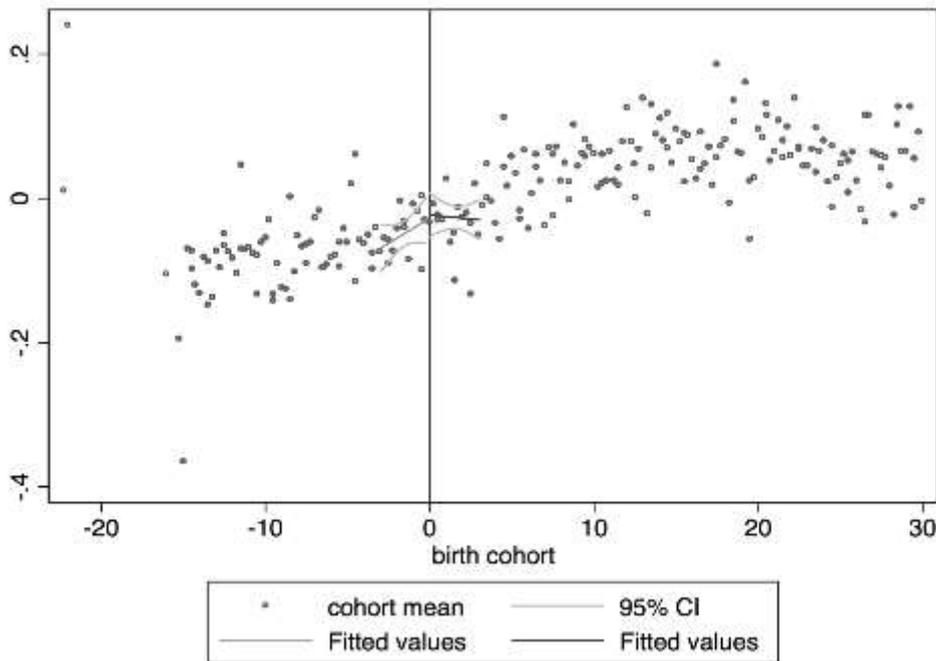


Figure 3a. Effect of the P4 training on trust: IFLS 5

Note: Figure 3a describes the non-discontinuity in trust index (trust to neighbourhood and village environment) using IFLS data. Circles represent the average value of the index by bin (birth quarter). The solid lines indicate the fitted values from linear local regression and the dashed lines are the 95 percent confidence interval for observation within the optimum bandwidth (minimum value of 3 obtained from *rdwselect* command). The vertical line indicates the cut-off point (normalized to 0).

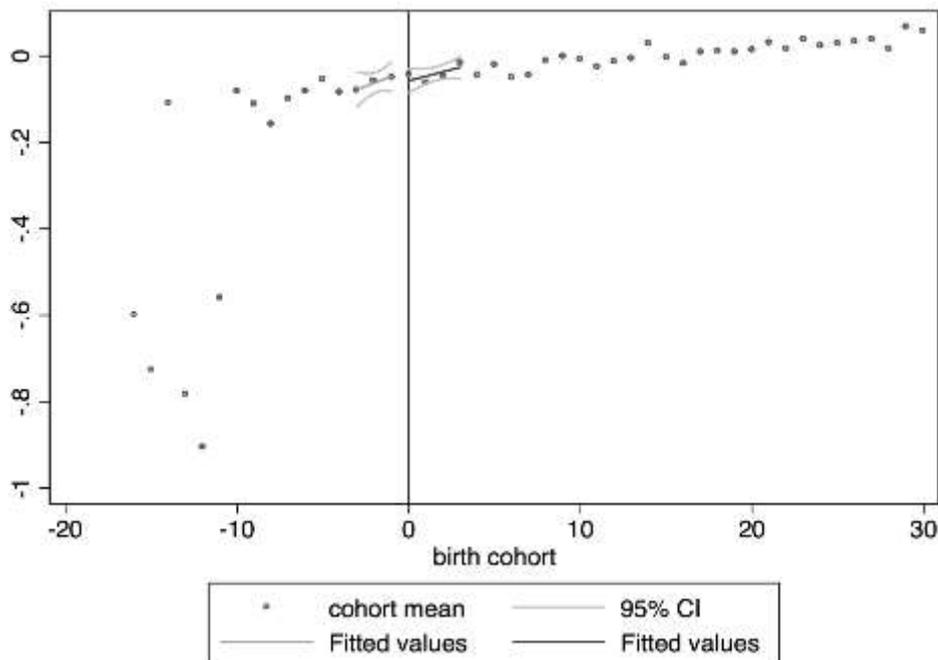


Figure 3b. Effect of the P4 training on trust: SUSENAS

Note: Figure 3b describes the non-discontinuity in trust index (trust to neighbourhood and village environment) using SUSENAS data. Circles represent the average value of the index by bin (birth quarter). The solid lines indicate the fitted values from linear local regression and the dashed lines are the 95 percent confidence interval for observation within the optimum bandwidth (minimum value of 3 obtained from *rdbwselect* command). The vertical line indicates the cut-off point (normalized to 0).

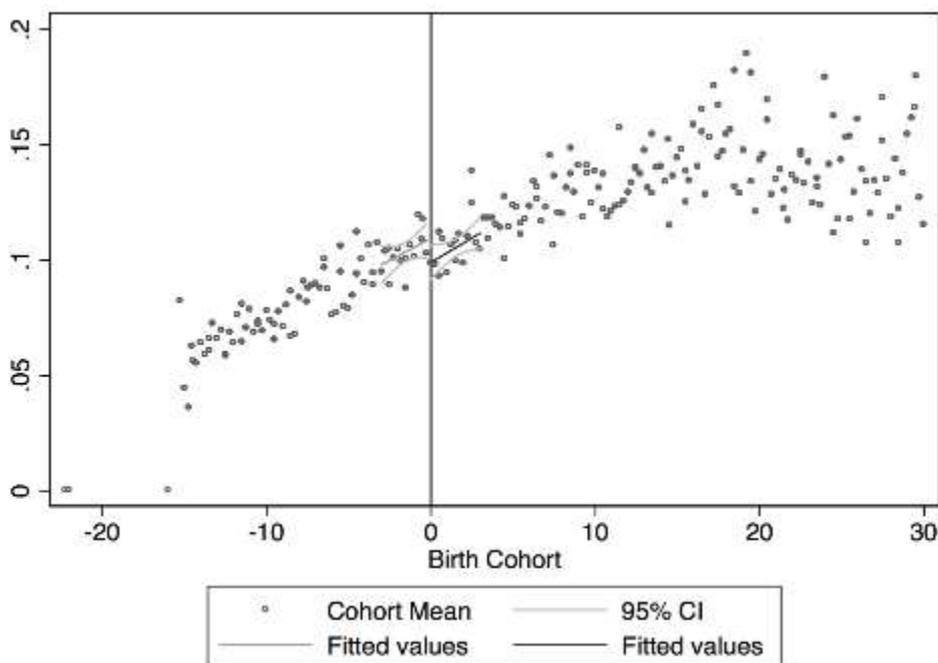


Figure 4a. Effect of the P4 training on social participation: IFLS 5

Note: Figure 4 describes the non-discontinuity in social participation (number of types of community, minimum 0 and maximum 17). Circles represent the average value of the index by bin (birth quarter). The solid lines indicate the fitted values from linear local regression and the dashed lines are the 95 percent confidence interval for observation within the optimum bandwidth (minimum value of 3 obtained from *rdbwselect* command). The vertical line indicates the cut-off point (normalized to 0).

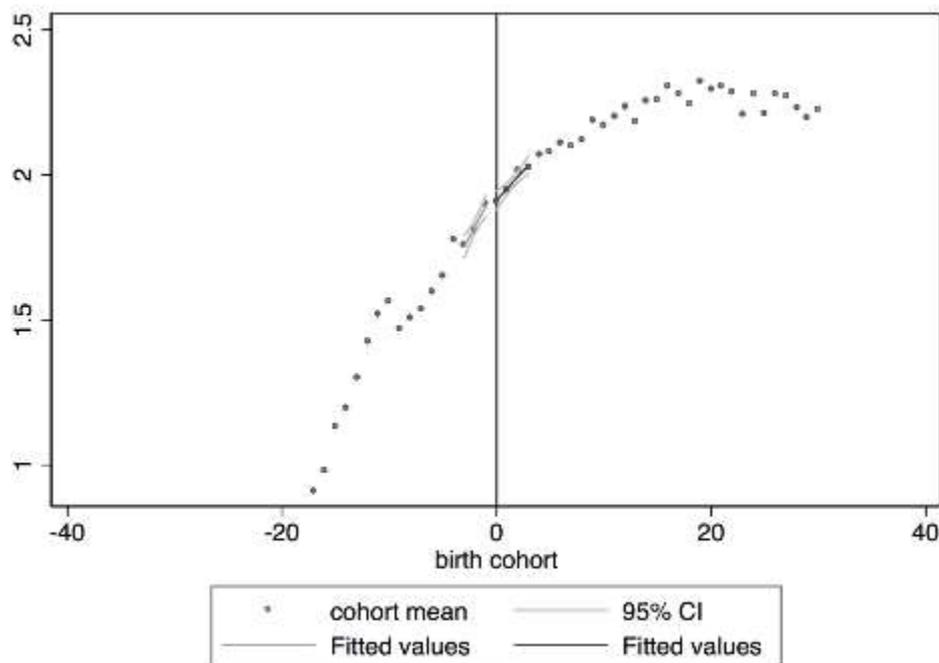


Figure 4b. Effect of the P4 training on social participation: SUSENAS Data

Note: Figure 4 describes the non-discontinuity in social participation (number of types of community, minimum 0 and maximum 7). Circles represent the average value of the index by bin (birth quarter). The solid lines indicate the fitted values from linear local regression and the dashed lines are the 95 percent confidence interval for observation within the optimum bandwidth (minimum value of 3 obtained from *rdwselect* command). The vertical line indicates the cut-off point (normalized to 0).

5.2 The First-Stage Estimates

Table 3a and Table 3b present the first stage estimate of the fuzzy RD design of equation 4 using IFLS and SUSENAS data respectively. It confirms the graphical representation of Figure 1a and Figure 1b. The first stage exists, and it shows that the participation rate of individual aged 13 or older in 1998 to the P4 training is about 30 to 45 percent when we use a more precise identification of treatment status using IFLS data. The SUSENAS data, on the other hand, suggest a larger point estimates of the participation rate by about twice, i.e. 70 percent. This is because the assignment of participation status uses a crude identification of combination birth cohort at year level and education profile. Consequently, the excluded F in SUSENAS data estimates produce a very high number which suggest a perfect compliance from the control group. This is not surprising since we assign a value of zero for all individual in the control group for the participation status which does not happen in the IFLS dataset.

Table 3a. First-stage Estimates: IFLS

	(1) Polynomial of degree one	(2) Polynomial of degree two	(3) Polynomial of degree two with covariates
Treatment Cohort=1	0.445*** (0.095)	0.314** (0.143)	0.294** (0.138)
Birth Cohort	0.046*** (0.017)	0.143** (0.065)	0.154** (0.063)
Birth Cohort ²		-0.024* (0.014)	-0.025* (0.014)
Observations	6664	6664	6443
Excluded F	21.86	4.85	4.52

Note: Robust standard errors clustered at cohort level are in parentheses with * $p < .1$, ** $p < .05$, *** $p < .01$. The observations are within the optimum bandwidth of 4 (the minimum value obtained from the *rdwselect* command for all of the outcomes estimates). Covariates used are gender, location dummy, religion and all predetermined outcomes at the age of 12 listed in Table 2.

Table 3b. First-stage Estimates SUSENAS

Dependent variable: P4 Participation

	(1) Polynomial of degree one	(2) Polynomial of degree two	(3) Polynomial of degree two with covariates
Treatment Cohort=1	0.699*** (0.012)	0.708*** (0.015)	0.712*** (0.016)
Birth Cohort	-0.008*** (0.002)	-0.014* (0.008)	-0.016* (0.008)
Birth of Cohort^2		0.001 (0.002)	0.002 (0.002)
Constant	-0.021*** (0.008)	-0.025** (0.010)	0.219*** (0.070)
Observations	36008	36008	36008
Excluded F	3361.98	2293.93	1939.09

Note: Robust standard errors clustered at cohort level are in parentheses with * $p < .1$, ** $p < .05$, *** $p < .01$. The observations are within the optimum bandwidth of 4 (the minimum value obtained from the *rdwselect* command for all of the outcomes estimates). A large value of F-statistics suggest perfect compliance was detected on the control group as we do not have information on exact time when individuals enter school. Covariates used are gender and locational dummy (urban/rural).

5.3 The Effect of the P4 training on Social Skills

The framework set by equation 1-3 guides us that the elements of social capital casted by the program at the adolescence period which have a long-term dimension is the social skill variable. Therefore, the main interest of this paper is to firstly check whether there is statistical difference in this variable. We do not such long-term effect of the P4 training on individual social skill variable *e*. The estimates in Table 4a and Table 4b confirm the above graphical representations. The estimates of the effect of the P4 training on either aggregate index of social skills or individual measures such as consciousness, extraversion, agreeableness, openness and emotion stability using IFLS data yield no statistical difference between individual participates in the P4 training and those who do not participate. These results set a foundation so that we expect for no higher order effect of the program on the social capital measure such as trust to neighbourhood or community participation.

Table 4a. Effect of the P4 training on social skills: IFLS 5

Dependent variable: social skills

	(1) Aggregate Index	(2) Consciousness	(3) Openness	(4) Extraversion	(5) Agreeableness	(6) Emotion Stability
P4_dummy	-0.030 (0.040)	-0.068 (0.086)	-0.001 (0.084)	-0.077 (0.062)	-0.012 (0.057)	0.006 (0.048)
Birth Cohort	0.011** (0.005)	0.028** (0.011)	0.002 (0.011)	0.007 (0.008)	0.010 (0.008)	0.010 (0.006)
Observations	6664	6664	6664	6664	6664	6664

Note: Robust standard errors clustered at cohort level are in parentheses with * $p < .1$, ** $p < .05$, *** $p < .01$. We use 2SLS of a fuzzy setting and a local linear regression with optimal bandwidth calculated by the *rdwselect* command of Imbens and Kalyanaraman (2012). The first-stage estimates for all columns use polynomial degree of one which has the largest excluded F-statistics relative to other polynomial or the use of covariates.

Table 4b. Effect of the P4 training on social skills: IFLS 5 with covariates

Dependent variable: social skills

	(1) Aggregate Index	(2) Consciousness	(3) Openness	(4) Extraversion	(5) Agreeableness	(6) Emotion Stability
P4_dummy	-0.037 (0.042)	-0.070 (0.092)	-0.001 (0.087)	-0.108 (0.070)	0.002 (0.067)	-0.008 (0.055)
Birth Cohort	0.013** (0.005)	0.028** (0.012)	0.004 (0.011)	0.013 (0.009)	0.007 (0.010)	0.012 (0.008)
Observations	6443	6443	6443	6443	6443	6443

Note: Robust standard errors clustered at cohort level are in parentheses with * $p < .1$, ** $p < .05$, *** $p < .01$. We use 2SLS of a fuzzy setting and a local linear regression with optimal bandwidth calculated by the *rdwselect* command of Imbens and Kalyanaraman (2012). The first-stage estimates for all columns use polynomial degree of one which has the largest excluded F-statistics relative to other polynomial or the use of covariates.

Covariates used are gender, location dummy, religion and all predetermined outcomes at the age of 12 listed in Table 2.

These results are robust for different set of specification of the birth cohort polynomial, inclusiveness of covariates, the falsification test and the use of different bandwidth. The results however are not replicable in SUSENAS data as there are no such questions in the survey.

5.4 The Effect of the P4 training on Social Capital

The effect of the program on social capital is tested both using both IFLS and SUSENAS data. The Estimates are presented in Table 5a and Table 5b. Both Table's estimates confirm the graphical representation in Figure 3a, Figure 3b, Figure 4a and Figure 4b. There difference of trust to neighbourhood and community participation between treatment and control group are not statistically significant. Hence there is no effect of the P4 training participation on social capital.

Table 5a. Effect of the P4 training on social capital: IFLS 5 Dependent variable: social capital

	(1) Trust neighbourhood	(2) onTrust neighbourhood	(3) onTrust neighbourhood -with covariates	(4) onCommunity Participation	(5) Community Participation	(6) Community Participation -with covariates
P4_dummy	0.012 (0.040)	0.037 (0.066)	0.054 (0.067)	-0.024** (0.009)	-0.037* (0.021)	-0.038 (0.023)
Birth Cohort	0.005 (0.005)	-0.004 (0.020)	-0.007 (0.021)	0.005*** (0.001)	0.010* (0.006)	0.011 (0.007)
Birth Cohort^2		0.002 (0.004)	0.002 (0.004)		-0.001 (0.001)	-0.001 (0.001)
Observations	6664	6664	6443	6664	6664	6443

Note: Robust standard errors clustered at cohort level are in parentheses with * $p < .1$, ** $p < .05$, *** $p < .01$. We use 2SLS of a fuzzy setting and a local linear regression with optimal bandwidth calculated by the *rdwselect* command of Imbens and Kalyanaraman (2012). The covariates used for estimates in column 3 and column 6 are gender, location dummy, religion and all predetermined outcomes at the age of 12 listed in Table 2.

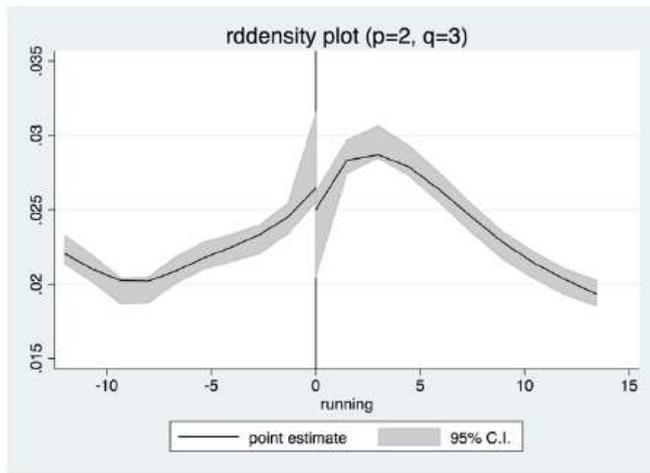
Table 5b. Effect of the P4 training on social capital: SUSENAS Dependent variable: P4 Participation

	(1) Community Participation	(2) Community Participation	(3) Community Participation with Covariates	(4) Trust Index	(5) Trust Index	(6) Trust Index with Covariates
Treatment Cohort=1	-0.002 (0.023)	-0.039 (0.031)	-0.045 (0.029)	-0.004 (0.017)	-0.002 (0.025)	-0.008 (0.023)
Birth Cohort	0.041*** (0.004)	0.068*** (0.014)	0.070*** (0.014)	0.006 (0.004)	0.005 (0.013)	0.008 (0.013)
Birth of Cohort^2		-0.006* (0.003)	-0.007** (0.003)		0.000 (0.003)	-0.000 (0.003)
Constant	1.913*** (0.017)	1.934*** (0.020)	1.611*** (0.042)	-0.051*** (0.010)	-0.052*** (0.014)	-0.323*** (0.015)
Observations	36008	36008	36008	12470	12470	12470

Note: Robust standard errors clustered at cohort level are in parentheses with * $p < .1$, ** $p < .05$, *** $p < .01$. We use sharp RD design and a local linear regression with optimal bandwidth calculated by the *rdwselect* command of Imbens and Kalyanaraman (2012). The covariates used for estimates in column 3 and column 6 are gender and location dummy (urban/rural). The observations for community participation are all household member whereas for trust index are only representative individual (one for each household).

Even though in general there has been no effect of participation in the P4 training on social capital, there could be some dynamic complementarity of the program that offset the program impact as hypothesized in Section 2. To test such possible cases, we rerun the estimate into subpopulation by demographic factor. We use gender and location (urban/rural) as possible dynamic complementarity of the program effect. We argue that living in a more heterogenous environment such as higher ethnic diversity of ethnic like urban area could reinforce the program effect than the rural area. The gender effect also could be different between male and female, especially in the case that the way the program cast the personal social skill was through indoctrination. It could be the case that gender factor significantly differs in these respects.

Figure 5a. Density Manipulation test: IFLS 5



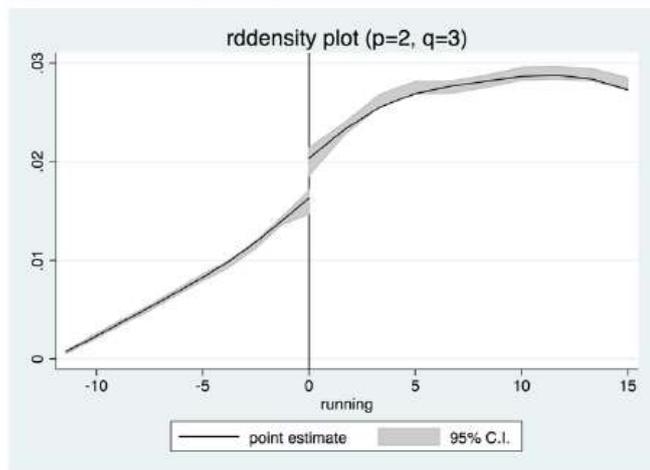
RD Manipulation Test using local polynomial density estimation.

Cutoff c = 0	Left of c	Right of c	Number of obs =
			30638
			Model = unrestricted
			BW method = comb
			Kernel = triangular
			VCE method = jackknife
Number of obs |	10158	20480	
Eff. Number of obs |	2966	3872	
Order est. (p) |	2	2	
Order bias (q) |	3	3	
BW est. (h) |	4.000	4.477	

Running variable: running.

Method	T	P>|T|
Robust	-1.4839	0.1378

Figure 5b. Density Manipulation test: SUSENAS 2012



RD Manipulation Test using local polynomial density estimation.

Cutoff c = 0	Left of c	Right of c	Number of obs =
			71722
			Model = unrestricted
			BW method = comb
			Kernel = triangular
			VCE method = jackknife
Number of obs |	2883	64839	
Eff. Number of obs |	3249	8406	
Order est. (p) |	2	2	
Order bias (q) |	3	3	
BW est. (h) |	3.807	4.996	

Running variable: running.

Method	T	P>|T|
Robust	2.0153	0.0439

5.5 Heterogenous Effect

The estimates for each subpopulation shows consistent profiles so that there is no impact of the program on both the channel and the outcome variables. Indeed, the significant different in the community participation estimates indeed driven by the tendency of urban population to be having more social activities than in rural area. The gender dimension also revealing the robustness of the impact estimates as well as proving that there are no dynamic complementary factors for the program. Table A6, A7, A8 and A9 in the Appendix present the heterogenous impact estimates by gender and location dimension respectively.

5.6 Robustness Check

To defend the robustness of our results, we employ several strategies. First is to use different set of datasets. The use of either IFLS or SUSENAS data barely change the results. Both estimates produced by these datasets show a consistent sign and statistical significance both in the first-stage and in the main equation. Second is the inclusion of the predetermined socio-economic characteristics of the subject. Our identification strategy relies on the assumption that, other than the P4 program, there has been no other thing happened in relation to social capital formation. To test this assumption, if the inclusion of pre-determined socio-economic characteristics should have a little effect to our estimate without these variables. All of the robustness checks of either use or not using covariates (Table 3a- Table 5b) suggest minor change in the coefficients magnitude.

Third is the falsification test. Aguero and Bharadwaj (2014) suggest of using different cut-off, that is by omitting the observation around the cut-off. This approach is to ensure that the effect is not due to coincidence gap at the cut-off. We implement this test by two techniques. First is to omitting observations of the year of birth 1985 and 1984 which are one year below and above the normalized running variable. The replication of estimates correspond to this test is presented in Table A3a-Table A5b). All of the replications show that the estimates results are barely change, except for the estimate in column 5 and 6 of Table 4a. These estimates suggest statistically significant different of the two cohort regarding the social participation in IFLS data. Interpreting this result, we argue that the statistical significance is not the program's effect as both the estimates using polynomial of degree one and using SUSENAS do not suggest the same result. relationship between average number of social group participation and age. In addition, Figure 4b shows a well-known inverted U-shape of average social group participation as in Glaeser, Laibson, & Sacerdote (2002) and Putnam (2000). Hence the statistical significance could also coincide with the quadratic functional form of the estimating equation. Second is to testing the density manipulation test at around the cut-off (Cattaneo, Jansson, and Ma 2016). Figure 5a and Figure 5b present the whether there is a jump of the distribution near the cut-off. The report shows that the statistical

test failed to reject the null of there is no jump in the distribution for SUSNEAS data (T statistics of 2.0153 and p-value of 0.0439) but not for IFLS data (T-statistics of -1.4839 and p-value of 0.1378). Interpreting this result, as for SUSENAS we argue that the jump is not the case of individual manipulating to be in the treatment group, but rather it is just due to the profile of distribution of SUSENAS block sample of the cohort. As for the case of IFLS the test rejects the null of there is no systematic manipulation of the running variable/the density of the units is continuous near the cut-off.

The last robustness check is the use of different bandwidth. We extend the bandwidth into plus five of the optimum bandwidth for each side below and above the cut-off. The robustness check of extending the bandwidth (Figure A4b, Figure A5a1 and Figure A5b1) also show stable result in term of statistical significance of the estimates.

6 INTERPRETATION

Up to this point, we have documented an empirical assessment to show that individuals' exposure to state ideology indoctrination courses in Indonesia does not have a long-lasting effect on individual social capital formation. There are two argumentations for this result. First is due to the reverse effect of the reform. For anti-New Order group, the reform in 1998 is a momentum to disregard all of norms and value dictated by the regime. Since it is not possible to identify whether individual are belongs to this group or the opposing group, New Order loyalist, we infer that the large portion of individual in our sample is coming from the former group.

The second argument is about the program design. The P4 program is lacking real life practice for the value and norms taught in the class to be effective. Moreover, the workshop is dominated by discussion and cognitive-building like activities. The effectiveness to cast a strong effect, despite the believe of indoctrination with a strong environment, seems to be weak as our results show. To see whether this claim is valid, we rerun the estimates and decompose them by types of trust level to show that the impact is only profound for outcome at the idea level (cognitive) but not at practical level.

Moreover, the impact is larger in a more facilitating and environmentally supporting area i.e., urban rather than rural area. Urban area for example, have more ethnicity heterogeneity that help participant to better form their understanding about inter-ethnic trust (Table 6).

Table 6. Interpreting the impact: type of trust by location
Dependent variable: Trust item Idea (TR03) and Practical(TR04)

	(1) Idea-Urban	(2) Practical-Urban	(3) Idea-Rural	(4) Practical-Rural
P4_dummy	0.315* (0.186)	0.039 (0.126)	0.025 (0.166)	0.050 (0.258)
Birth Cohort	-0.043 (0.028)	0.010 (0.019)	0.004 (0.019)	0.014 (0.028)
Observations	3895	3188	2769	2380
F	1.402	1.637	0.480	2.354

Note: Robust standard errors clustered at cohort level are in parentheses with * $p < .1$, ** $p < .05$, *** $p < .01$. We use 2SLS of a fuzzy setting and a local linear regression with optimal bandwidth calculated by the *rdwselect* command of Imbens and Kalyanaraman (2012) at bandwidth of 4. The estimates does not include covariates.

7 CONCLUSION

This study aims to test whether individual exposure to P4-program influences individual social capital formation in the long-run. The estimate results using both the fuzzy regression discontinuity design with IFLS data and a sharp RD design using the SUSENAS data exploiting the event of the termination of Pancasila Moral Education in Indonesia in 1998 suggest that the program effect do not last in the long-run to affect individual social capital. We argue that, despite it cost-effectiveness in the sense of an embedded program to build social capital in education, learning from such non-targeted program's in Indonesia Soeharto's era give us an impression that such program's role to build individual social capital in the long run is limited. A combination of an intense cognitive leaning and an environmentally supportive location might improve the program effectiveness. Such an indoctrination solely approach was not an effective way, despite the large amount of resource dedicated to preparing and train the instructor for the program. This result is can be generalized into a context of policy debate, whether government can promote social capital through education.

REFERENCES

- Aditjondro, George Junus. 1994. "The Media as Development 'Textbook': A Case Study on Information Distortion in the Debate about the Social Impact of an Indonesian Dam." Cornell University.
- Aditjondro, George, and David Kowalewski. 1994. "Damning the Dams in Indonesia: A Test of Competing Perspectives." *Asian Survey* 34(4): 381-95. <http://www.jstor.org/stable/2645145> (April 18, 2018).
- Aguero, Jorge M, and Prashant Bharadwaj. 2014. "Do the More Educated Know More about Health? Evidence from Schooling and HIV Knowledge in Zimbabwe." *Economic Development and Cultural Change* 62(3): 489-517.
- Alatas, Vivi et al. 2012. "Targeting the Poor: Evidence from a Field Experiment in Indonesia." *American Economic Review* 102(4): 1206-40. <http://pubs.aeaweb.org/doi/10.1257/aer.102.4.1206>.
- Alesina, Alberto, and Nicola Fuchs-Schündeln. 2007. "Good-Bye Lenin (or Not?): The Effect of Communism on People's Preferences." *American Economic Review* 97(4): 1507-28. <http://pubs.aeaweb.org/doi/10.1257/aer.97.4.1507>.
- Baay, Pieter E., Marcel A.G. van Aken, Denise T.D. de Ridder, and Tanja van der Lippe. 2014. "Understanding the Role of Social Capital in Adolescents' Big Five Personality Effects on School-to-Work Transitions." *Journal of Adolescence* 37(5): 739-48.
- Bebbington, Anthony, Scott Guggenheim, Elizabeth Olson, and Michael Woolcock. 2004. "Exploring Social Capital Debates at the World Bank." *Journal of Development Studies* 40(5): 33-64.

<http://www.tandfonline.com/doi/abs/10.1080/0022038042000218134>.

- Bloch, Francis, Garance Genicot, and Debraj Ray. 2007. "Reciprocity in Groups and the Limits to Social Capital." *American Economic Review* 97(2): 65–69. <http://pubs.aeaweb.org/doi/10.1257/aer.97.2.65>.
- Bourdieu, Pierre. 1986. "The Forms of Social Capital." In *Handbook of Theory and Research for the Sociology of Education*, ed. J. G. Richardson. Greenwood Publishing Group.
- Calonico, Sebastian, Matias D Cattaneo, and Rocío Titiunik. 2014. "Robust Data-Driven Inference in the Regression-Discontinuity Design." *The Stata Journal* 14(4): 909–46.
- Cattaneo, Matias D, Michael Jansson, and Xinwei Ma. 2016. "Rddensity: Manipulation Testing Based on Density Discontinuity." *The Stata Journal* ii: 1–24. <https://pdfs.semanticscholar.org/4523/c0a6b2d7c9a802bdbff4941263181701a659.pdf> (April 23, 2018).
- Cleaver, Frances. 2005. "The Inequality of Social Capital and the Reproduction of Chronic Poverty." *World Development* 33(6): 893–906. <http://linkinghub.elsevier.com/retrieve/pii/S0305750X05000409>.
- Cunha, Flavio, and James Heckman. 2007. "The Technology of Skill Formation." *American Economic Review* 97(2): 31–47. <http://pubs.aeaweb.org/doi/10.1257/aer.97.2.31>.
- Dale, A., and L. Newman. 2010. "Social Capital: A Necessary and Sufficient Condition for Sustainable Community Development?" *Community Development Journal* 45(1): 5–21. <https://academic.oup.com/cdj/article-lookup/doi/10.1093/cdj/bsn028>.
- Duflo, Esther. 2001. "Schooling and Labor Market Consequences of School Construction in Indonesia: Evidence from an Unusual Policy Experiment." *American Economic Review* 91(4): 795–813. <http://pubs.aeaweb.org/doi/10.1257/aer.91.4.795> (April 18, 2018).
- Fukuyama, Francis. 2001. "Social Capital, Civil Society and Development." *Third World Quarterly* 22(1): 7–20. <http://www.tandfonline.com/doi/full/10.1080/713701144>.
- Glaeser, Edward L. 2001. "The Formation of Social Capital." *Canadian Journal of Policy Research* 2(1): 34–40.
- Glaeser, Edward L, David Laibson, and Bruce Sacerdote. 2002. "An Economic Approach to Social Capital." *The Economic Journal* 112(483): F437–58.
- Gong, Jie, Yi Lu, and Huihua Xie. 2015. "Adolescent Environment and Noncognitive Skills." <https://ssrn.com/abstract=2397046>.
- Heggart, Keith. 2015. "Social Capital and Civics and Citizenship: Developing a Framework for Activist Education." *Issues in Educational Research* 25(3): 276–90.
- Imbens, Guido, and Karthik Kalyanaraman. 2012. "Optimal Bandwidth Choice for the Regression Discontinuity Estimator." *The Review of Economic Studies* 79(3): 933–59.
- Imbens, Guido W., and Thomas Lemieux. 2008. "Regression Discontinuity Designs: A Guide to Practice." *Journal of Econometrics* 142(2): 615–35.
- Klaauw, Wilbert van der. 2002. "Estimating the Effect of Financial Aid Offers on College Enrollment: A Regression-Discontinuity Approach." *International Economic Review* 43: 1249–87.
- Labonne, Julien, and Robert S. Chase. 2011. "Do Community-Driven Development Projects Enhance Social Capital? Evidence from the Philippines." *Journal of Development Economics* 96(2): 348–<http://linkinghub.elsevier.com/retrieve/pii/S0304387810001008>.
- Levien, Michael. 2015. "Social Capital as Obstacle to Development: Brokering Land, Norms, and Trust in Rural India." *World Development* 74: 77–92. <http://linkinghub.elsevier.com/retrieve/pii/S0305750X15000960>.
- Martin, Katie S, Beatrice L Rogers, John T Cook, and Hugh M Joseph. 2004. "Social Capital Is Associated with Decreased Risk of Hunger." *Social Science & Medicine* 58(12): 2645–54. <http://linkinghub.elsevier.com/retrieve/pii/S0277953603005094>.
- Matuschke, Ira, and Matin Qaim. 2009. "The Impact of Social Networks on Hybrid Seed Adoption in India." *Agricultural Economics* 40(5): 493–505. <http://doi.wiley.com/10.1111/j.1574-0862.2009.00393.x>.
- Meng, Xin, and R. G. Gregory. 2002. "The Impact of Interrupted Education on Subsequent Educational Attainment: A Cost of the Chinese Cultural Revolution." *Economic Development and Cultural Change* 50(4): 935–59. <https://www.journals.uchicago.edu/doi/10.1086/342761>.
- Munshi, Kaivan, and Mark Rosenzweig. 2016. "Networks and Misallocation: Insurance, Migration, and the Rural-Urban Wage Gap." *American Economic Review* 106(1): 46–98. <http://pubs.aeaweb.org/doi/10.1257/aer.2013.1365>.
- Narayan, Deepa, and Lant Pritchett. 1999. "Cents and Sociability: Household Income and Social Capital in Rural Tanzania." *Economic Development and Cultural Change* 47(4): 871–97.
- Nejad, Maryam Naghsh, and Anna Kochanova. 2017. "Minds for the Market: Non-Cognitive Skills in Post-Soviet Countries." In *AASLE Inaugural Conference 2017*.
- Nishimura, Shigeo. 1995. "The Development of Pancasila Moral Education in Indonesia." *Southeast Asian Studies* 33(3).
- Olken, Benjamin A. 2007. "Monitoring Corruption: Evidence from a Field Experiment in Indonesia." *Journal of Political Economy* 115(2): 200–249. <https://www.journals.uchicago.edu/doi/10.1086/517935>.
- Olken, Benjamin A. 2010. "Direct Democracy and Local Public Goods: Evidence from a Field Experiment in Indonesia." *American Political Science Review* 104(02): 243–67. <http://www.journals.cambridge.org/abstract/S0003055410000079>.
- Ostrom, Elinor. 1994. "Constituting Social Capital and Collective Action." *Journal of Theoretical Politics* 6(4): 527–62.
- Parinduri, Rasyad A. 2016. "Does Education Improve Health? Evidence from Indonesia." *The Journal of Development Studies*: 1–18.
- Prasta, Yogana, Scott Guggenheim, Susan Wong, and Tatag Wiranto. 2004. *Indonesia's Kecamatan Development Program: A Large-Scale Use of Community Development to Reduce Poverty*.
- Print, Murray, and David Coleman. 2003. "Towards Understanding of Social Capital and Citizenship Education." *Cambridge Journal of Education* 33(1): 123–49. <https://www.tandfonline.com/doi/full/10.1080/0305764032000047522>.
- Putnam, Robert D. 2000. "Bowling Alone: America's Declining Social Capital." In *Culture and Politics*, New York: Palgrave Macmillan US, 223–34.
- Riches, Graham. 2002. "Food Banks and Food Security: Welfare Reform, Human Rights and Social Policy. Lessons from Canada?" *Social Policy and Administration* 36(6): 648–63. <http://doi.wiley.com/10.1111/1467-9515.00309>.
- Roberts, Brent W., Dustin Wood, and Jennifer L. Smith. 2005. "Evaluating Five Factor Theory and Social Investment Perspectives on Personality Trait Development." *Journal of Research in Personality* 39(1): 166–84.
- Simmons, Phil, Paul Winters, and Ian Patrick. 2005. "An Analysis of Contract Farming in East Java, Bali, and Lombok, Indonesia." *Agricultural Economics* 33(s3): 513–25. <http://doi.wiley.com/10.1111/j.1574-0864.2005.00096.x>.
- Skirbekk, V., M. Blekesaune, and U.M. Staudinger. 2015. "Personality Development in the Second Half of Life and Critical Life Events." *The Gerontologist* 55(Suppl_2): 32–32.
- Soto, Christopher J., and Jennifer L. Tackett. 2015. "Personality Traits in Childhood and Adolescence." *Current Directions in Psychological Science* 24(5): 358–62.

Stancanelli, Elena, and Arthur Van Soest. 2012. "Retirement and Home Production: A Regression Discontinuity Approach." *American Economic Review* 102(3): 600–605.

Torres-Vitolas, Carlos A. 2017. "Effects of Social Capital Building on Social Network Formation among the Rural Poor: A Case-Study from Peru." *Oxford Development Studies* 0818(September): 1–15. <https://www.tandfonline.com/doi/full/10.1080/13600818.2017.1347255>.

Willis, Robert J, and Sherwin Rosen. 1979. "Education and Self-Selection." *Source Journal of Political Economy* 87(2): 7–36.

Woodhouse, Andrea F. 2001. "Village Corruption in Indonesia: Fighting Corruption in the World Bank's Kecamatan Development Program." *Indonesia social development paper no.6:* 1–59. <http://documents.worldbank.org/curated/en/107111468259516418/Village-corruption-in-Indonesia-fighting-corruption-in-the-World-Banks-Kecamatan-Development-Program>.

Woolcock, Michael, and Deepa Narayan. 2000. "Social Capital : Implications for Development Theory, Research, and Policy." *The World Bank Research Observer* 15(2): 225–49.

Zhang, Saijun, and Steven G Anderson. 2011. "The Differentiated Impact of Bridging and Bonding Social Capital on Economic Well-Being: An Individual Level Perspective." *Journal of Sociology & Social Welfare* 38(1): 119–42.

APPENDIX

Table A3a. First-stage Estimates: IFLS-Falsification Test

Dependent variable: P4 Participation

	(1) poly(1)	(2) poly(2)	(3) poly(2) with covariates
Treatment Cohort=1	0.779*** (0.065)	0.863*** (0.272)	0.901*** (0.264)
Birth Cohort	-0.005 (0.009)	-0.031 (0.078)	-0.041 (0.075)
Birth Cohort^2		0.004 (0.011)	0.006 (0.010)
Observations	5291	5291	5098

Note: Robust standard errors clustered at cohort level are in parentheses with * $p < .1$, ** $p < .05$, *** $p < .01$. The observations are within the optimum bandwidth of 4 (the minimum value obtained from the *rdwselect* command for all of the outcomes estimates). The estimates exclude observations with the birth of cohort year one below and one above the cut-off.

Table A3b. First-stage Estimates SUSENAS-Falsification Test

Dependent variable: P4 Participation

	(1) poly(1)	(2) poly(2)	(3) poly(2) with covariates
Treatment Cohort=1	0.696*** (0.032)	0.701*** (0.102)	0.700*** (0.109)
Birth Cohort	-0.008* (0.004)	-0.009 (0.029)	-0.010 (0.030)
Birth of Cohort^2		0.000 (0.004)	0.000 (0.004)
Constant	-0.028* (0.016)	-0.030 (0.050)	0.201** (0.081)
Observations	32768	32768	32768

Note: Robust standard errors clustered at cohort level are in parentheses with * $p < .1$, ** $p < .05$, *** $p < .01$. The observations are within the optimum bandwidth of 4 (the minimum value obtained from the *rdwselect* command for all of the outcomes estimates). The estimates exclude observations with the birth of cohort year one below and one above the cut-off.

Table A4a. Effect of the P4 training on social skills: IFLS 5-Falsification Test Dependent variable: social skills

	(1) Aggregate Index	(2) Consciousness	(3) Openness	(4) Extraversion	(5) Agreeableness	(6) Emotion Stability
P4_dummy	0.020 (0.055)	0.003 (0.081)	0.136** (0.058)	-0.012 (0.094)	-0.048 (0.068)	0.019 (0.087)
Birth Cohort	0.005 (0.006)	0.015 (0.009)	-0.011* (0.006)	0.001 (0.010)	0.010 (0.007)	0.008 (0.009)
Observations	5291	5291	5291	5291	5291	5291

Note: Robust standard errors clustered at cohort level are in parentheses with * $p < .1$, ** $p < .05$, *** $p < .01$. The observations are within the optimum bandwidth of 4 (the minimum value obtained from the *rdwselect* command for all of the outcomes estimates). The estimates exclude observations with the birth of cohort year one below and one above the cut-off.

Table A4b. Effect of the P4 training on social skills: IFLS 5-Bandwidth +5 Dependent variable: social skills

	(1) Aggregate Index	(2) Consciousness	(3) Openness	(4) Extraversion	(5) Agreeableness	(6) Emotion Stability
P4_dummy	0.000 (0.021)	0.009 (0.038)	0.028 (0.046)	-0.053 (0.032)	0.006 (0.032)	0.011 (0.029)
Birth Cohort	0.006*** (0.001)	0.014*** (0.003)	-0.003 (0.003)	0.004* (0.002)	0.004* (0.002)	0.010*** (0.002)
Observations	13859	13859	13859	13859	13859	13859

Note: Robust standard errors clustered at cohort level are in parentheses with * $p < .1$, ** $p < .05$, *** $p < .01$. The estimates include observations within optimum bandwidth +5 of the birth of cohort year one below and one above the cut-off.

Table A5a. Effect of the P4 training on social capital: IFLS 5-Falsification Test Dependent variable: social capital

	(1) Trust on neighbourhood	(2) Trust on neighbourhood	(3) Trust on neighbourhood -with covariates	(4) Community Participation	(5) Community Participation	(6) Community Participation -with covariates
P4_dummy	-0.011 (0.059)	0.096 (0.161)	0.023 (0.135)	0.003 (0.115)	1.312** (0.563)	1.257** (0.515)
Birth Cohort	0.008 (0.007)	-0.017 (0.040)	0.005 (0.033)	-0.014 (0.012)	-0.322** (0.131)	-0.315** (0.124)
Birth Cohort^2		0.004 (0.006)	-0.000 (0.005)		0.045** (0.019)	0.045** (0.018)
Observations	5291	5291	5098	5291	5291	5098

Note: Robust standard errors clustered at cohort level are in parentheses with * $p < .1$, ** $p < .05$, *** $p < .01$. The observations are within the optimum bandwidth of 4 (the minimum value obtained from the *rdwselect* command for all of the outcomes estimates). The estimates exclude observations with the birth of cohort year one below and one above the cut-off.

Table A5a1. Effect of the P4 training on social capital: IFLS 5-Bandwidth +5 Dependent variable: social capital

	(1) Trust neighbourhood	(2) Trust neighbourhood	(3) Trust neighbourhood -with covariates	(4) Community Participation	(5) Community Participation	(6) Community Participation -with covariates
P4_dummy	-0.011 (0.059)	0.096 (0.161)	0.023 (0.135)	-0.020 (0.013)	0.009 (0.046)	-0.002 (0.049)
Birth Cohort	0.008 (0.007)	-0.017 (0.040)	0.005 (0.033)	0.005*** (0.001)	-0.002 (0.010)	0.002 (0.011)
Birth Cohort^2		0.004 (0.006)	-0.000 (0.005)		0.001 (0.001)	0.000 (0.002)
Observations	5291	5291	5098	5291	5291	5098
F	8.436	5.380	5.742	23.887	19.186	19.536

Note: Robust standard errors clustered at cohort level are in parentheses with * $p < .1$, ** $p < .05$, *** $p < .01$. The estimates include observations within optimum bandwidth +5 of the birth of cohort year one below and one above the cut-off.

Table A5b. Effect of the P4 training on social capital: SUSENAS-Falsification Test Dependent variable: P4 Participation

	(1) Community Participation	(2) Community Participation	(3) Community Participation with Covariates	(4) Trust Index	(5) Trust Index	(6) Trust Index with Covariates
Treatment Cohort=1	0.056 (0.051)	0.227 (0.174)	0.226 (0.167)	0.012 (0.027)	-0.099 (0.102)	-0.095 (0.099)
Birth Cohort	0.035*** (0.009)	-0.020 (0.056)	-0.019 (0.054)	0.004 (0.004)	0.039 (0.034)	0.037 (0.033)
Birth of Cohort^2		0.008 (0.008)	0.007 (0.008)		-0.005 (0.005)	-0.005 (0.005)
Constant	1.869*** (0.023)	1.783*** (0.086)	1.439*** (0.130)	-0.056*** (0.012)	-0.001 (0.053)	-0.268*** (0.040)
Observations	32768	32768	32768	11125	11125	11125
F	161.825	117.972	1259.388	8.041	9.086	146.467

Note: Robust standard errors clustered at cohort level are in parentheses with * $p < .1$, ** $p < .05$, *** $p < .01$. The observations are within the optimum bandwidth of 4 (the minimum value obtained from the *rdwselect* command for all of the outcomes estimates). The estimates exclude observations with the birth of cohort year one below and one above the cut-off.

Table A5b1. Effect of the P4 training on social capital: SUSENAS-Falsification Test Dependent variable: P4 Participation

	(1) Community Participation	(2) Community Participation	(3) Community Participation with Covariates	(4) Trust Index	(5) Trust Index	(6) Trust Index with Covariates
Treatment Cohort=1	0.031 (0.044)	0.026 (0.061)	0.023 (0.056)	-0.002 (0.012)	0.015 (0.017)	0.010 (0.014)
Birth Cohort	0.038*** (0.004)	0.040*** (0.013)	0.040*** (0.012)	0.005*** (0.001)	-0.000 (0.005)	0.001 (0.004)
Birth of Cohort^2		-0.000 (0.001)	-0.000 (0.001)		0.001 (0.000)	0.001 (0.000)

Constant	1.855*** (0.029)	1.858*** (0.037)	1.534*** (0.055)	-0.055*** (0.007)	-0.064*** (0.011)	-0.318*** (0.014)
Observations	77231	77231	77231	25032	25032	25032
F	210.500	155.948	172.858	18.830	18.608	128.420

Note: Robust standard errors clustered at cohort level are in parentheses with * $p < .1$, ** $p < .05$, *** $p < .01$. The estimates include observations within optimum bandwidth +5 of the birth of cohort year one below and one above the cut-off.

Table A6.1 Heterogenous Effect of the P4 training on social skills: IFLS 5-Male Dependent variable: social skills

	(1) Aggregate Index	(2) Consciousness	(3) Openness	(4) Extraversion	(5) Agreeableness	(6) Emotion Stability
P4_dummy	0.083 (0.086)	0.049 (0.130)	0.145 (0.159)	-0.021 (0.149)	0.113 (0.094)	0.129 (0.106)
Birth Cohort	-0.004 (0.012)	0.012 (0.019)	-0.019 (0.020)	0.005 (0.020)	-0.018 (0.014)	-0.002 (0.014)
Observations	2978	2978	2978	2978	2978	2978
F	2.456	5.175	0.425	0.097	0.783	9.011

Note: Robust standard errors clustered at cohort level are in parentheses with * $p < .1$, ** $p < .05$, *** $p < .01$. The observations are within the optimum bandwidth of 4 (the minimum value obtained from the *rdwselect* command for all of the outcomes estimates). The estimates use male only observation and do not include covariates.

Table A6.1 Heterogenous Effect of the P4 training on social skills: IFLS 5-Female Dependent variable: social skills

	(1) Aggregate Index	(2) Consciousness	(3) Openness	(4) Extraversion	(5) Agreeableness	(6) Emotion Stability
P4_dummy	-0.100 (0.063)	-0.142 (0.115)	-0.085 (0.118)	-0.123 (0.108)	-0.089 (0.081)	-0.061 (0.064)
Birth Cohort	0.021*** (0.008)	0.038*** (0.014)	0.014 (0.015)	0.010 (0.014)	0.028*** (0.011)	0.014 (0.009)
Observations	3686	3686	3686	3686	3686	3686
F	8.766	13.118	0.515	1.170	8.559	1.636

Note: Robust standard errors clustered at cohort level are in parentheses with * $p < .1$, ** $p < .05$, *** $p < .01$. The observations are within the optimum bandwidth of 4 (the minimum value obtained from the *rdwselect* command for all of the outcomes estimates). The estimates use female only observations and do not include covariates.

Table A7.1 Heterogenous Effect of the P4 training on social skills: IFLS 5-Urban Dependent variable: social skills

	(1) Aggregate Index	(2) Consciousness	(3) Openness	(4) Extraversion	(5) Agreeableness	(6) Emotion Stability
P4_dummy	-0.053 (0.048)	-0.080 (0.087)	-0.062 (0.111)	-0.107 (0.087)	-0.075 (0.072)	0.060 (0.085)
Birth Cohort	0.015** (0.007)	0.032*** (0.012)	0.014 (0.017)	0.011 (0.012)	0.015 (0.010)	0.002 (0.012)
Observations	3895	3895	3895	3895	3895	3895
F	7.664	25.415	0.683	1.145	1.360	3.550

Note: Robust standard errors clustered at cohort level are in parentheses with * $p < .1$, ** $p < .05$, *** $p < .01$. The observations are within the optimum bandwidth of 4 (the minimum value obtained from the *rdwselect* command for all of the outcomes estimates). The estimates use urban only observations and do not include covariates.

Table A7.1 Heterogenous Effect of the P4 training on social skills: IFLS 5-Rural
Dependent variable: social skills

	(1) Aggregate Index	(2) Consciousness	(3) Openness	(4) Extraversion	(5) Agreeableness	(6) Emotion Stability
P4_dummy	-0.004 (0.069)	-0.061 (0.138)	0.081 (0.124)	-0.036 (0.125)	0.087 (0.102)	-0.091 (0.094)
Birth Cohort	0.007 (0.008)	0.023 (0.016)	-0.013 (0.014)	0.003 (0.013)	0.004 (0.012)	0.020 (0.012)
Observations	2769	2769	2769	2769	2769	2769
F	3.411	4.897	0.678	0.044	5.813	2.355

Note: Robust standard errors clustered at cohort level are in parentheses with * $p < .1$, ** $p < .05$, *** $p < .01$. The observations are within the optimum bandwidth of 4 (the minimum value obtained from the *rdwselect* command for all of the outcomes estimates). The estimates use rural only observation and do not include covariates.

Table A8.1 Effect of the P4 training on social capital: IFLS 5-Male
Dependent variable: social capital

	(1) Trust neighbourhood	(2) onTrust neighbourhood	(3) onTrust neighbourhood -with covariates	(4) onCommunity Participation	(5) Community Participation	(6) Community Participation -with covariates
P4_dummy	-0.011 (0.066)	-0.021 (0.123)	-0.079 (0.159)	-0.026 (0.020)	-0.052 (0.040)	-0.066 (0.048)

Birth Cohort	0.005 (0.010)	0.009 (0.040)	0.031 (0.049)	0.005* (0.003)	0.014 (0.012)	0.017 (0.014)
Birth Cohort^2		-0.001 (0.008)	-0.005 (0.010)		-0.002 (0.002)	-0.002 (0.003)
Observation s	2978	2978	2883	2978	2978	2883
F	0.558	0.401	0.835	2.012	1.975	1.802

Note: Robust standard errors clustered at cohort level are in parentheses with * $p < .1$, ** $p < .05$, *** $p < .01$. The observations are within the optimum bandwidth of 4 (the minimum value obtained from the *rdwselect* command for all of the outcomes estimates). The estimates use male only observation and do not include covariates.

Table A8.2 Effect of the P4 training on social capital: IFLS 5-Female
Dependent variable: social capital

	(1) Trust neighbourhood	(2) onTrust neighbourhood	(3) onTrust neighbourhood -with covariates	(4) onCommunity Participation	(5) Community Participation	(6) Community Participation -with covariates
P4_dummy	0.038 (0.047)	-0.021 (0.123)	-0.079 (0.159)	-0.026 (0.020)	-0.052 (0.040)	-0.066 (0.048)
Birth Cohort	0.004 (0.006)	0.009 (0.040)	0.031 (0.049)	0.005* (0.003)	0.014 (0.012)	0.017 (0.014)
Birth Cohort^2		-0.001 (0.008)	-0.005 (0.010)		-0.002 (0.002)	-0.002 (0.003)
Observation s	3686	2978	2883	2978	2978	2883
F	5.525	0.401	0.835	2.012	1.975	1.802

Note: Robust standard errors clustered at cohort level are in parentheses with * $p < .1$, ** $p < .05$, *** $p < .01$. The observations are within the optimum bandwidth of 4 (the minimum value obtained from the *rdwselect* command for all of the outcomes estimates). The estimates use female only observation and do not include covariates.

Table A9.1 Effect of the P4 training on social capital: IFLS 5-Urban Dependent variable: social capital

	(1) Trust neighbourhood	(2) onTrust neighbourhood	(3) onTrust neighbourhood -with covariates	(4) onCommunity Participation	(5) Community Participation	(6) Community Participation -with covariates
P4_dummy	0.031 (0.058)	0.067 (0.105)	0.045 (0.111)	-0.006 (0.008)	-0.021 (0.019)	-0.034 (0.027)
Birth Cohort	0.003 (0.008)	-0.012 (0.035)	0.004 (0.037)	0.004*** (0.001)	0.010 (0.007)	0.014 (0.009)
Birth Cohort^2		0.003 (0.007)	-0.001 (0.007)		-0.001 (0.001)	-0.002 (0.002)
Observation s	3895	3895	3746	3895	3895	3746
F	3.481	2.212	2.830	10.696	8.173	9.488

Note: Robust standard errors clustered at cohort level are in parentheses with * $p < .1$, ** $p < .05$, *** $p < .01$. The observations are within the optimum bandwidth of 4 (the minimum value obtained from the *rdwselect* command for all of the outcomes estimates). The estimates use urban only observation and do not include covariates.

Table A9.2 Effect of the P4 training on social capital: IFLS 5-Rural Dependent variable: social capital

	(1) Trust neighbourhood	(2) onTrust neighbourhood	(3) onTrust neighbourhood -with covariates	(4) onCommunity Participation	(5) Community Participation	(6) Community Participation -with covariates
P4_dummy	-0.005 (0.065)	0.017 (0.119)	0.047 (0.112)	-0.045** (0.022)	-0.050 (0.038)	-0.037 (0.038)
Birth Cohort	0.008 (0.008)	0.001 (0.031)	-0.017 (0.031)	0.006** (0.002)	0.008 (0.010)	0.005 (0.010)
Birth Cohort^2		0.002 (0.006)	0.006 (0.006)		-0.000 (0.002)	0.000 (0.002)
Observation s	2769	2769	2697	2769	2769	2697
F	3.032	2.150	2.341	3.501	2.234	2.583

Note: Robust standard errors clustered at cohort level are in parentheses with * $p < .1$, ** $p < .05$, *** $p < .01$. The observations are within the optimum bandwidth of 4 (the minimum value obtained from the *rdwselect* command for all of the outcomes estimates). The estimates use rural only observation and do not include covariates.

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1244 WILLINGNESS TO PAY ESTIMATES: EVIDENCES FROM AN URBAN WETLAND HAVING RECREATION-CUM-FISHERY BENEFITS

ABSTRACT

The rationale behind the conservation and restoration of wetlands emerges from a set of ecological and economic values attributed for the welfare of the community. Water bodies have been supporting biodiversity, sustaining livelihood, providing goods, services and other amenities, controlling flood, generating employment and yielding recreation benefits. However, the dichotomy that urban development projects posit upon society - prosperity on the one hand and degradation on the other, is the basis of this study. The question that arises therefore is whether the costs incurred in the project are likely to exceed the benefits provided by water bodies while considering the overall impact upon the environment. Kolkata, the leading metropolitan city of Eastern India, being located on deltaic plain, is endowed with vast water resources in the form of rivers, drainage channels, wetlands, lakes, canals and ponds. However, the problem of restoring and preserving these water bodies emerges due to their consideration as “free” public goods which have no direct monetary value since they are not traded in markets, in spite of offering a wide range of benefits. Economic valuation of the services and benefits accrued from the water bodies can be instrumental in protection of these water bodies. Urban wetlands often play multiple roles in recreation-resource generation-livelihood protection. Selecting one such wetland which is a Nature Park and a long-established Cooperative Fishery, this study seeks to assess the major ecosystem services, the multifarious roles and the economic value generated by the system. Mudialy Fishermen Cooperative Society (MFCS) named as Nature Park, an important ecological entity in the south western fringe of Kolkata, is selected for the study. This paper attempts to find out how people perceive the wetland as an ecological entity and their preferences by assessing their willingness to pay. It also seeks to determine the drivers controlling their preferences. Non market valuation techniques are used to draw conclusions. Focus group discussions with members of the Cooperative and other direct stakeholders further substantiate the analysis of preferences. The study shows that determination of a substitute cost can be used as a proxy for the overall services that these water bodies provide for free. It has revealed the strong preference of the people who are directly dependent on it for their livelihood. The study finally concludes an economic rationale for the further development and preservation of the water body so as to avoid the further consequences of negligence of water bodies.

Keywords: welfare, economic value, public goods, economic valuation, substitute cost

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1558 HUMAN VULNERABILITY ASSESSMENT FROM DEMOGRAPHIC, SOCIAL AND CLIMATIC DIMENSIONS

ABSTRACT

Human being are adversely affected by the changing nature of climate. The trend of the climate and associated occurrence of various hazardous phenomena are manifold higher than it was before. Population are more and more vulnerable towards different kind of climatic exposures, as manifest in various dimensions like demographic vulnerability, agricultural vulnerability, biophysical vulnerability etc. as a cumulative effect. Assessment of human vulnerability is a challenge in view of lack of systematic, quantitative data with respect to the climate change impacts. Also, there is an uncertainty on the methods of quantification of human vulnerability. This study is an endeavor to quantify human and climatic vulnerability, based on the analysis of the demographic, social variables along with meteorological data. Methods – The demographic and social dimensions of selected Indian states (from northern, eastern, southern and western regions of India) were gathered along with the IMD meteorological information with reference to time zones and season. Details statistical methodology was adopted to obtain apportionment of relative contributions of different variables, derived as coefficient matrices using Principal Component Analysis. The coefficient matrices were associated to selected climatic indices to demonstrate the climatic vulnerability. Results – Vulnerability is defined as the summated impacts of human exposure, sensitivity and their adaptive ability to a climatic condition. Analysis provided quantification of these components based on sample data drawn from selected states spatially shown through GIS mapping. This approach has a high promise to predict and project population vulnerability associated to its confounders in relation to climatic extremes.

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1581 WETLAND CONSERVATION AND KOLKATA'S ECOLOGICAL RESILIENCE

ABSTRACT

Ecological resilience develops over time and space as result of the dynamic interaction of social-economic and ecological processes in multiple scales and magnitudes. The ecological resilience of urban ecosystem refers to the state in which the system able to tolerate the alteration without changing into a new structure and processes. Decline in the ecological niches of regions result in challenges to resilience. Wet lands remain acutely threatened as an ecosystem, even more so in urban regions simply due to anthropogenic pressures. Several reasons such as unplanned growth of the urban area at the cost of nature, lack of proper environmental strategy, lack of adequate implementation of management plans, failure of past management actions due to lack of environmental justice, and finally a general attitude of negligence of nature in urban localities as they lose their previous importance in serving the area reduce the cross- scale resilience, leaving the system vulnerable to change. At present, decisions are implemented based on the present needs of the human society and that shapes the ecological system. In these circumstances, assessment of the ecological services provided by the wetlands ecosystem is an important issue to understand the present situation. The present study is aimed at providing a background to the understanding of ecological resilience in terms of the East Kolkata Wetlands, an expansive tract of water bodies, streams, canals and channels – an intricate deltaic ecosystem that nurtures the megacity of Kolkata. Ecological service assessment methodology has been applied that can be used to assess multiple ecological services of the wetlands in urban areas and integrate them with socio-ecological conditions in urban neighborhoods. This study tries to point out the reasons which lead to arrive current situation through historical context analysis in order to conserve them in contemporary time. It is also important to analyze the past and present policies related with wetland conservation and management to identify the reasons behind its present condition. Result of the analysis will help to identify the gap between theoretical and practical implementation of the present planning policies related with the wetland conservation and management. In this context, mapping is an important tool towards spatial representation of the present vulnerable conditions of the wetlands using the resilience context of wet lands in urban areas. The study seeks to provide a set of technical and strategic alternatives towards modification of the policy framework that can significantly improve its effectiveness in establishing of wetland resilience.

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1707 CHARACTERISTICS AND THE NATURE OF THE TREND OF CLIMATE IN THE CITY KOLKATA

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ABSTRACT

The changing nature of the climate of the city is experienced throughout all over the world, but its magnitude of change may differ from city to city. Complexity of the city structure influenced the rate of natural change of the climatic elements from its counter suburban or rural areas and the effect known Urban Heat Island (UHI) effect. So to measure the extreme climatic elements is the major task, by which special policy may formulate to overcome the situation. Here an attempt has been made to measure the nature of extremes climatic elements, which are recommended by Expert Team on Climate Change Detection and Indices (ETCCDI) as well as other relevant indices of the climate of Kolkata. For this purpose, daily climatic elements (Maximum Temperature, Mean Temperature, Minimum Temperature, Precipitation and Relative Humidity) has been used for the period of 1969-2012. Both parametric (linear regression test) and non-parametric (Mann Kendall test) has been used to detect the change and Sen's slope estimator used to degree of change. To detect homogeneity of the dataset four homogeneous test has been applied. Long term (1969-2012) trend of extreme temperature indices like TXa, TXn, TMa, TNx, TNa and TNn of monthly, seasonal and annual time step have follow positive increasing trends, while noticeable decadal positive change of 0.19°C-0.45 °C has noticed in mean Temperature. The intensity of the Precipitation of different scale also changed, but not significant ones. Other elements like relative humidity also changed over time and trend of average RH during 8.30 am and 5.30 pm shows alarming rate of change during monsoon, pre-monsoon and post monsoon seasons, high humidity in monsoon season increases higher heat index value.

Key Notes: ETCCDI, Mean Temperature, Precipitation Trends, Relative Humidity, Heat Index.

1. INTRODUCTION

Characteristics and trends of Extreme Climatic Indices (ECIs) like maximum temperature (TX) and minimum temperature (TN) and precipitation indices in the world have been analyses by different researchers and most of the findings reveal the fact that ECIs has increased in recent times (Easterling et al., 1997; Plummer, et al., 1999; Zhang, Hogg, & Mekis, 2001; Frich, et al., 2002; Vose et al., 2004;; Moberg & Jones, 2005; Rahmstorf & Coumou, 2011; Lee, Kwon, Modarres, Kim, & Chebana, 2016; Scherrer, et al., 2016; Lin , et al., 2017; Abbas, Sarwar , Ibrahim, Adrees, & Ali, 2018; Mukherjee, Aadhar, Stone, & Mishra, 2018; Tirkey, Ghosh, Pandey, & Shekhar, 2018). Not only indices of TX, TN, mean temperature (TM) increase more significantly while significant decreasing trend of Diurnal Temperature Range-DTR (Brázdil, 1996; Moberg, & Jones 2005; Dashkhuu et al., 2014; Ghasemi, 2015) has been noticed. After reviewing existing trends of ECIs and its future projection of 3rd, 4th and 5th Assessment Reports (AR) of the IPCC, Alexander (2016) finally concluded that the warm temperature would increase and cold temperature extremes would continue to decrease. Karl et al. (1993) quantify the trend and found that the rise of the TN was three times more than the rise of the TX, and the decrease of the DTR was equal to the increase of the TM in the land dominated northern hemisphere. The urban areas trap the heat and increase firstly the Land Surface Temperature (LST), and thereafter the local air temperature, by which it can be differentiated from its rural or suburban counterpart, the process is commonly known as the Urban Heat Island (UHI) effect. And due to this mechanism, trend of ECIs in urban areas becomes more observable compare to its counter rural areas. The study by different researchers has found the alarming rate of the change of ECIs (Alghamdi & Moore, 2014; Keggenhoff, Elizbarashvili, Amiri-Farahani, & King, 2014; Mishra, Ganguly, Nijssen, & Lettenmaier, 2015). Not only increasing trend, asymmetry has also been found in the temporal distribution of temperature where Long-term change (1901- 2003) shows a slight increase of the TX (0.07 °C/decade), while in recent time (1971-2003) both TX and TN have increased (>0.2 °C/decade) substantially (Kothawale, & Rupa Kumar, 2005). In India, studies conducted by different researchers at the national level like Rao et al., (2004), Oza and Kishtawal (2015), basin level (Shrestha, 2016; Hamid, 2014) and city (Dhorde, Dhorde, & Gadgil, 2009; Mohan et al. 2011a, 2011b, and 2012; Desai, Patel, Rathi, Wagle, & Desai, 2015; Korade, & Dhorde, 2016) have found that the extreme temperature events as well as relative events like warm nights, warm days, and cold nights are increasing with different magnitudes.

Increase of temperature of the city under warming phases, precipitation, extreme likely to be increased as a result of The Clausius-Clapeyron (C-C) relationship, as water holding capacity of the atmosphere increase approximately 6-7%/K increase of temperature (Trenberth, Dai, Rasmussen, & Parsons, 2003; Kharin & Zwiers, 2007). So, along with extreme temperature indices, precipitation indices needs to incorporate, as the later one has also socio-economic impacts, like-urban flooding. Studies by researchers also confirm that, intensity of precipitation has increased in recent times and will be in the upcoming future (Siswanto, van Oldenborgh, van der Schrier, Jilderda, & van den Hurk, 2016; Mukherjee, Aadhar, Stone, & Mishra, 2018) while different precipitation(ndices respond differently (Rahimzadeh, Asgari, & Fattahi, 2009)

Table 9. Extreme Temperature and Precipitation Indices

ID	Index name	Description	Unit
Temperature Extremes			
TXx	Maximum Tmax	Monthly maximum value of daily Tmax	°C
TNx	Max Tmin	Monthly maximum value of daily Tmin	°C

TXn	Min Tmax	Monthly minimum value of daily Tmax	°C
TNn	Min Tmin	Monthly minimum value of daily Tmin	°C
TXa	Average Tmax	Monthly average value of Daily Tmax	°C
TNa	Average Tmin	Monthly average value of Daily Tmin	°C
TM	Average Tmean	Monthly average value of Daily Tmean	°C
TN10p	Cool nights	Total no. days when daily TN less than 10th Percentile	Days
TX10p	Cool days	Total no. days when daily TX less than 10th Percentile	Days
Tn90p	Warm Nights	Total no. days when daily TN less than 90th Percentile	Days
TX90p	Warm days	Total no. days when daily TX less than 90th Percentile	Days
DTR	Diurnal Temperature Range	Annual mean value of difference between TX and TN	°C
Precipitation Extremes			
PRCPTOT	Annual Total Wet Day PR	Annual Total Number of Wet Day rainfall ≥ 0.001	Days
R10mm	Number of heavy rain Days	annual number of days when PR>10mm	Days
R20mm	Number of very heavy rain Days	Annual Number of days when PR>20mm	Days
R95p	Total annual PR from heavy rain days	Annual sum of daily PR>95 percentile	mm
R95pTOT	Contribution from very Wet days	$100 \times r95p / PRCPTOT$	%
R99p	Total annual PR from very heavy rain days	Annual sum of daily PR>99 percentile	mm
R99pTOT	Contribution from extremely Wet days	$100 \times r99p / PRCPTOT$	%
R*1Day	Maximum 1 day PR	Maximum 1 day PR total	mm/day
R*5Day	Max 5 day PR	Maximum 5 day PR total	mm/day
SDII	Simple Daily Intensity Index	Annual total PR divided by the number of wet days(when PR ≥ 0.01 mm)	

2. STUDY AREA, DATA AND METHODOLOGY

The Kolkata Metropolitan Area (KMA) is the 3rd largest Urban Agglomeration (UA) and oldest metropolis (more than 300 years old) of India, consists of three Municipal Corporation (MC-Kolkata, Howrah and Chandannagar), 38 Municipalities and 24 Panchayat Samitis. Kolkata Municipal Corporation (KMC) is the most populated MC of KMA. The Kolkata city has only one meteorological station, Alipore which is also the oldest meteorological station of the country. As the city has a long history of growth, the impact of growth on micro climate is not sudden, hence, the prime objective of the paper to find out the climatic trend of the city at present and also upcoming future. Spatio-temporal distribution of surface temperature- Land Surface Temperature (LST) using multi temporal Landsat Thematic Mapper (TM) imagery has been used. To fulfil the main objective of the paper, 44 years (1969-2012) of daily temperature (maximum and minimum), precipitation and relative humidity data, have been used, which has been collected from the office of India Meteorological Department (IMD), Alipore and Pune. The dataset having almost complete with less than 2% of missing data. The missing data are excluded as the distance is more in-between Alipore and other observatories. Quality control of the data have also been conducted according to the standard process described by Alexander et al. (2006). After analyzing extreme temperatures of a long-period (1850 to 2012), as per the IPCC fifth Assessment Report (AR5) it has been identified that 1983 to 2012 period was the warmest period of the earth; and current climate period also fall under this warming phase, hence it is expected that this study will enable to figure out the micro-climatic condition and its trend of Kolkata. The IPCC in its Special Reports managing the risks of Extreme Events and Disaster to Advance Climate Change Adaptation (SREX) in 2012 and AR5 in 2013 has given special emphasis to temperature and precipitation extremes in the context of climate change. Expert Team on Climate Change Detection and Indices (ETCCDI) recommended 27 core temperature and precipitation indices, out of which, most of the temperature indices (both absolute and relative) and precipitation indices which are suitable to analyses the climate of city have been analyzed here (table 1). Both parametric test (linear regression test) and non-parametric test (Mann-Kendall Tau test, MK) have been computed to know the nature of change either positive or negative in the areas, Theil Sen's Slope (SS) has also been computed to know the degree of change.

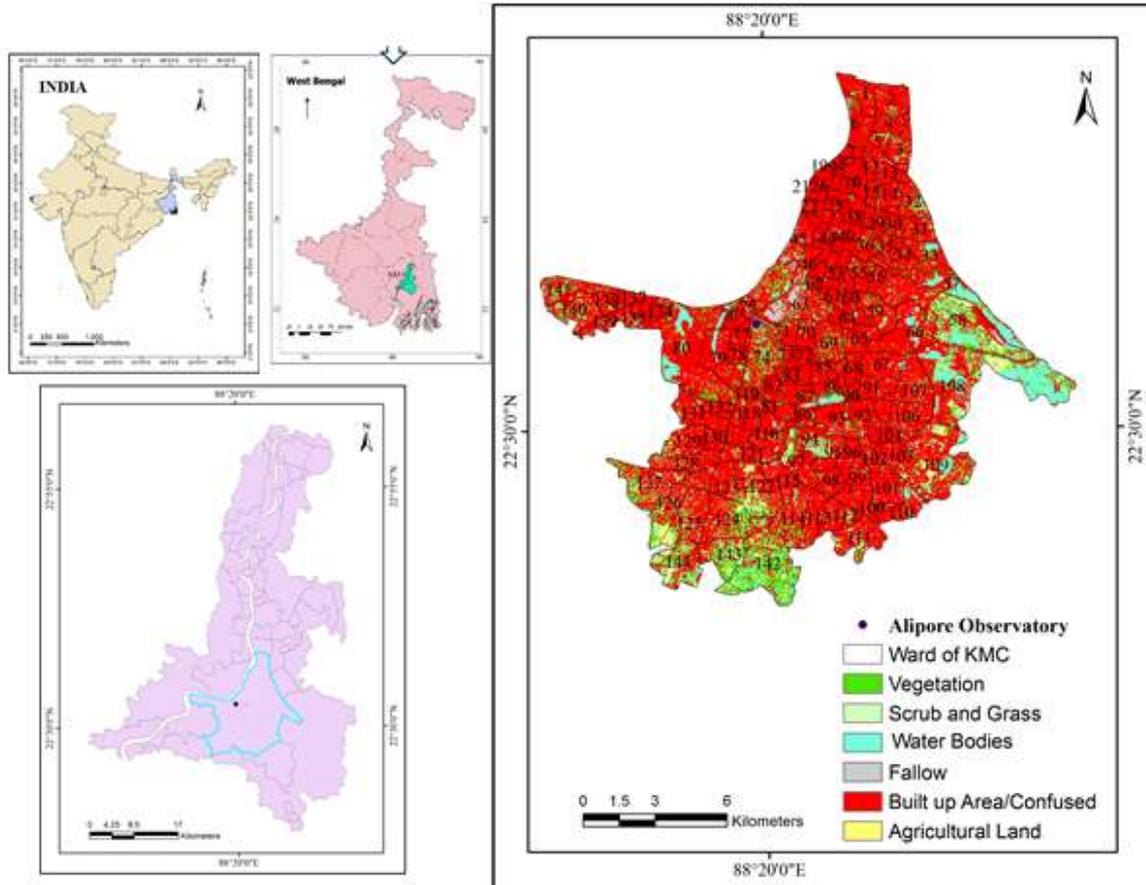


Figure 42 Location Map of the Study Area

Land Surface Temperature (LST)

In order to convert the DN value of Landsat Thematic Mapper 5, band 6 the following equation has been used-

$$L_i = L_{max} + (L_{max} - L_{min}) / Q_{dn} / Q_{max}$$

Where, L_i is the at-sensor spectral radiance ($MW \cdot cm^{-2} \cdot sr^{-1} \cdot \mu m^{-1}$); L_{max} is the maximum at-sensor spectral radiance; L_{min} is the minimum at-sensor spectral radiance; Q_{max} represents the maximum DN value of pixels and Q_{dn} represents the DN value of pixel. For Landsat TM 6 data, Equation can be expressed as Equation:

$$L_6 = 0.005632156 Q_{dn} + 1.238$$

Where, L_6 is the at-sensor spectral radiance of Landsat TM 6, and Q_{dn} is the DN value of pixel.

In order to convert the spectral radiance into at-sensor brightness temperature, the Planck's function can be used as:

$$T_6 = K_2 \ln (1 + K_1 / L_6)$$

$$K_1 = 60.776 MW \cdot cm^{-2} \cdot sr^{-1} \mu m^{-1}$$

$$K_2 = 1260.56 K$$

Where, T_6 is the at-sensor brightness temperature of Landsat TM 6; K_1, K_2 are calibration constants of Landsat TM and L_6 represents the at-sensor spectral radiance of Landsat TM 6. Further brightness temperature of Landsat TM6 is converted from Kelvin to Celsius.

Mann Kendall Test

Mann Kendall test is one of the effective non-parametric test which can significantly detect the trend of meteorological data series.

$$s = \sum_{i=1}^{n-1} \sum_{j=i+1}^n sgn(x_j - x_i)$$

Where, n is the periods or length of the data set and x_i and x_j represent data point in the time series of i and j , respectively ($i > j$),

$$sgn(x_j - x_i) = \begin{cases} -1, & \text{if } x_j - x_i < 0 \\ 0, & \text{if } x_j - x_i = 0 \\ +1, & \text{if } x_j - x_i > 0 \end{cases}$$

It has been documented that when $n \geq 10$ Then the distribution of S is normally follow

$$E(S) = 0$$

$$V(S) = \frac{n(n-1)(2n+5) - \sum_{i=1}^m t_i(t_i-1)(2t_i+5)}{18}$$

Where $E(S)$ is the mean and $V(S)$ is the variance, m is the number of the groups and t_i is the size of the i th tied group. The standard normal test statistics Z is given by

$$Z = \begin{cases} \frac{S+1}{\sqrt{V(S)}}, & \text{if } S < 0 \\ 0, & \text{if } S = 0 \\ \frac{S-1}{\sqrt{V(S)}}, & \text{if } S > 0 \end{cases}$$

Positive Z score indicates an increasing trend and negative shows negative trend or decreasing trend of the precipitation. If $|Z| > Z_{1-\alpha/2}$, null hypothesis H_0 for “no trend” in the time series is rejected and a significant trend exist. In the present study, significance level is fixed at 0.05. No Pre-Whitening is done as the data length is enough (Bayazit and Önöz, 2008).

Theil-Sen’s approach (TSA) (Theil 1950: Sen 1968) is used to determine the degree or magnitude if change. TSA slope i.e. β is defined as-

$$\beta = \text{median}\left(\frac{X_j - X_i}{j - i}\right)$$

Where X_i and X_j represent data points in time series i and j , respectively ($i < j$). A positive value of the slope, β indicates and increasing trend and vice versa.

Decadal change

Here, magnitude of the change computed in time step of decade. Yue and Hashino (2003) used percentage change of sen’s slope on their articles, here decadal change of temperature have been computed using the formula

$$\text{Decadal change (\%)} = \frac{\beta * N}{\bar{X}} * 10$$

Where, β is the slope value calculated by Theil-Sen’s formula and N is the data length and \bar{X} is the mean of the data.

3. RESULT AND DISCUSSION

3.1 Land Surface Temperature

Analyzing the spatio-temporal distribution and the characteristics of Land Surface Temperature (LST) is one of the important factors to study the micro-climatic condition of an area and due to changing Land Use and Land Cover (LULC) and conversion of any kind of land to impervious material, LST has significantly increased (Hu & Jia, 2009; Wang, Zhan, & Ouyang, 2017; Xiao, et al., 2018). Here two seasons i.e. summer and winter has been chosen to examine the behavior of LST during the seasons in different decades. To measures winter and summer season LST multiple year Landsat Thematic Mapper (TM) 5 (band 6) satellite images has been used. Details of the algorithm and band information has been given in the table 2. Here only one sensor data have been used to monitor the LST as the different sensor has a different reflectance and may give different results.

Table 10 Basic Information about the used Satellite Images

Imagery	Landsat Thermal Mapper (TM) 5 Winter Seasons (Jan-1990, 2001, 2010); Summer Seasons (April 1990, 1999, 2009)
Band Used	Thermal (Band no. 6)
Wave length	10.40 - 12.50 (µm)
Resolution	120 meter

LST has been measured across 144 wards of the KMC in two seasons; winter (1990, 2001 and 2010) and summer (1990, 1999 and 2009). From the Fig. 2(a-c) and 3 (a-c), it can be said that, LST has increased significantly during the time period in both of the seasons, while the rate of change is maximum in summer seasons with more than 2^o C. Both of the seasons shows a significant increase of LST in northern, eastern (ward no. of 75-80) and southern (ward no. 70-76, 80-84, 116-118) part of the study area.

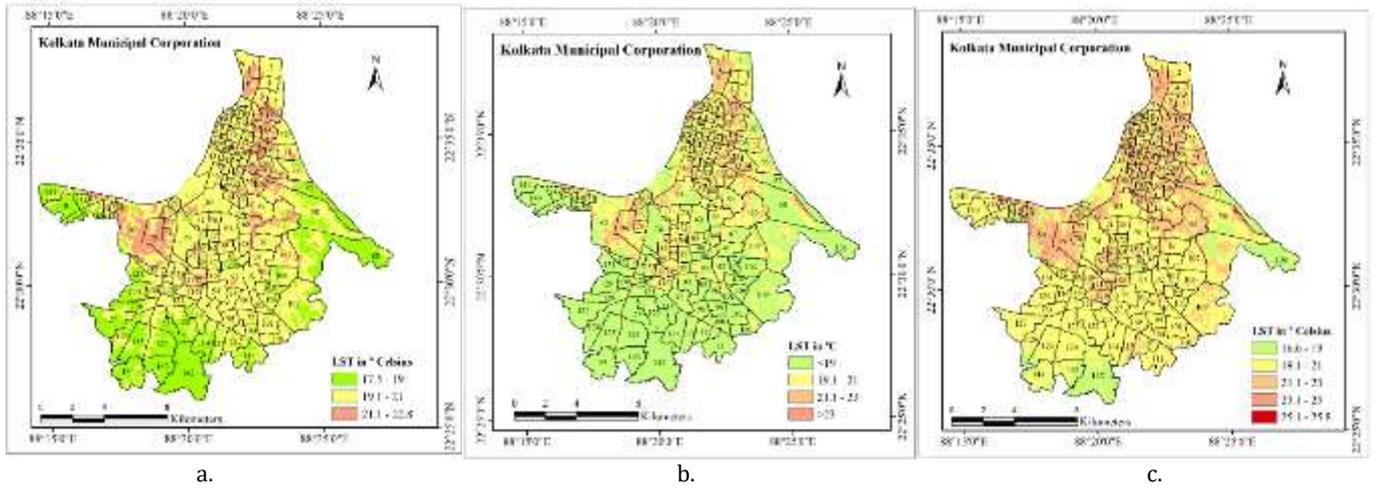


Figure 2 LST during Winter Season: January 1990 (a), January 2000 (b), and January 2010 (c)

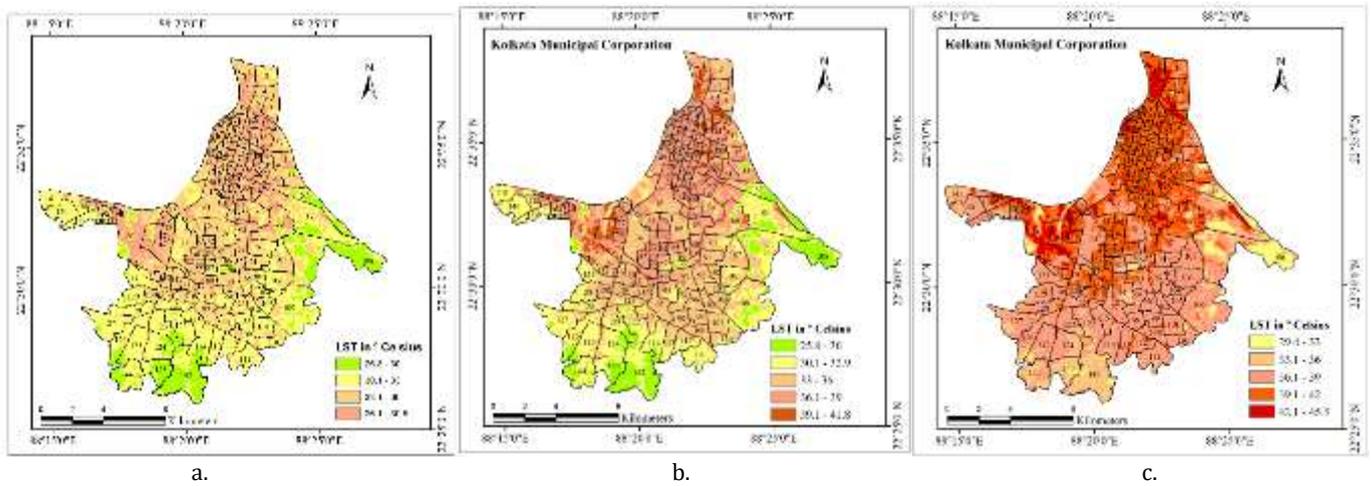


Figure 3. LST during Summer Season: 1990 (a), 1999 (b), and 2009 (c)

3.2 Temperature Extremes

3.2.1 Monthly Characteristics of T_I's and trends

3.2.1.1 T_X, T_{Xn}, T_{Xa}

Monthly T_X of Alipore has increased with insignificantly trend (table 1). Out of 12 months, nine months shows a slight increasing trend of T_X while March, April and May shows a slight decreasing trend. While significant increasing trend has been noticed in the August month and October month with positive trend of 0.16 °C/decade and 0.18 °C/decade respectively. Like T_X, T_{Xn} have also found similar trend with most of the month remains non statistical significant trend. Although, significant decreasing trend (1.80 °C/decade) of T_{Xn} in January month has been recorded. T_{Xa} as a whole is a good indicator to have an idea about whether monthly average T_X has increased or not. No Significant increasing trend of T_{Xa} has been found in most of the months, while statistically decreasing trend (0.50 °C/decade) of T_{Xa} has been observed in January month.

3.2.1.2 T_N, T_{Nn} and T_{Na}

Daily T_N is one of the most important parameters to define change of temperatures in the urban areas. An increase of T_N in all of the months has been found, where most of the months have indicated a significant increasing trend, with decadal change, of February (0.98 °C), March (0.60 °C), April (0.53 °C) and June (0.41 °C) at Dum Dum, and February (0.71°C), March (0.62 °C) April (0.59 °C) and December (1.13 °C).

It is very interesting to note that, T_{Nn} shows an increasing trend in all of the months while significant increasing trend has been also noticed in the months of January, February, March, June and August with decadal increasing trend of 1.41°C, 1.37°C, 1.28°C, 0.6°C and 0.40°C respectively.

T_{Na} also shows a significantly (both 5% and 1% significant level) increasing trend. Out of the twelve months of a year, around ten months significantly figure out the fact. Although the rate of the change of the temperatures differ from month to month; and noticeable decadal increasing trends have been noticed in the months of December (1.5°C) February (0.87°C) and March (0.89°C).

3.2.1.3 T_M

Monthly Tmean (TM) of the city have shown different kind of results. Although in all of the months of the Alipore Observatory indicate an increasing trend, the significantly increasing trend has been noticed in the months, with decadal change, of March (0.45 °C), July (0.19 °C), August (0.22°C), September (0.20°C) and December (0.53°C), and the remaining months represent non-significant trend.

3.2.2 Seasonal Characteristics of TI's and trends

Seasonal TXx, TXn, TXa of Kolkata also indicate varying results, where statistically significant increasing trend of TXx has been found in post-monsoon season (0.17°C/decade). Statistically significant decreasing trend of TXn of -1.66°C/decade have been found in the winter season. Whereas, no significant seasonal increasing trend of TXa has been found in Kolkata.

Table 11. Extreme Temperature Trends in Kolkata

Time	TXx Alipore		TXa Alipore		TXn Alipore		TMa Alipore		TNx Alipore		TNa Alipore		TNn Alipore	
	MK	Sen's	MK	Sen's	MK	Sen's	MK	Sen's	MK	Sen's	MK	Sen's	MK	Sen's
Jan	0.1	0.24	-0.29	-0.52*	-0.39	-1.80**	-0.05	-0.12	0.05	0.233	0.15	0.658	0.28	1.39**
Feb	0.1	0.29	0.06	0.1	-0.09	-0.55	0.2	0.43*	0.26	0.71**	0.32	0.88**	0.17	1.366
Mar	-0.09	-0.17	0.07	0.13	0.07	0.35	0.25	0.44*	0.36	0.63**	0.32	0.89**	0.24	1.28*
Apr	-0.11	-0.2	-0.06	-0.11	-0.06	-0.24	0.08	0.12	0.37	0.58**	0.26	0.38*	0.08	0.305
May	-0.02	-0.06	0.05	0.1	-0.12	-0.51	0.17	0.22	0.20	0.21	0.26	0.43*	0.11	0.401
Jun	0.01	0	0.09	0.14	-0.07	-0.18	0.19	0.26	0.26	0.32*	0.37	0.44*	0.29	0.60**
Jul	0.11	0.19	0.09	0.07	0.06	0.12	0.21	0.19*	0.30	0.26**	0.42	0.35*	0.12	0.144
Aug	0.17	0.16	0.13	0.12	0.03	0.07	0.27	0.23*	0.26	0.22*	0.44	0.33**	0.27	0.40*
Sep	0.17	0.17	0.11	0.11	-0.02	-0.05	0.25	0.20*	0.19	0.175	0.41	0.30**	0.28	0.33**
Oct	0.22	0.18*	-0.03	-0.03	0	0	0.1	0.09	0.29	0.29**	0.20	0.24*	0.02	0
Nov	0.11	0.14	-0.04	-0.03	-0.07	-0.4	0.2	0.35*	0.15	0.453	0.23	0.73*	0.11	0.762
Dec	0.13	0.25	-0.01	-0.01	-0.11	-0.58	0.27	0.53*	0.23	1.13*	0.45	1.51**	0.14	0.565
JF	0.1	0.29	-0.13	-0.22	-0.33	-1.66**	0.1	0.17*	0.26	0.71*	0.29	0.84**	0.16	0.874
MAM	-0.09	-0.17	0.02	0.01	-0.07	-0.35	0.2	0.24*	0.25	0.28*	0.39	0.57**	0.24	1.28*
JJAS	-0.07	-0.19	0.15	0.1	0.07	0.07	0.33	0.22**	0.27	0.29*	0.54	0.33**	0.27	0.46*
OND	0.22	0.18*	-0.08	-0.06	-0.13	-0.71	0.3	0.30**	0.30	0.33**	0.42	0.72**	0.14	0.565
Annual	-0.1	-0.17	-0.03	-0.01	-0.26	-1.35*	0.37	0.21**	0.22	0.25*	0.63	0.53**	0.15	0.75

*Bold mark are statistically significant, while * and ** denotes 5% significance level and 1% significance level.*

TNx follows significant increasing trend in all of the seasons having alarming trend found in winter season with the decadal increasing trend of more than 0.96°C. An interesting finding is that, TNn has increasing trend at Alipore with statistically significant trend in the pre-monsoon (1.28°C /decade) and monsoon (0.46°C/decade) seasons. But TNa has got significant increasing trend in all of the seasons at both of the stations with noticeable increasing trend found in winter (0.83°C/decade), pre-monsoon (0.57°C/decade), monsoon (0.33°C/decade) and post-monsoon (0.72°C/decade) seasons at Alipore.

Seasonal TMa of both the stations shows an alarmingly increase trend throughout the year, and the maximum positive trend has been noticed in pre-monsoon, monsoon and post-monsoon seasons with decadal change of TMa varying from 0.21°C/decade to 0.48°C/decade, decadal change of TMa is the maximum in post-monsoon season with decadal change of 0.30°C/decade.

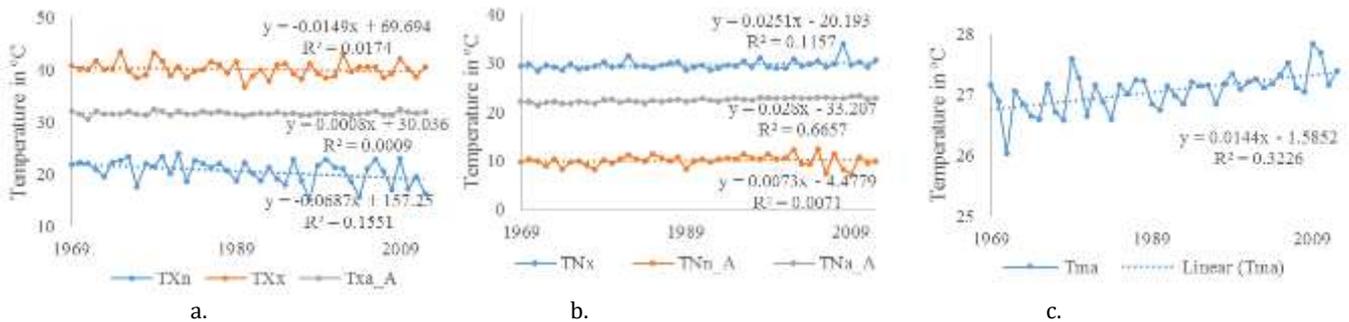


Figure 4. Annual Trend of TXx, TXn and TXa (a), Annual Trend of TNx, TNn and TNa (b) and Annual Trend of TMa (c) at Alipore meteorological station

3.2.3. Trend of annual extreme temperatures over Kolkata

Temperature extremes like TXx, TNn, TM, TXn, TNx, TXa and TNa in annual time step have been computed to know the trend of such elements (Fig 4). Both parametric and non-parametric tests have been computed to know the actual change of the temperature (table 3). No statistical change of TXx has been observed at any of the stations selected here. TXn of Alipore has decreased (-1.34 °C/decade) significantly with p value 0.013. Higher rate of increasing trend of annual TNx has been noticed in Alipore (0.25 °C/decade); while significant annual TNa has been recorded at Alipore with decadal change of temperature of 0.53 °C with p < 0.0001 and R² value of 0.41. Annual TNn have been recorded with increasing trends, but the results have no statistical significance at 5% or 1% significance level. TMa shows an increasing trend with

95% confidence level, with both parametric (R^2 values 0.1) and non-parametric test (0.21 °C/decade with $p = 0.0003$) result signifies the result.

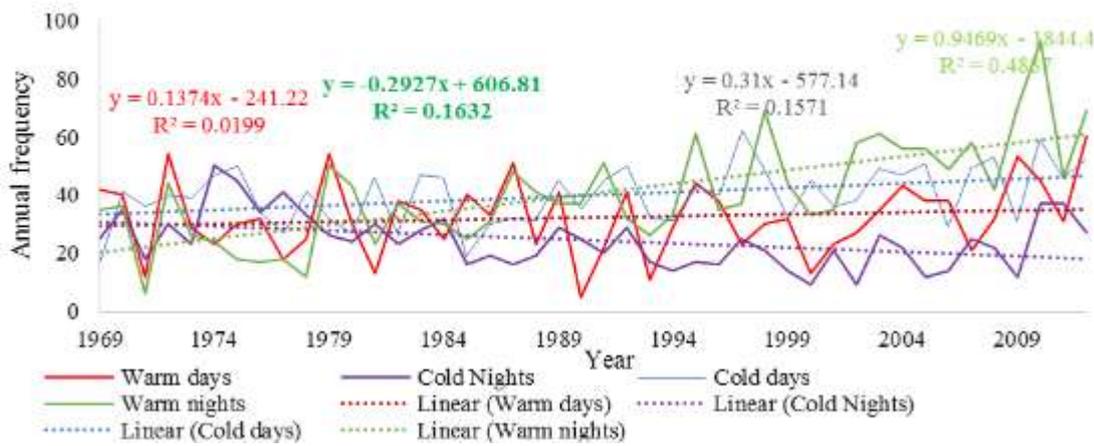


Figure 5. Frequency and Trend of Relative Temperature Extreme

Alipore

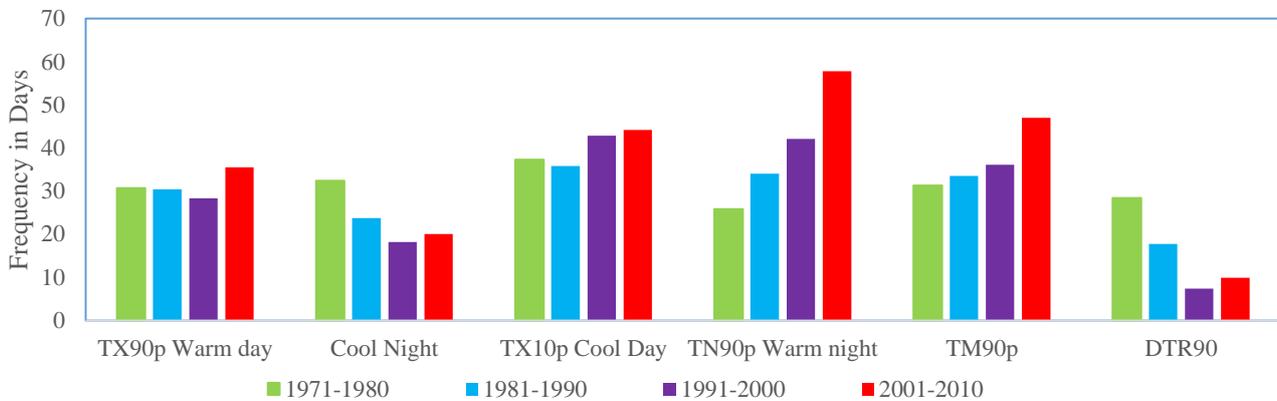


Figure 6. Decadal Variability of Relative Temperature Extremes

3.2.4. Annual and Decadal Distribution of Relative extreme Events

For relative measures of temperature events, six indices have been used, out of which IPCC has recommended four indices, namely Warm Days (TX90p), Warm Night (TN90p), Cool Nights (TN10p), Cold Days (TX10p); and apart from this, Tmean90p and DTR90p have also been used here to find out whether the extreme mean temperature values and extreme diurnal values changed over the time period or not, as those are also important temperature parameters. Significantly increase trend of warm nights has been recorded at Alipore with R^2 value of 0.49 (fig. 5).

The selected dataset have been suitably divided into four decades like 1971-1980, 1981-1990, 1991-2000 and 2001-2010. Different indices behave differently throughout the study period. It has been found that warm days and warm nights both of the urban observatories shows an increasing values (Fig. 6). The frequency of cool nights have not increased, while a gradual decreasing trend of cool nights, has been observed. On the other hand, a little increase of the cold days frequency has been noticed at Alipore. It is interesting to note that from all of the four parameters, positive change of the warm nights has been marked in other cities of India and World.

3.3 Precipitation extremes

Like temperature extremes, precipitation extremes of Kolkata has also been computed here (table 4 and fig. 7 a-d). Precipitation extremes of different parts of the world, changed differently, where most of the cases an increase of the PE has been examined, while others remain decreasing trend.

Table 12 Precipitation Extremes of Kolkata

Variable	Min	Max	Mean	SD	Kendall's tau	p-value	Sen's slope	Decadal Trend
R*1Day	50.30	343.60	122.24	60.64	0.15	0.16	0.57	2.06
R*5Day	126.90	550.80	239.16	108.94	0.17	0.12	1.46	2.69
R99pTOT	9.77	27.08	17.00	4.20	0.04	0.74	0.02	5.68
R95PTOT	60.20	90.34	79.03	6.29	0.12	0.27	0.09	5.03
R95P	148.20	606.60	293.93	106.11	0.13	0.21	1.24	1.85
R99P	48.83	128.24	72.04	17.88	0.12	0.24	0.21	1.29
R90P	795.50	2043.10	1348.17	250.89	0.11	0.32	3.18	1.04
PR95Rough	8.52	23.28	13.96	3.19	0.00	0.98	0.00	0.07

PR95	10.13	24.21	15.12	2.56	0.05	0.66	0.01	0.42	
Rainy Days	61.00	99.00	83.45	8.11	-0.04	0.72	0.00	0.00	
Wet Days	85.00	160.00	124.39	14.62	0.00	1.00	0.00	0.00	
Pr>=120mm	0.00	3.00	0.59	0.92	0.11	0.37	0.00	0.00	
Pr>=70mm	0.00	11.00	3.23	2.23	0.13	0.25	0.00	0.00	
Pr>125	0.00	3.00	0.52	0.85	0.12	0.33	0.00	0.00	
Pr>20	15.00	43.00	27.70	4.74	0.03	0.81	0.00	0.00	
Pr 90 Percentile	25.00	59.00	36.36	5.60	0.05	0.63	0.00	0.00	
pr 95 percentile	9.00	34.00	18.14	4.51	-0.01	0.96	0.00	0.00	
Pr 99 percentile	0.00	11.00	3.61	2.31	0.13	0.25	0.00	0.00	
75 Percentile	65.00	107.00	90.84	9.23	-0.04	0.69	-0.05	-0.22	
Annual Precipitation	1095.90	2464.70	1706.06	289.62	0.11	0.32	2.20	0.57	
SDII	9.44	20.04	13.76	2.25	0.09	0.38	0.02	0.68	
Wet Days	JF	0.00	9.00	3.89	2.70	-0.10	0.35	0.00	0.00
	MAM	5.00	34.00	17.91	6.84	-0.01	0.90	0.00	0.00
	JJAS	66.00	99.00	82.70	8.03	-0.06	0.56	-0.04	-0.23
	OND	4.00	39.00	20.91	7.77	0.18	0.08	0.18	3.89
Rainy Days	JF	0.00	5.00	2.05	1.60	-0.14	0.20	0.00	0.00
	MAM	1.00	20.00	9.93	4.37	-0.04	0.71	0.00	0.00
	JJAS	40.00	72.00	57.32	7.33	-0.02	0.87	0.00	0.00
	OND	2.00	28.00	13.41	5.73	0.17	0.12	0.12	3.90

3.3.1. R*1Day, R*5Day

One day Maximum Precipitation (R*1Day) and consecutive five days extremes precipitation (R*5Day) trend show an increasing trend with decadal increasing trend of 2.06mm/ day and 2.69mm/day respectively but the trend is not statistically significant.

3.3.2. Daily heavy to very severe Precipitation

Daily Heavy to severe precipitation of Precipitation greater than 20mm, 70mm, 120mm shows almost no trend with a slight decadal change of respected precipitation extremes lies from 0.11-0.15mm. No statistical significant trend has been observed at Alipore.

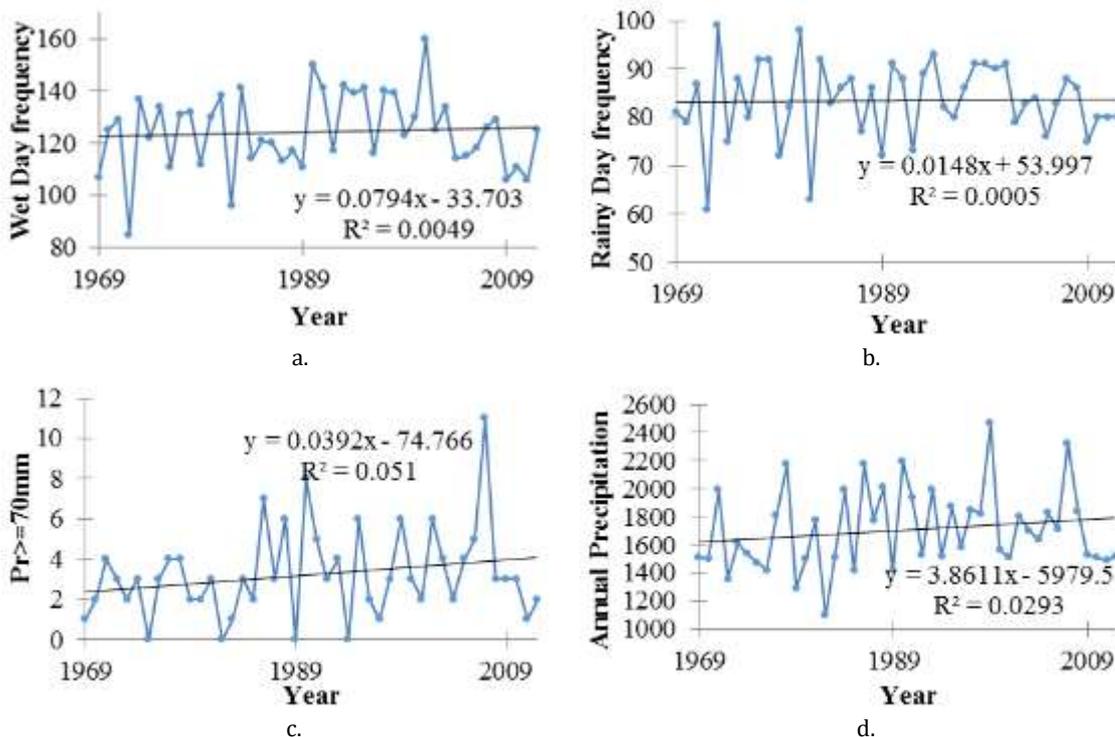


Figure 7. Precipitation Extremes of Kolkata: Wet Days frequency (a), Rainy Day Frequency (b), Heavy Precipitation Day (Pr>=70mm/day) frequency (c) and Annual Precipitation (d)

3.3.3. Wet Days Frequency and Rainy Days Frequency

Wet Days frequency (Pr>0.01mm/day) and Rainy Days frequency (Pr>2.54mm/day) are also good indicators for precipitation extreme analysis. Frequency of wet and rainy days remain unchanged throughout the time periods. Seasonal wet days frequency of the post monsoon seasons shows significant increasing trend with 3.89mm/decade, while other seasons remain unchanged with a decreasing trend of wet days frequency in monsoon seasons (-2.89mm/decade) has been noticed.

3.3.4. Simple Daily Intensity Index (SDII)

Simple Daily Intensity Index of the precipitation is increased with 0.68 mm/day. Although like other precipitation indices, trend of SDII also shows an insignificant trend.

3.3.5. Contribution 99th Percentile and 95th percentile of precipitation (R99P and R95P) and percentage contribution to total wet days (R99PTOT and R95PTOT)

R99P and R95P shows insignificant increasing trend of 1.29mm/decade and 1.85 mm/decade respectively, while R99PTOT and R95PTOT found to be insignificantly changed over the time period at the rate of 5.68% and 5.0% respectively.

A slight decreasing trend of the total annual precipitation (-0.57mm/decade), has been recorded while R95Percentile, R99Percentile remain no changed.

3.4 Trend of the Relative Humidity in Kolkata

Relative humidity is also an important parameter of the climate and its variability also plays a significant role on both physical elements such as Climate and other process and Human Being also. But, compare to temperature and precipitation, a little work has been carried forward by the researchers on RH, most of result shows a decreasing trend of the RH (Akinbode, Eludoyin, & Fashae, 2008; Jayamurugan, Kumaravel, Palanivel, & Chockalingam, 2013; Liu, Zhang, Zhang, & Wa, 2015; Yao, Zhao, Wang, Wang, & Zhang, 2016; Russo, Sillmann, & Sterl, 2017; Chang, 2017), While few study shows increase of RH (Chau & Woo, 2015; Desai, Patel, Rathi, Wagle, & Desai, 2015; Coffel, Horton, & Sherbinin, 2018). Here, RH at 8.30 am and 5.30 pm of Indian Standard Time (IST) has been analyzed. The results (table 5 and 6) show that, average RH of all of the seasons shows significant increasing trend with winter (2.28 %), Summer (1.11%), monsoon (0.44%), post monsoon (1.80%) and overall annual (1.45%) RH at 8.30 am, while winter (2.25 %), summer (0.73%), monsoon (0.31%), post monsoon (1.25%) and overall annual (1.14%) RH at 5.30 pm respectively. While RH 75 percentile days (RH75P) and 50 percentile days (RH50P) of RH in different seasons at 8.30 am shows an alarming rate of increasing trend with maximum trend has been noticed in the post monsoon season with 13.77% (RH75P) and 12.28(RH50P) while at 5.30 PM, pre monsoon and monsoon RH shows a decreasing trend while post monsoon season has recorded significant increasing trend.

Table 13 Trend of Relative Humidity (8.30 am) at Kolkata

Variable		Min	Max	Mean	SD	Kendall	p-value (Two-tailed)	Sen's slope	Change of RH per decade
Average RH	JF	63.03	85.30	73.91	5.77	0.64	< 0.0001	0.41	2.28
	MAM	64.23	78.08	71.15	3.69	0.48	< 0.0001	0.20	1.11
	JJAS	78.39	86.44	82.37	1.87	0.40	0.00	0.09	0.44
	OND	65.03	83.48	74.20	4.89	0.57	< 0.0001	0.33	1.80
	Annual	70.14	85.30	75.72	3.67	0.70	< 0.0001	0.26	1.45
RH75P	JF	6.00	30.00	15.88	7.19	0.38	0.00	0.33	8.25
	MAM	0.00	33.00	8.90	6.50	0.45	< 0.0001	0.29	12.52
	JJAS	31.00	86.00	50.25	13.08	0.42	0.00	0.56	4.47
	OND	4.00	48.00	20.50	11.27	0.56	< 0.0001	0.71	13.77
RH50P	JF	10.00	46.00	26.23	9.22	0.51	< 0.0001	0.62	9.41
	MAM	9.00	64.00	31.54	14.95	0.55	< 0.0001	1.00	12.37
	JJAS	74.00	115.00	92.73	10.92	0.34	0.00	0.47	2.04
	OND	12.00	80.00	39.95	17.63	0.61	< 0.0001	1.23	12.28

Table 14 Trends of Relative Humidity (5.30PM) at Kolkata

Variable		Min	Max	Mean	SD	Kendall's tau	p-value (Two-tailed)	Sen's slope:	Change of RH per decade
Average RH	JF	45.78	68.20	57.61	5.16	0.53	< 0.0001	0.32	2.25
	MAM	49.96	72.67	58.79	4.15	0.23	0.04	0.11	0.73
	JJAS	75.31	84.98	80.55	2.07	0.23	0.04	0.06	0.31
	OND	60.73	80.05	69.74	4.45	0.45	< 0.0001	0.22	1.25
	Annual	60.78	74.97	66.69	3.26	0.48	< 0.0001	0.18	1.14
RH75P	JF	0.00	7.00	1.77	1.98	-0.11	0.35	0.00	0.00
	MAM	0.00	27.00	4.98	5.51	-0.22	0.04	-0.07	-6.59
	JJAS	0.00	92.00	60.48	22.21	-0.04	0.72	-0.04	-0.30
	OND	0.00	43.00	15.66	9.94	0.14	0.19	0.21	5.88
RH50P	Annual	0.00	137.00	82.89	32.84	0.04	0.69	0.15	0.77
	JF	0.00	22.00	7.61	6.04	0.15	0.17	0.10	5.78
	MAM	0.00	58.00	23.48	12.76	-0.11	0.31	-0.20	-3.75
	JJAS	0.00	119.00	96.64	32.02	-0.10	0.36	-0.11	-0.51
	OND	0.00	89.00	39.34	20.43	0.28	0.01	0.59	6.58
Annual	0.00	258.00	167.07	60.55	0.12	0.24	0.60	1.59	

4. CONCLUSION

The changing nature of the climate of any city is a very prominent feature all over the world, as increasing trend of TNA is three times greater in the northern hemisphere than southern hemisphere due to predominance of landmass (Karl, 1993; Ji, 2014). Hence a city located in the northern hemisphere may face faster rate of positive temperature change in recent times and in upcoming future also. The IPCC predicts that world urban agglomeration will experience a minimum of 2°C warming excluding UHI effects, compare to the pre-industrial level, and it may rise a minimum of 2.5 °C in some urban centers in 2025 and this rise of the temperature may also exceed 4°C by the end of this century as per the Representation Concentration Pathway (RCP) 8.5 scenario. LST of the Kolkata shows an increasing trend in both summer and winter seasons. Annual, seasonal and monthly TXa, TNa and TNx also show increasing trends in Kolkata, whereas the TXx is not increased. Annual and decadal trend of Relative TIs increased throughout the time period and the alarming rate of increasing trend of warm nights has been noticed which were also seen by Rahimzadeh, et al. 2009; Kothawale, et al. 2010; Revadekar, 2010; Jain, & Kumar, 2012; Dashkhuu, et al. 2015; Oza, & Kishtawal, 2015; Zhang, et al. 2017 on their studies. DTR of Kolkata has been decreased very much. On the other hand, trend of PIs did not show any significant increasing or decreasing change, only wet days frequency in the post monsoon season shows an increasing trend with 10% significance level. In urban areas, due to increase in temperature, precipitation not increased which also found by (Ali & Mishra, 2017) on their work. On the other hand, RH has been increasing at a very alarming rate and the change has been very significant in most of the cases with the p value <0.0001. Increasing trend of RH in the night has more compare to day time, and TXa, TNa, TM also shows increasing trend which leads to more value of the heat index, which amplifying the heat stress (Russo, Sillmann, & Sterl, 2017). Increase of summertime of the RH may lead to more morbidity in urban areas (Chau & Woo, 2015).

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REFERENCES

- Abbas, F., Sarwar, N., Ibrahim, M., Adrees, M., & Ali, S. (2018). Patterns of Climate Extremes in the Coastal and Highland Regions of Balochistan, Pakistan. *Earth Interaction*, 22, 1-23. doi:10.1175/EI-D-16-0028.1.
- Akinbode, O., Eludoyin, A., & Fashae, O. (2008). Temperature and relative humidity distributions in a medium-size administrative town in southwest Nigeria. *Journal of Environmental Management*, 87, 95-105.
- Alexander, L.V. (2016). Global observed long-term changes in temperature and precipitation extremes: A review of progress and limitations in IPCC assessments and beyond. *Weather and Climate Extremes*. Vol.11 pp 4-16.
- Alexander, L.V., Zhang, X., Peterson, T.C., Caesar, J., Gleason, B., Klein Tank, A.M.G., Haylock, M., Collins, D., Trewin, B., Rahimzadeh, F., Tagipour, A., Rupa Kumar, K., Revadekar, J., Griffiths, G., Vincent, L., Stephenson, D.B., Burn, J., Aguilar, E., Brunet, M., Taylor, M., New, M., Zhai, P., Rusticucci, M., & Vazquez-Aguirre, J.L. (2006). Global observed changes in daily climate extremes of temperature and precipitation. *Journal of Geophysical Research: Atmospheres* 111: D05109, doi: 10.1029/2005JD006290.
- Alghamdi, A., & Moore, T. (2014). Analysis and Comparison of Trends in Extreme Temperature Indices in Riyadh City, Kingdom of Saudi Arabia, 1985–2010. *Journal of Climatology*. doi:http://dx.doi.org/10.1155/2014/560985.
- Ali, H., & Mishra, V. (2017). Contrasting response of rainfall extremes to increase in surface air and dew point temperatures at urban locations in India. *Nature: Scientific Reports*, 1-15. doi:10.1038/s41598-017-01306-1.
- Brázdil, R., Budíková, M., Auer, I., Böhm, R., Cegnar, T., Faško, P., Lapin, M., Gajič-Čapka, M., Zaninović, K., Koleva, E., Niedźwiedz, T., Ustrnul, Z., Szalai, S., & Weber, R. O. (1996). Trends of Maximum and Minimum Daily Temperatures in Central and Southeastern Europe. *International Journal of Climatology* 16: 765-782(1996).
- Chang, C. (2017). A Study of Changing Trends of the Ambient Dry Bulb Temperature. *International Proceedings of Chemical, Biological and Environmental Engineering*, 19-27.
- Chau, P., & Woo, J. (2015). The Trends in Excess Mortality in Winter vs. Summer in a Sub-Tropical City and Its Association with Extreme Climate Conditions. *PLOS ONE*, 10(5). doi:doi:10.1371/journal.pone.0126774.
- Coffel, E., Horton, R., & Sherbinin, A. (2018). Temperature and humidity based projections of a rapid rise in global heat stress exposure during the 21st century. *Environmental Research Letters*, 13.
- Dashkhuu, D., Kim, J. P., Chun, J. A., & Lee, W. S. (2015). Long-term trends in daily temperature extremes over Mongolia. *Weather and Climate Extremes*, 8 (2015) 26-33. http://dx.doi.org/10.1016/j.wace.2014.11.003.
- Dashkhuu, D., Kim, J. P., Chun, J.A., & Lee, Woo-Seop. (2014). Long term trends in the daily temperature extremes over Mongolia. *Weather and Climate Extremes*. Vol 8. Pp 26-33. https://doi.org/10.1016/j.wace.2014.11.003.
- Desai, V., Patel, U., Rathi, S., Wagle, S., & Desai, H. (2015). Temperature and Humidity Variability for Surat (coastal) city, India. *International Journal of Environmental Sciences*, 5(5), 935-946.
- Dhorde, A., Dhorde, A., & Gadgil, A.S. (2009). Long-term Temperature Trends at Four Largest Cities of India during the Twentieth Century. *Journal of Indian Geophysical Union*. Vol. 13. No. 2. Pp 85-97.
- Easterling, D.R., Horton, B., Jones, P.D., Peterson, T.C., Karl, T.R., Parker, D.E., Salinger, M.J., Razuvayev, V., Plummer, N., Jamason, P., & Folland, C.K. (1997). Maximum and Minimum temperature Trends for the Globe. *Science*, Vol 277.pp 364-367.
- Frich, P., Alexander, L., Della-Marta, P., Gleason, B., Haylock, M., Klein Tank, A., & Peterson, T. (2002). Observed coherent changes in climatic extremes during the second half of the twentieth century. *Climate Research*, 193-212.
- Ghasemi, A.R. (2015). Changes and trends in maximum, minimum and mean temperature series in Iran. *Atmospheric Science Letters*, Vol. 16 pp 366-372. DOI: 10.1002/asl2.569.
- Hamid, A.T., Sharif, M., Archer, D. (2014). Analysis of Temperature Trends in Satluj River Basin, India. *Journal of Earth Science & Climatic Change* 5: 222. doi:10.4172/2157-7617.1000222.
- Hu, Y., & Jia, G. (2009). Influence of land use change on urban heat island derived from multi-sensor data. *International Journal of Climatology*, 30(9), 1382-1395. doi:https://doi.org/10.1002/joc.1984.
- Jain, S.K., & Kumar, V. (2012). Trend analysis of rainfall and temperature data for India. *Current Science*. Vol. 102. no. 1 pp37-49.

- Jayamurugan, R., Kumaravel, B., Palanivel, S., & Chockalingam, M. (2013). Influence of Temperature, Relative Humidity and Seasonal Variability on Ambient Air Quality in a Coastal Urban Area. *International Journal of Atmospheric Sciences*, 7.
- Ji, F., Wu, Z., Huang, J., Chassignet, E.P. (2014). Evolution of land surface air temperature trend. *Nature Climate Change* 4, 462–466 (2014). doi:10.1038/nclimate2223.
- Karl, T. R., Jones, P. D., Knight, R. W., Kukla, G., Plummer, N., Razuvayev, V., Gallo, K.P., Lindseay, J., Charlson, R. J., & Peterson, T. C. (1993). Asymmetric trends of daily maximum and minimum temperature. *Bulletin of the American Meteorological Society*, Vol.74, pp1007 – 1023.
- Keggenhoff, I., Elizbarashvili, M., Amiri-Farahani, A., & King, L. (2014). Trends in daily temperature and precipitation extremes over Georgia, 1971–2010. *Weather and Climate Extremes*, 75-85.
- Kharin, V., & Zwiers, F. (2007). Changes in Temperature and Precipitation Extremes in the IPCC Ensemble of Global Coupled Model Simulations. *Journal of Climate*, 20, 1419-1444. doi:https://doi.org/10.1175/JCLI4066.1.
- Korade, M.S., & Dhorde, A.G. (2016). Trends in surface temperature variability over Mumbai and Ratnagiri cities of coastal Maharashtra, India. *Mausam*, 67, 2(April 2016), 455-462.
- Kothawale, D.R., & Rupa Kumar, K. (2005). On the recent changes in surface temperature trends over India. *Geophysical Research Letters*, Vol. 32. L18714. Doi: 10.1029/2005GL023528, 2005.
- Lee, T., Kwon, H., Modarres, R., Kim, S., & Chebana, F. (2016). Hydrological and Meteorological Extreme Events in Asia: Understanding, Modeling, Vulnerability, and Adaptation Measures. *Advances in Meteorology*, 1. doi:http://dx.doi.org/10.1155/2016/2325384.
- Lin, P., He, Z., Du, J., Chen, L., Zhu, X., & Li, J. (2017). Recent changes in daily climate extremes in an arid mountain region, a case study in northwestern China's Qilian Mountains. *Nature: Scientific Reports*. doi:10.1038/s41598-017-02345-4.
- Liu, H., Zhang, X., Zhang, L., & Wa, X. (2015). Changing Trends in Meteorological Elements and Reference Evapotranspiration in a Mega City: A Case Study in Shenzhen City, China. *Advances in Meteorology*, Pages 11.
- Mishra, V., Ganguly, A., Nijssen, B., & Lettenmaier, D. (2015). Changes in observed climate extremes in global urban areas. *Environmental Research Letters* (10). doi:10.1088/1748-9326/10/2/024005.
- Moberg, A., & Jones, P. (2005). Trends in indices for extremes in daily temperature and Precipitation in central and Western Europe, 1901–99. *International Journal of Climatology*, 1149-1171.
- Mohan, M., Kandya, A., & Battiprolu, A. (2011a). Urban heat island effect over national capital region of India: a study using the temperature trends. *Journal of Environmental Protection*, 2(4), pp465-472.
- Mohan, M., Kikegawa, Y., Gurjar, B., Bhati, S., Kandya, A., & Ogawa, K. (2012). Urban heat island assessment for a tropical urban Airshed in India. *Atmospheric and Climate Sciences*, 2(2), pp127-138
- Mohan, M., Pathan, S.K., Narendrareddy, K., Kandya, A., & Pandey, S. (2011b). Dynamics of urbanization and its impact on land-use/land-cover: a case study of Megacity Delhi. *Journal of Environmental Protection*, 2(9), pp1274-1283.
- Mukherjee, S., Aadhar, S., Stone, D., & Mishra, V. (2018). Increase in extreme precipitation events under anthropogenic warming in India. *Weather and Climate Extremes*. doi:https://doi.org/10.1016/j.wace.2018.03.005.
- Oza, M., & Kishtawal, C.M. (2015). Spatio-temporal changes in temperature over India. *Current Science*. Vol 109, No 6(25 September 2015), pp1154-1158.
- Plummer, N., Salinger, M., Nicholls, N., Suppiah, R., Hennessy, K., Leighton, R., . . . Lough, J. (1999). Changes in climate extremes over the Australian region and New Zealand during the twentieth century. *Climate Change*, 183-202.
- Rahimzadeh, F., Asgari, A., & Fattahi, E. (2009). Variability of extreme temperature and precipitation in Iran during recent decades. *International Journal of Climatology*, 329-343. doi:10.1002/joc.1739.
- Rahmstorf, S., & Coumou, D. (2011). Increase of extreme events in a warming world. *PNAS*, 17905–17909. doi:10.1073/pnas.1101766108.
- Rao, G.S.P., Krishnamurthy, M., Jhoshi, U.R., & Thapliyal, V. (2004). Climate change over India as revealed by critical extreme temperature. *Mausam*, 56 3(July 2005), 601-608.
- Revadekar, J.V., & Kumar, R. K. (2010). Recent trends in pre-monsoon daily temperature extremes over India. *Journal of Earth System Science*. Vol. 119, No. 1, February 2010, pp. 51–65.
- Russo, S., Sillmann, J., & Sterl, A. (2017). Humid heat waves at different warming levels. *Nature: Scientific Report*. doi:10.1038/s41598-017-07536-7.
- Scherrer, S., Fischer, E., Posselt, R., Liniger, M., Croci-Maspoli, M., & Knutti, R. (2016). Emerging trends in heavy precipitation and hot temperature extremes in Switzerland. *Journal of Geophysical Research: Atmospheres*, 121(6), 1-12. doi:10.1002/2015JD024634.
- Shrestha, A. B., Bajracharya, S. R., Sharma, A. R., Duo, C., & Kulkarni, A. (2017). Observed trends and changes in daily temperature and precipitation extremes over the Koshi river basin 1975–2010. *International Journal of Climatology*, 37: 1066–1083. doi:10.1002/joc.4761.
- Siswanto, U., van Oldenborgh, G., van der Schrier, G., Jilderda, R., & van den Hurk, B. (2016). Temperature, extreme precipitation, and diurnal rainfall changes in the urbanized Jakarta city during the past 130 years. *International Journal of Climatology*, 3207-3225. doi: 10.1002/joc.4548.
- Tirkey, A., Ghosh, M., Pandey, A., & Shekhar, S. (2018). Assessment of climate extremes and its long term spatial variability over the Jharkhand state of India. *The Egyptian Journal of Remote Sensing and Space Science*, 49-63.
- Trenberth, K., Dai, A., Rasmussen, R., & Parsons, D. (2003). The Changing Character of Precipitation. *Bulletin of American Meteorological Society*, 1205-1217. doi:10.1175/BAMS-84-9-1205.
- Vose, R. S., Easterling, D. R., & Gleason, B. (2005). Maximum and minimum temperature trends for the globe: An update through 2004. *Geophysical Research Letters*, 32, L23822, doi: 10.1029/2005GL024379.
- Wang, Y., Zhan, Q., & Ouyang, W. (2017). Impact of Urban Climate Landscape Patterns on Land Surface Temperature in Wuhan, China. *Sustainability*, 1-16. doi:10.3390/su9101700.
- Xiao, H., Kopecká, M., Guo, S., Guan, Y., Cai, D., Zhang, C., Yao, W. (2018). Responses of Urban Land Surface Temperature on Land Cover: A Comparative Study of Vienna and Madrid. *Sustainability*, 1-19. doi:10.3390/su10020260.
- Yao, S., Zhao, C., Wang, S., Wang, H., & Zhang, T. (2016). Long-term meteorological trends in the Naiman. *Earth and Environmental Science*, 41. doi: doi:10.1088/1755-1315/41/1/012019.
- Zhang, R., Chen, Zhao-Yue., Ou, Chun-Quan., & Zhuang, Y. (2017). Trends of Heat Waves and Cold Spells over 1951–2015 in Guangzhou, China. *Atmosphere*, 8(2), 37. DOI:10.3390/atmos8020037.
- Zhang, X., Hogg, W., & Mekis, É. (2001). Spatial and Temporal Characteristics of Heavy Precipitation Events over Canada. *Journal of Climate*, 1923-1836.

PY.2. RSAI Young Researchers Prize

1080 STATUS OF MUNICIPAL E-GOVERNANCE IN INDIA: A NEW APPROACH OF EVALUATION

ABSTRACT

Innovation in Information and Communication Technologies (ICTs) is bringing the world to one's home. It is not only speeding up processes and communication, but also makes information available to every human being on earth, irrespective of one's location and profile. Rapid urbanization and scarcity of time is making ICT enabled mechanisms more and more effective. Managing the urban centres; be it a town or a metropolis; is becoming the toughest job for municipal administrators. Making the system of urban governance good is a major challenge for the contemporary world. India, being a developing nation is progressing towards the establishment of a transparent and accountable system of governance. Urban India is engulfed by multifaceted problems relating to environment, economy, administration, society and polity. Technology is making the urban affairs E-savvy. The ICTs are crucial to foster economic growth and facilitate pro-citizen development. E-Governance provides the opportunity to streamline the functioning of Urban Local Bodies (ULBs). While providing opportunity to urban administrators to disseminate information, collect tax, registrar birth/death, provide licenses; also making it easier for the citizen to convey their opinion, lodge complaints, access services from home and participate in developmental activities of their neighbourhood. Since the system of electronic governance is multi-dimensional, it can't be gauged apparently by considering only a few factors. This study is therefore a systematic effort to evaluate the municipal E-Governance of some selected Indian ULBs, through a set of newly constructed indices like Institutional E-governance Index, Participatory E-Governance Index, Social E-Governance Index, Financial E-Governance Index, Environmental E-Governance Index and Citizen centric E-Governance Index. The gaps in the level of urban E-Governance in India with that of the other countries are also identified. The methodological framework of this study focuses on the different dimensions of urban management. Since websites are the mirror of functions and functionalities of any organization, the in-depth municipal website survey forms the database of this study. These website-based E-Governance evaluation indices involve unique analysis in the sense that it deals with the actual service delivery interface that the common people deal with. Rigorous evaluation of municipal E-Governance portrays an overall satisfactory performance of the ULBs. It is also observed that in general the ULBs tend to follow a similar pattern in all the indices. Large urban centres and metropolis exert overwhelming dominance over the smaller towns and cities. While, the performance of Pune and Madurai is the best in citizen-centrism of municipal E-Governance; Port Blair and Diu occupies the bottom of the table. Though the overall performance of the Indian ULBs is satisfactory, but it portrays a wide gap in general outlook and approaches of urban E-Governance of the global economic giants. This systematic endeavour spotted that the municipal E-Governance in India is oriented to satisfy the minimum needs of people and maintain regular municipal enterprises; but ULBs of developed countries are motivated to promote and holistic upliftment of standard of living of their citizens. The Indian ULBs should therefore concentrate upon improving efficiency of pro-people E-Governance.

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1167 THE GEOGRAPHY OF POLITICAL IDEOLOGIES IN SWITZERLAND**Daniele Mantegazzi**Istituto di Ricerche Economiche, Università della Svizzera italiana, via Maderno 24, CH - 6900 Lugano, email: daniele.mantegazzi@usi.ch**ABSTRACT**

Income-sorting processes and partisan-sorting forces are hypothesized to be interrelated phenomena leading to the clustering of people having similar levels of income and political ideologies. This paper determines the predominant political ideology of each Swiss municipality and examines whether there is any spatial concentration of political ideologies. The contribution of this research is that it proposes a new way to capture social interactions, based on the geographical concentration of political ideologies, and, following the literature on “the geography of discontent”, it shows that these concentrations are correlated with income and income inequality.

Classification codes: O18, O43, P48, R1**Keywords:** Political ideologies, Economic geography, Spatial cohesion, Geography of discontent**1 INTRODUCTION**

Geographical sorting processes are phenomena that many societies all over the world have been experiencing for centuries, usually leading to the clustering of population based on socio-economic, religious or ethnic characteristics. Following the economic literature, individual income level plays an important role in sorting processes. On one hand, income could represent a constraint in the residential decision of people, as already formalized in the bid-rent theory (Fujita, 1989, based on the pioneering work of von Thünen, 1826 and Alonso, 1964), and, on the other hand, as already highlighted by Tiebout (1956), people prefer to live close to other people who are similar to themselves, also in terms of wealth. From an alternative perspective, in the political science literature there has been an increasing interest in the phenomenon of partisan sorting, which analyzes whether individuals are nowadays more geographically sorted according to their political preferences (Bishop, 2008; Abramowitz, 2010; Abrams and Fiorina, 2012; Tam Cho et al., 2013). Moreover, the literature on voting behavior highlights how individual socio-economic characteristics are important predictor of political preferences (Meltzer and Richard, 1981; Rueda and Stegmueller, 2014). This implies that people sorting themselves based on socio-economic characteristics are also expected to share similar political ideologies. Hence, various sorting processes are hypothesized to cluster people with analogous socio-economic characteristics and similar political preferences. This is closely related to recent findings on the importance of economic geography and regional differences in terms of economic welfare in explaining how people vote. The results of the Brexit referendum represent a key example, clearly showing that the level of local economy was an important driver, even after carefully controlling for individual characteristics (Los et al., 2017). This has led to the term “the geography of discontent”, referring to the spatial distribution of discontent in a country, reflecting inequalities between regions in terms of economic welfare. Hence, as already highlighted by O’Laughlin et al. (1994), the spatial dimension is extremely important and needs to be considered.

The aim of this paper is to propose a new definition of spatial cohesion, representing a new way to capture social interactions, based on the geographical concentration of political ideologies. More specifically, this paper contribute to the existing literature by empirically identifying whether there is any spatial concentration of political ideologies in the context of Switzerland and determining the spatial extension of these concentrations. Moreover, following the argument of “the geography of discontent”, this study analyzes whether this clustering of political preferences is correlated with income and income inequality. The analysis focuses on Switzerland, which represents a very interesting case because it practices a semi-direct democracy, which allows having a rich dataset on many referenda, which is independent from short-term, candidate-related and party-related factors.

Following Hermann and Leuthold (2003), this paper analyzes the results of 312 federal referenda between 1981 and 2017 at the municipal level. This study identifies Hermann and Leuthold (2003)’s three dimensions representing the Swiss political ideology space and expressing the following political beliefs: left vs. right, liberal vs. conservative and ecological vs. technocratic. Additionally, on each of these three dimensions, this paper empirically assesses the existence of spatial concentrations of Swiss municipalities sharing the same political ideology. This result is particularly interesting because it shows that the various sorting processes leading to the concentration of people sharing similar political preferences extend beyond municipal borders. Finally, based on these results, this research finds significant differences in the level of income and income inequality of Swiss municipalities, depending on their belonging to a political ideology cluster. This result contributes and further supports the findings and claims of other scholars, related to the concept of “the geography of discontent”, according to which economic geography is particularly important in understanding how people vote.

The rest of the paper is organized as follows. Section 2 presents a review of the related literature. The third and fourth sections describe the methodology and the database adopted for this research, respectively. In section five the results are presented and discussed, and the last section concludes.

2 LITERATURE REVIEW

Clustering processes refer to the geographical aggregation of people, usually sharing a specific characteristic, and are often the result of spatial sorting phenomena. Spatial sorting refers to the redistribution of population groups into different neighborhoods in both urban and non-urban areas (Kawachi and Berkman, 2003) and is a key characteristic of many cities and nations across the world (Bailey et al., 2017). In fact, for centuries societies have been experiencing processes of spatial sorting, typically based on socio-economic, religious or ethnic characteristics. Economists, among others, have been studying this phenomenon for many decades. Already in the classic framework of the bid-rent theory (Alonso 1964; Beckman, 1969; Muth, 1969; Mills 1972 based on the pioneering work of von Thünen, 1826), as shown by Fujita (1989), the price for real estate, changing with the distance from the city center, shapes the residential choices of various income groups within a society, generating income sorting. In this setting, spatial sorting is the result of different willingness to pay for different income classes. Another growing body of literature in economics links sorting processes to social interactions (Schelling, 1971; Clark, 1991; Fossett, 2006), where residential decision are driven by individual preferences for the neighborhood composition. In particular, people prefer to live in places in which other people are similar to themselves (McPherson et al., 2001; Musterd et al., 2015). The idea that people with similar preferences cluster in particular municipalities is the focus of another important stream of literature in economics, which goes back to Tiebout (1956), where, in a fiscal decentralized setting, people sort themselves according to their preferences to achieve an efficient provision of local public goods. This model has then been extended to analyze the important role of differences in income in explaining sorting processes (Ellickson, 1971; Westhof, 1977; Ross and Yinger, 1999; Schmidheiny, 2006). Hence, various theoretical frameworks analyze and give possible explanations of those sorting processes which can be found in many contexts all over the world.

From a slightly different perspective, in the political science literature, there has been a growing interest in the phenomenon of partisan sorting and there is currently a large debate on whether individuals are nowadays more sorted according to their political preferences. As highlighted by O’Laughlin et al. (1994), the spatial dimension is extremely important and needs to be considered in order to fully understand the political forces underlying this phenomenon. This is particularly relevant whenever the political power is partially decentralized (such as in a federal political system), given that various political institutions and political ideologies within the same country can generate different political contexts. Various studies find that, in the last decades, there has been an increase in the geographic polarization of voters (Kim et al., 2003; Bishop, 2008; Abramowitz, 2010; Wing and Walker, 2010; Tam Cho et al., 2013; Kinsella et al., 2015; Lang and Pearson-Merkowitz, 2015). The potential causes of this geographic polarization of voters are partisan migration, generational replacement and the fact that parties are more polarized, making it easier for voters to identify themselves with a party (Vegetti et al., 2017). Bishop (2008) argues that a potential drawback of this sorting process is that homogeneous communities might encourage extremism by ignoring differing opinions. In contrast with these results, other authors find that voters are nowadays no more geographically sorted than in the past and minimize its importance (Glaeser and Ward, 2006; Levendusky and Pope, 2011; Abrams and Fiorina, 2012; Strickler, 2016).

The vast majority of the studies analyzing the phenomenon of partisan sorting and polarization are based on presidential election in the US. As highlighted by Abrams and Fiorina (2012), data based on presidential elections are weak, because they are the result of short-term, candidate-related and party-related factors. Moreover, it is difficult to capture the complexity of the distribution of political ideologies with a single manifestation of the personal political preference, occurring only once every four years.

Additionally, the literature on voting behavior finds that socio-economic characteristics, such as income and the degree of income inequality, determine voting outcomes and are important predictors of party choice, at the individual level (Meltzer and Richard, 1981; McCarty et al., 2008, Rueda and Stegmueller, 2014).

Hence, different sorting processes are, on one hand, hypothesized to cluster people with analogous socio-economic characteristics, in particular with similar levels of income, and, on the other hand, group people sharing political preferences which are very much alike. At the same time, according to the literature on voting behavior, people sorting themselves based on socio-economic characteristics are also expected to share similar political ideologies. The implication is that income- sorting processes and partisan-sorting forces are likely to be interrelated phenomena, leading to the clustering of people having similar levels of income and political ideologies. This is closely related to recent findings on the importance of economic geography and regional differences in terms of economic welfare in explaining how people vote, in particular when the vote is used as a “mean of protest”. In particular, the results of the Brexit referendum, in which voters were asked whether they wished to leave or remain in the European Union, represent a key example, clearly showing that the level of local economy was an important driver (Los et al., 2017; Chen et al., 2018; Crescenzi et al., 2018). In fact, people in regions with lower levels of income who perceived to have suffered from modern globalization were more likely to vote “leave” than those from areas with higher levels of income (McCann, 2018). This has led to the term “the geography of discontent”, referring to the spatial distribution of discontent in a country, reflecting inequalities between regions in a country.

This paper contributes to the existing literature by proposing a new definition of spatial cohesion, based on the geographical concentration of political ideologies. In particular, the aim of this research is to empirically identify whether there is any spatial concentration of political ideologies in the context of Switzerland in order to determine in a new way the existence of social interactions, and determine the spatial extension of these concentrations. Moreover, following the argument of “the geography of discontent”, this study analyzes whether this concentration is correlated with income and income inequality.

Switzerland represents a very interesting case because it has strong institutions, it is a federal republic with highly decentralized political power and, at the same time, it practices a semi-direct democracy, in which Swiss citizens directly vote on various issues. More specifically, any constitutional change needs to be approved by a mandatory referendum. Furthermore, an optional referendum can be demanded for any change in the Swiss law decided by the federal parliament⁵⁶. Additionally, any Swiss citizen may propose a popular initiative to introduce amendments to the federal constitution⁵⁷. The outcome of any vote is legally binding. Approximately, Swiss citizens vote four times a year and the most frequent topics on which they vote are healthcare, taxes, social welfare, drug policy, public transport, immigration, political asylum and education. The availability of referendum data allows overcoming the limitations of presidential election data mentioned above, and better determining the spectrum of political ideologies of voters. In particular, given that Swiss citizens directly express their opinion on various issues, the information available is independent from short-term, candidate-related and party-related factors. Moreover, the political preference is manifested several times every year. Hence, unlike the analyses on presidential elections or the Brexit referendum, this study simultaneously considers the results of several referenda, capturing the underlying long-term structure of political ideologies.

3 METHODOLOGY

The analysis presented in this study proceeds in three phases. The first step is to identify what is the political ideology of each municipality in Switzerland. Second, a spatial cluster analysis is performed in order to determine whether and where there is a significant geographical concentration of political ideologies. Finally, some tests are carried out to analyze whether the level of income and income inequality of municipalities belonging to different political ideology clusters are significantly different.

The first task is to establish the political ideology of each municipality. To do so, this study follows Hermann and Leuthold (2001; 2003), by considering the federal referenda collected at the municipal level in Switzerland and performing an exploratory factor analysis on them. The underlying idea is that the referenda are the observed outcome of fewer independent and unobserved dimensions characterizing the political ideology space. This hypothesis is supported by qualitative and quantitative considerations related to the data used. In particular, from a qualitative perspective, several referenda concern the same (or at least very similar) topic. One can therefore expect that the outcome of referenda on similar topics are highly correlated because are driven by the same underlying political preference. Indeed, from a quantitative perspective, the distribution of referenda shows that they are spatially associated, indicating that the variance of the referenda exhibits similar patterns. In order to maximize the explained variance, the exploratory factor analysis is performed with VARIMAX-rotation.

The results of the factor analysis allow extracting the statistical relationship among the referenda in order to determine the underlying unobserved factors. However, as highlighted by Hermann and Leuthold (2003), in order to meaningfully interpret them and identify the related ideological content, a qualitative interpretation of the specific political objects is needed. The combination of the factor analysis with the qualitative inspection of its results allows finding the dimensions representing the Swiss political ideology space.

In the second step, in order to measure the degree of geographical concentration of the political ideology, a spatial cluster analysis is performed. Following Kim et al. (2003), Darmofal (2008), Wing and Walker (2010) and Kinsella et al. (2015), this study computes the vector of Local Moran's I statistic (Moran, 1948; Cliff and Ord, 1981; Anselin, 1995) for each factor identified in the previous phase. The Local Moran's I statistic associates a vector of observed values of a specific variable with a weighted average of the neighboring values and compares the real distribution with random spatial distributions, in order to capture significant spatial pattern. In particular, this analysis is able to establish whether a municipality has a significantly high (low) value on a specific factor and is surrounded by municipalities with high (low) values on the same factor, or whether the value of the municipality is not significantly high or low. Hence, this analysis allows determining if and where there is a significant geographical concentration of the different typologies of political ideologies identified with the previous step.

Finally, following the social capital argument, the analysis focuses on empirically testing whether there is any evidence suggesting that there are significant differences in the level of income and income inequality of municipalities belonging to different typologies of political ideology clusters. The aim of this exercise is to follow the recent literature on the "geography of discontent" in order to verify whether the claim that economic geography is particularly important in understanding how people vote is valid even in the Swiss context, by simultaneously considering the results of several referenda, capturing the underlying long-term structure of political ideologies. To do so, Kruskal-Wallis tests are performed (Kruskal and Wallis, 1952). Similar to ANOVA, this test is used to verify whether the distribution of a specific variable is significantly different between more than two independent groups. However, differently from ANOVA, the Kruskal-Wallis test does not require the assumptions of homogeneity of variance between the groups and the normality of residuals. The result of the Kruskal-Wallis test indicates whether there are significant differences among the groups, however, it does not provide information regarding which pairs of groups are significantly different. Hence, this final phase is extended by computing the Dunn's test (Dunn, 1964), which is a post hoc pairwise multiple comparison suitable to deepen the analysis after a rejection of the Kruskal-Wallis test. In order to account for the fact that multiple

56 Any change to the Swiss law is subject to referendum if a minimum of 50'000 Swiss people have signed an official request to do so within 100 days.
57 In the case of a federal popular initiative, a vote is organized if the promoter collects at least 100'000 signatures from Swiss people within 18 months.

comparisons are conducted at the same time, Dunn's tests are performed with the Benjamini-Hochberg procedure (Benjamini and Hochberg, 1995).

4 DATA

This research analyzes the results at the municipal level concerning all the 312 federal referenda between 1981 and 2017. This information is obtained from the section Politics, Culture and Media of the Swiss Federal Statistical Office (FSO)⁵⁸. In particular, the factor analysis performed in order to identify the political ideology of each Swiss municipality is computed on the yes-share of all the 312 federal referenda considered⁵⁹. In order to compare and combine the data in terms of geo-political unit, all the referenda are based on the 2017 municipal definition of the FSO, which includes 2240 municipalities.

As explained above, the most frequent topics on which Swiss citizens vote are healthcare, taxes, social welfare, drug policy, public transport, immigration, political asylum and education. In order to capture changes in the political ideology of each municipality through time, the factor analysis is computed on different time-subsamples of the whole dataset. In particular, the first subsample considers all the 65 referenda between 1981 and 1990, the second subsample takes into account all the 106 referenda between 1991 and 2000; the third one contains all the 82 referenda between 2001 and 2010, and the fourth subsample considers all the 59 referenda between 2011 and 2017. As the results show, given that the Swiss population periodically votes on the same topics, the factor analyses computed over different time-subsamples generate factors which are built in a very similar way, allowing comparing the results from different periods.

To perform spatial analyses, there exist different specification of the spatial dependence matrix, W .

In order to take into consideration the impact of the extremely uneven topographical context of Switzerland⁶⁰ on the actual distance between two municipalities, this study considers a spatial weight matrix based on the inverse travel time between the centroids of the municipalities. Travel time data are provided by the Swiss Federal Office for Spatial Development and consider the trip by car in minutes. To keep the spatial analysis at a local level, after examining the distribution of distances between Swiss municipalities, a cutoff is imposed at a distance of 20 minutes travel time. Moreover, following the spatial econometric literature (Anselin, 1988; Kelejian and Prucha, 1998; LeSage and Pace, 2009), the W matrix has been standardized, such that each row sums to unity.

In the final part of this research, the aim is to test whether there are significant differences in the economic welfare level of municipalities belonging to different typologies of political ideology clusters. In particular, this study considers the median income and the Gini coefficient of the income distribution of each municipality. All these variables are obtained from the Swiss Federal Tax Administration. The analysis is done for each of the four time-subsample and the reference year for the economic welfare variable is the first year of the considered period⁶¹.

5 RESULTS AND DISCUSSION

This section first presents the results of the exploratory factor analysis and describes the identified dimensions of the political ideology space. Subsequently, the results of the spatial cluster analysis are shown. Finally, the discussion ends focusing on the results of the tests, which aim at verifying whether there are significant differences in the income level and income distribution of municipalities belonging to different typologies of political ideology clusters.

Factor analysis

In order to be consistent with the existing literature on the identification of the Swiss political ideology structure, this study follows Hermann and Leuthold (2003) and performs a factor analysis⁶² for each period identifying the same three unobserved factors they found. These three factors are able to capture between 55 and 60% of the overall variance of all the referenda, depending on the period considered. This indicates that the majority of political ideologies in Switzerland can be represented by three main dimensions. In order to give a meaningful interpretation to the resulting factors, the analysis considers from a qualitative perspective the ideological content of the referenda building them.⁶³

Considering the most important referenda building factor 1 in the period 1981-1990, factor 3 in the period 1991-2000, factor 2 in the decade 2001-2010 and factor 1 in the period 2011-2017, it emerges that they are based on topics related to the protection of the workforce (e.g. the popular initiative on shortening working hours in 1988, the popular initiative for a flexible retirement age in 2000, or the popular initiative for a minimum wage in 2014), the welfare state (such as the amendment to the federal law on aged and bereaved insurance in 1995, the popular initiative "Health has to be affordable" in 2003, or the popular initiative for a basic income in 2016), and the national security policy (for example the popular initiative for a Switzerland without army and a comprehensive policy of peace in 1989, the popular initiative for a voluntary civilian peace service in 2001, or the popular initiative on the abolition of compulsory military service in

58 It is possible to download the municipal-level results of Swiss referenda at the following webpage:

<https://www.bfs.admin.ch/bfs/de/home/statistiken/politik/abstimmungen/stimmbeteiligung.assetdetail.3362356.html>

59 The factor analysis is able to account for the fact that the wording of referenda on similar topics could be inconsistent, by giving positive or negative factor loadings.

60 Switzerland is characterized by flat areas and regions with very high mountains.

61 For the third period, data on median income and Gini coefficients are not available for the year 2001. Hence, information for the year 2003 are used instead.

62 The results of the factor analysis are reported in Appendix A.

63 The final factors are built considering all the votes with a factor loading of at least 0.5 (in absolute terms).

2013). Hence, as in Hermann and Leuthold (2003), these factors represent the “Left-Right” dimension of the political ideology space. In particular, these factors are capturing the debate between those who are in favor of the welfare state, the protection of the workforce, personal freedom and pacifism on one hand (i.e. with a left-wing perspective), and on the other hand those that have more propriety-oriented values, support the military strength and entrepreneurial freedom (i.e. with a right-wing perspective).

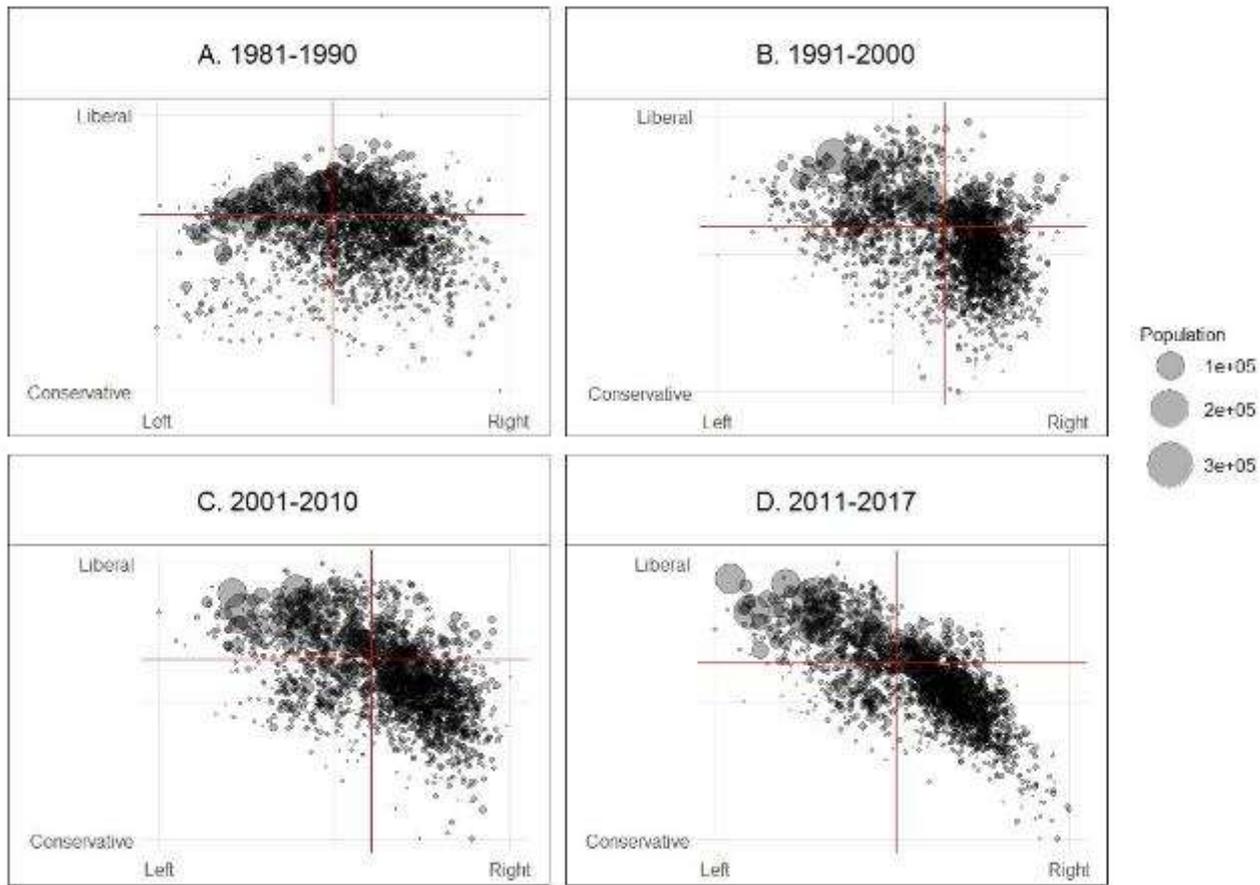
A different dimension of the political ideology structure of Switzerland is represented by factor 3 in the decade 1981-1990, factor 1 in the period 1991-2000, factor 1 in the decade 2001-2010 and factor 2 in the period 2011-2017. Analyzing the main referenda contributing to the construction of these factors, it appears that they link to topics related to foreign integration (such as the federal decree for a review of the procedure for naturalizing young immigrants in 1994, the popular initiative against the construction of new minarets in 2009, or the popular initiative against mass immigration in 2014), liberal economic policies (e.g. the federal decree on joining Bretton Woods in 1992, the popular initiative for Switzerland to join the United Nations in 2002, or the federal decree on extending the agreement on free movement of people to new countries of the European Union in 2005), and regulatory modernization (for example the federal law on government and administrative organization in 1996, the federal decree on a new Swiss Federal Constitution in 1999, or the federal decree on the non-introduction of public initiatives in 2009). Also in this case, the results are in line with those of Hermann and Leuthold (2003), in fact, these factors express the “Liberal-Conservative” dimension of the political ideology space. In particular, this dimension is representing the debate between those who support the opening of the country, are in favor of liberal economic policies and the modernization of institutions (i.e. with a liberal attitude), and those who are more skeptical towards changes and the opening of the country, prefer to preserve the existing regulations and mistrust the political and economic elites (i.e. with a conservative attitude).

Finally, the third dimension of the Swiss political ideology space is captured by factor 2 in the decades 1981-1990 and 1991-2000, and factor 3 in the periods 2001-2010 and 2011-2017. This dimension is based on topics related to traffic (e.g. the popular initiative “Stop the concrete - for a limitation on road making” in 1990, the popular initiative for the protection of the alpine region from traffic in 1994, or the popular initiative on lowering the urban speed limit to 30 km/h in 2001), and environmental protection (such as the federal decree on varying tolls based on engine power or mileage in 1994, the federal decree on providing enhanced legal protection for animals in 2010, or the popular initiative for the introduction of a tax on non-renewable energy in 2015). These factors represent the “Ecological-Technocratic” dimension identified by Hermann and Leuthold (2003). More specifically, this dimension expresses the debate between those who support the protection of the natural environment and are in favor of policies reducing the negative impact of human activities on nature (i.e. with an ecological attitude), and those who believe that the natural environment should be transformed to create more security and comfort, and used to generate technological progress (i.e. with a technocratic attitude).

The results of the factor analysis show that the political ideology of Swiss municipalities can be represented in a three-dimensional space, in which the three independent axes express the following political debates: left vs. right, liberal vs. conservative and ecological vs. technocratic. Figure 1 shows the political ideology position of Swiss municipalities on two of these three dimensions, for each considered period. In particular, the horizontal axis expresses the “Left-Right” dimension, while the vertical axis maps the position of each municipality on the “Liberal-Conservative” dimension⁶⁴. Each dot represents a municipality, and the size of the dots indicates the dimension of the municipality, in terms of inhabitants in the first year of the considered period. The red lines show the overall national position on these two dimensions. This graphical representation allows highlighting the following two remarks. Firstly, in the first two decades the positions of Swiss municipalities are spread on all four quadrants, however, in the last two periods (in particular in the last one) the political ideology positions of Swiss municipalities are mainly concentrated in the “Left-Liberal” and “Right-Conservative” quadrants. Hence, this first graphical representation highlights a phenomenon of increasing polarization that is characterizing the Swiss political ideology space. Moreover, to better capture political preferences and the underlying political forces, it is important to consider more than a single political dimension, which, additionally, should be independent from short-term, candidate-related and party-related factors. Secondly, by simultaneously taking into considerations both these dimensions and the size of each municipality, in terms of number of inhabitants, it emerges that the position on the political ideology space is also a manifestation of the rural-urban divide. In fact, in line with Hermann and Leuthold (2003), cities and bigger municipalities are mainly positioned in the “Left-Liberal” quadrant, while smaller and rural communes are mainly found in the “Right-Conservative” quadrant.

Figure 1 – The political ideology position of Swiss municipalities

⁶⁴ The two-dimensional graphical representation is preferred to the three-dimensional one because easier to interpret. The choice of the two dimensions to consider is based on their importance in explaining the overall variance of political preferences, as indicated from the results of the factor analysis.



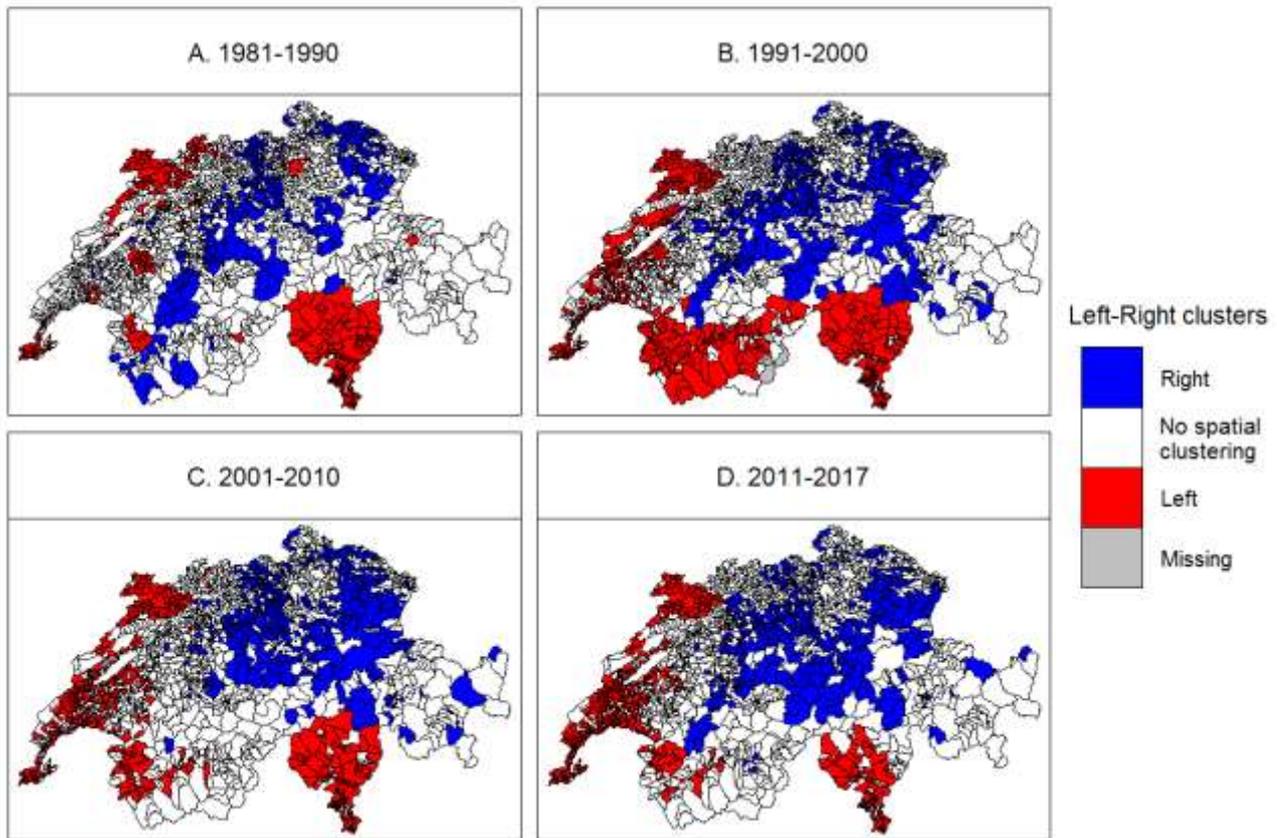
The identification of the political ideology of Swiss municipalities allows continuing the analysis with spatial cluster methods in order to empirically assess the degree of geographical concentration of political ideologies.

Spatial cluster analysis (Local Moran's I)

Following Kim et al. (2003), Darmofal (2008), Wing and Walker (2010) and Kinsella et al. (2015), the second phase of this analysis applies spatial cluster analysis to identify whether and where the political ideologies of Swiss municipalities are geographically concentrated. In particular, local Moran's I statistics for each of the three dimensions determined with the factor analysis are computed and then plotted in order to visualize the spatial pattern of significant concentration of political ideologies.

Figure 2 plots the results of the local Moran's I statistics for the "Left-Right" dimension as a set of significance maps for the four different periods. Municipalities exhibiting significant spatial clustering of the right-wing political ideology are shown in blue, while those belonging to a significant geographical concentration of the left-wing political ideology are colored in red. This graphical visualization clearly illustrates that the "Left-Right" dimension of the Swiss political ideology space is characterized by geographical concentrations of municipalities with similar political preferences. More specifically, in line with the results of Hermann and Leuthold (2003), right-wing municipalities are predominantly clustered in the rural areas of the German speaking part of Switzerland, i.e. the center and north-east parts.

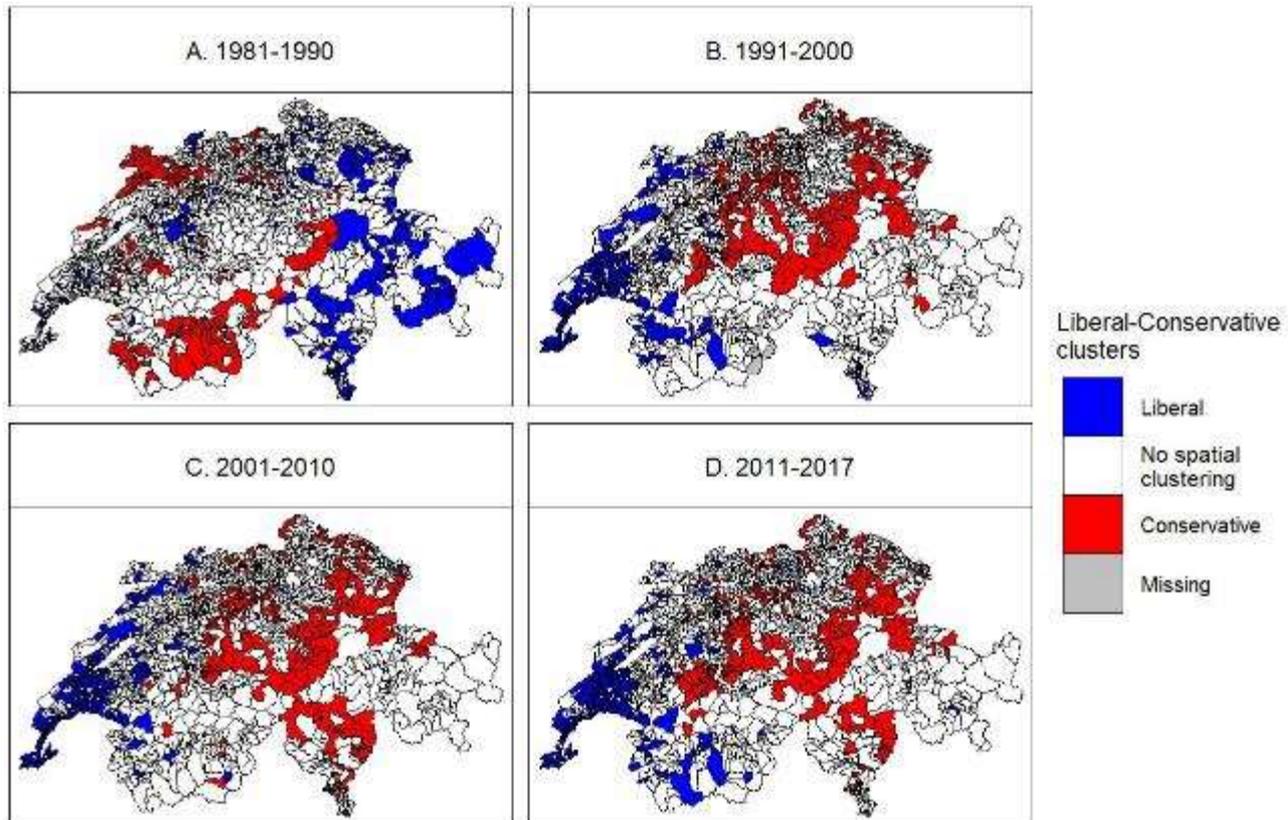
Figure 2 - Local Moran's I statistics for the Left-Right dimension



Additionally, left-wing municipalities are mainly concentrated in the Italian and French speaking part of Switzerland, i.e. in the south and in the west parts, respectively. The results also show that through time there has been some minor changes. More specifically, the geographical concentrations of right-wing municipalities are increasing in the central part of Switzerland, while the ones concerning left-wing municipalities are increasing in the western part of Switzerland and decreasing in the south, after an increase in the second period.

The results concerning the spatial cluster analysis on the “Liberal-Conservative” dimension of the Swiss political ideology space are shown in Figure 3. In this case, municipalities marked in blue belong to significant geographical concentrations of communes with a liberal political preference, while those colored in red are municipalities exhibiting significant spatial clustering of the conservative political ideology. The first consideration emerging from this graphical visualization is that geographical concentrations of political ideologies occurs also on the “Liberal-Conservative” dimension. More specifically, liberal municipalities are mainly clustered around the Swiss central-western cities and in the French speaking part of Switzerland. On the other side, the conservative municipalities are mainly concentrated in the rural areas of the German and Italian speaking parts of Switzerland, i.e. in the east and in the south-east, respectively.

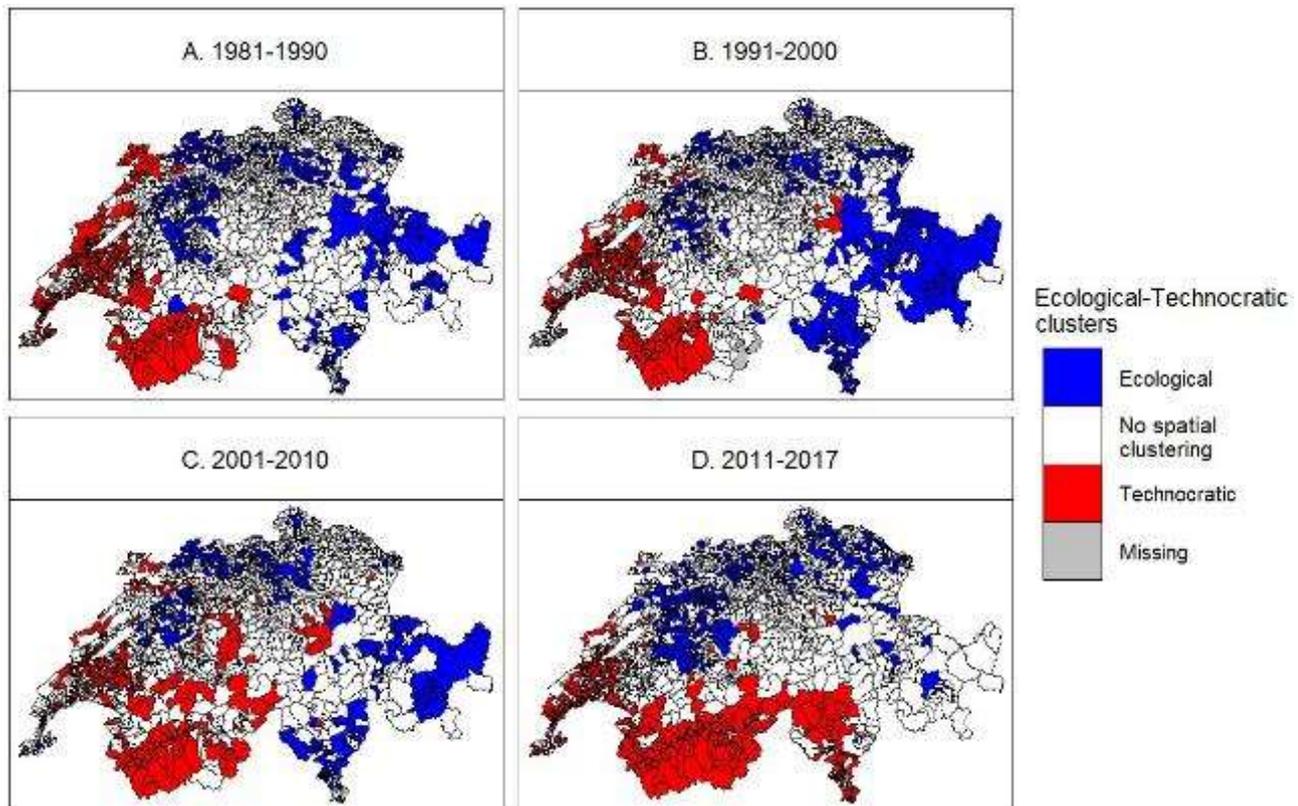
Figure 3 - Local Moran's I statistics for the Liberal-Conservative dimension



Considering the temporal evolution of the geographical concentrations of political ideologies along the “Liberal-Conservative” dimension, it clearly emerges that the first decade shows different patterns than the other three periods. As highlighted by Hermann and Leuthold (2003), this can be explained by the fact that the debate between liberals and conservatives in Switzerland became significantly important at the beginning of the nineties, when the discussion concerning the relationship between Switzerland and Europe started.

Finally, Figure 4 maps the results of the cluster analysis on the “Ecological-Technocratic” dimension of the Swiss political ideology space. Municipalities belonging to a significant geographical concentration of the ecological political ideology are colored in blue, while communes exhibiting significant spatial clustering of the technocratic political ideology are marked in red. Even in this case the results show that there are geographical concentrations of municipalities with similar political preferences. Ecological municipalities are mainly concentrated close to the big cities of the German speaking part of Switzerland (i.e. in the center and north-east parts) and in the rural areas in the east and south-east. On the contrary, technocratic communes are predominantly clustered in the rural areas of the French speaking part of Switzerland (i.e. in the west). The temporal perspective allows determining that the geographical concentrations of ecological municipalities have decreased, in particular in the rural areas in the east and south-east part of Switzerland. Moreover, the spatial concentrations of technocratic municipalities have increased in the south, but diminished in the north-west.

Figure 4 - Local Moran's I statistics for the Ecological-Technocratic dimension



Overall, the results of the spatial cluster analysis highlight that along all the three dimensions characterizing the Swiss political ideology space there are geographical concentrations of municipalities with similar political preferences. The geographical representations of these results show that the “Left-Right” dimension is characterized by many and wider clusters, while the “Liberal- Conservative” dimension is defined by fewer and narrower concentrations. Hence, it seems that there are stronger sorting and polarizing effects along the “Left-Right” axes and weaker along the “Liberal-Conservative” one, with the dimension related to the “Ecological-Technocratic” debate somewhere in between. These results are particularly interesting because they show that social interactions, captured as the geographical concentration of political ideologies, extend beyond municipal borders and further support the importance of analyzing these clusters.

Kruskal-Wallis and Dunn tests

The results discussed above indicate that Switzerland is characterized by geographical concentrations of political ideologies along various dimensions. As mentioned above, partisan-sorting processes are expected to be interrelated with income-sorting processes, implying that these phenomena are likely to lead to the clustering of people having similar levels of income and political ideologies. This hypothesis is also supported by the literature on “the geography of discontent” (Los et al., 2017; Chen et al., 2018; Crescenzi et al., 2018) as well as the one on voting behavior (Meltzer and Richard, 1981; McCarty et al., 2008, Rueda and Stegmüller, 2014). Hence, the final phase of this analysis aims at empirically verifying whether there are differences in economic welfare among municipalities belonging to different clusters of political ideologies. In particular, Kruskal-Wallis tests are performed on the median income and the Gini coefficient of the income distribution of each municipality, to verify whether the distribution of these variables are significantly different among municipalities belonging to different aggregations of political ideologies and that do not belong to any cluster. These tests are carried out for each dimension of the Swiss political ideology space and for each period previously considered, separately, and are reported in Table 1, Table 2 and Table 3, along with the median value of the considered variables for each cluster of municipalities. Additionally, Dunn’s tests are performed in order to exactly identify which pairs of groups are significantly different. Given that multiple tests are carried out at the same time, these tests are corrected with the Benjamini-Hochberg procedure⁶⁵.

Considering the “Left-Right” dimension, the results, as reported in Table 1 and in Tables B.1 and B.2 of Appendix B, indicate that the clusters of left-wing and right-wing municipalities are characterized by significant differences in the distributions of both median income and the Gini coefficient of the income distribution, with the exception of the decade 2001-2010 for median income.

Table 1 – Results of the Kruskal-Wallis tests on the “Left-Right” dimension

⁶⁵ The results of the Dunn’s tests are reported in Appendix B, along with the median value of the considered variables for each group of municipalities and for each period.

	1981-1990	1991-2000	2001-2010	2011-2017
Median income	$\chi^2(2) = 55.1$ p < 0.001	$\chi^2(2) = 125.3$ p < 0.001	$\chi^2(2) = 0.8$ p = 0.66	$\chi^2(2) = 62.8$ p < 0.001
Median “Left”	32’500 CHF	44’350 CHF	54’967 CHF	61’800 CHF
Median “Not Significant”	34’000 CHF	48’050 CHF	56’000 CHF	59’550 CHF
Median “Right”	32’250 CHF	48’500 CHF	55’925 CHF	56’600 CHF
Gini coefficient of the income distribution	$\chi^2(2) = 75.1$ p < 0.001	$\chi^2(2) = 23.6$ p < 0.001	$\chi^2(2) = 11.3$ p < 0.001	$\chi^2(2) = 113.0$ p < 0.001
Median “Left”	0.317	0.329	0.316	0.360
Median “Not Significant”	0.308	0.316	0.310	0.336
Median “Right”	0.290	0.318	0.310	0.328

By taking into account the median income for each cluster, it is not possible to find a clear pattern showing which cluster of political ideology is associated with higher (lower) values of median income in the four considered periods. On the other hand, the results indicate that municipalities belonging to a geographical concentration of a left-wing political ideology are characterized by a significantly higher Gini coefficient of income distribution, when compared to those with a right-wing political ideology, showing that there is a higher demand for left-wing policies where there are higher degrees of income inequality. Hence, these findings indicate that groups of municipalities with a significant left-wing ideology are characterized by significantly higher degrees of income inequality, in line with the findings of the literature on voting behavior (Meltzer and Richard, 1981; McCarty et al., 2008, Rueda and Stegmüller, 2014).

Table 2 – Results of the Kruskal-Wallis tests on the “Liberal-Conservative” dimension

	1981-1990	1991-2000	2001-2010	2011-2017
Median income	$\chi^2(2) = 105.0$ p < 0.001	$\chi^2(2) = 97.4$ p < 0.001	$\chi^2(2) = 335.6$ p < 0.001	$\chi^2(2) = 314.1$ p < 0.001
Median “Conservative”	30’775 CHF	45’650 CHF	52’200 CHF	54’200 CHF
Median “Not Significant”	33’600 CHF	47’125 CHF	55’800 CHF	59’150 CHF
Median “Liberal”	34’850 CHF	50’050 CHF	62’500 CHF	68’400 CHF
Gini coefficient of the income distribution	$\chi^2(2) = 157.9$ p < 0.001	$\chi^2(2) = 140.5$ p < 0.001	$\chi^2(2) = 120.0$ p < 0.001	$\chi^2(2) = 203.0$ p < 0.001
Median “Conservative”	0.279	0.304	0.297	0.317
Median “Not Significant”	0.304	0.322	0.311	0.337
Median “Liberal”	0.335	0.338	0.331	0.371

Focusing the attention to the “Liberal-Conservative” dimension, the results, as indicated in Table 2 and in Tables B.2 and B.3 of Appendix B, show that among the clusters of liberal and conservative municipalities there always are significant differences in the distributions of both median income and the Gini coefficient of the income distribution.

Moreover, both the median income and the Gini coefficient of the income distribution in clusters of liberal municipalities are in each period significantly higher than those of municipalities that do not belong to any cluster, along this dimension, and even higher than those of municipalities linked to a conservative cluster. Therefore, these results show that clusters of municipalities with a significant liberal ideology are characterized by significantly higher levels of economic welfare as well as significantly higher degrees of income inequality.

Finally, considering the “Ecological-Technocratic” axis of the Swiss political ideology space, the results, as reported in Table 3 and in Tables B.5 and B.6 of Appendix B, indicate that the clusters of ecological and technocratic municipalities are characterized by significant differences in the distributions of both median income and the Gini coefficient of the income distribution.

Table 3 – Results of the Kruskal-Wallis tests on the “Ecological-Technocratic” dimension

	1981-1990	1991-2000	2001-2010	2011-2017
Median income	$\chi^2(2) = 31.1$ p < 0.001	$\chi^2(2) = 13.7$ p < 0.001	$\chi^2(2) = 58.3$ p < 0.001	$\chi^2(2) = 7.1$ p = 0.03
Median “Ecological”	34’700 CHF	48’000 CHF	58’000 CHF	58’400 CHF
Median “Not Significant”	33’050 CHF	47’400 CHF	55’925 CHF	59’400 CHF
Median “Technocratic”	33’117 CHF	45’938 CHF	53’150 CHF	60’300 CHF
Gini coefficient of the income distribution	$\chi^2(2) = 26.9$ p < 0.001	$\chi^2(2) = 128.7$ p < 0.001	$\chi^2(2) = 37.0$ p < 0.001	$\chi^2(2) = 195.9$ p < 0.001
Median “Ecological”	0.311	0.343	0.323	0.327
Median “Not Significant”	0.302	0.313	0.308	0.333
Median “Technocratic”	0.315	0.318	0.307	0.373

In addition, both the median income and the Gini coefficient of the income distribution in clusters of ecological municipalities are significantly higher than those of municipalities belonging to a technocratic cluster, with the exception of the last period, which, interestingly, shows opposite results. Hence, between 1981 and 2010, clusters of municipalities with a significant ecological ideology are characterized by significantly higher levels of economic welfare as well as significantly higher degrees of income inequality. However, in the period 2011-2017 the reverse is true, i.e. clusters of municipalities with a significant technocratic ideology have a significantly higher median income as well as significantly higher degrees of income inequality.

Overall, these results clearly indicate that there are significant differences in the level of income and income inequality of Swiss municipalities, depending on their belonging to a political ideology cluster. These findings seem to support the hypothesis that partisan-sorting processes are interrelated with income-sorting processes and contributes to the literature on “the geography of discontent”, according to which economic geography is particularly important in understanding how people vote.

6 CONCLUSION

This paper proposes a new definition of spatial cohesion, based on the geographical concentration of political ideologies, which represents a new way to capture social interactions. The application of spatial cluster analysis empirically assesses the existence of spatial concentrations of Swiss municipalities sharing the same political ideology. This first result is particularly interesting because it shows that social interactions, captured as the geographical concentration of political ideologies, extend beyond municipal borders and further supports the importance of analyzing these clusters. Moreover, this result is valid for all the three main dimensions characterizing the Swiss political ideology space, expressing the following political beliefs: left vs. right, liberal vs. conservative and ecological vs. technocratic. Additionally, these findings seems to indicate that there are stronger clustering effects along the “Left-Right” axes and relatively weaker along the “Liberal-Conservative” one.

Moreover, a second important finding of this paper indicates that the geographical distribution of the clusters of political ideologies are also a manifestation of the rural-urban divide as well as the cultural divides among the different linguistic regions of Switzerland. In particular, geographical concentrations of left-wing municipalities are mainly located close to cities and in the French and Italian speaking parts of Switzerland, while clusters of right-wing municipalities are predominantly found in rural areas and in the German speaking part of Switzerland. At the same time, spatial concentrations of liberal municipalities are mostly situated close to cities and in the French speaking part of Switzerland, whereas clusters of conservative communes are mainly located in rural areas and in the German and Italian speaking regions of Switzerland. Additionally, clusters of ecological municipalities are predominantly found around cities and in the German speaking part of Switzerland, while agglomerations of technocratic communes are mostly located in rural areas and in the French speaking region of Switzerland. Moreover, the evolution of such divides between 1981 and 2017 seems to suggest that the Swiss political ideology space is characterized by a phenomenon of increasing polarization.

Thirdly, this study finds significant differences in income levels and income inequalities among Swiss municipalities, depending on their belonging to a political ideology cluster. More specifically, clusters of left-wing municipalities are characterized by significantly higher degrees of income inequality, when compared to aggregations of right-wing municipalities. At the same time, the results indicate that clusters of liberal communes have a significantly higher median income and a higher degree of income inequality, compared to concentrations of conservative municipalities. Moreover, with the exception of the period 2011-2017, clusters of ecological communes have a significantly higher median income and a higher degree of income inequality, compared to concentrations of technocratic municipalities.

Hence, these findings indicate that clusters of communes with a similar political ideology group either urban municipalities with relatively high levels of income and high degrees of inequality (as in the cases of left, liberal or ecological clusters) or rural communes with relatively low levels of income and low degrees of inequality (for the cases of right, technocratic or conservative clusters). Interestingly, the empirical evidence does not show any political ideology clustering of “privileged” communes (i.e. with high levels of income and low degrees of inequality), nor “left-behind” municipalities (i.e. with low levels of income and high degrees of inequality).

In conclusion, besides identifying the political preference of Swiss municipalities, these results highlight the importance of the geography of these political ideologies, and, in particular, of their spatial concentration. This result contributes and further supports the findings and claims of the literature on “the geography of discontent”, according to which economic geography is particularly important in understanding how people vote. These findings are particularly interesting because they emerge from a study simultaneously considering the results of several referenda, capturing the underlying long-term structure of political ideologies, which is independent from short-term, candidate-related and party-related factors. The existence of differences in economic welfare among municipalities belonging to different clusters of political ideologies implies that future research should consider this new definition of spatial cohesion in order to understand how and why different concentrations of political preferences are associated to different levels of welfare.

REFERENCES

- Abramowitz, A., 2010, “Transformation and polarization: The 2008 presidential election and the new American electorate”, *Electoral Studies*, 29(4):594-603. <http://dx.doi.org/10.1016/j.electstud.2010.04.006>
- Abrams, S. and Fiorina, M., 2012, “‘The big sort’ that wasn’t: A skeptical Reexamination”, *Political Science and Politics*, 45(2):203-10. <https://doi.org/10.1017/S1049096512000017>
- Alonso, W., 1964, *Location and Land Use*. Harvard University Press, Cambridge, MA.
- Anselin, L., 1988, *Spatial Econometric: Method and Models*, Dordrecht: Kluwer Academic Publishers.
- Anselin, L., 1995, “Local indicators of spatial association-LISA”, *Geographical Analysis*, 27(2):93-115. <https://doi.org/10.1111/j.1538-4632.1995.tb00338.x>
- Bailey, N, van Gent, W and Musterd, S., 2017, “Remaking urban segregation: processes of income sorting and neighbourhood change”, *Population, Space and Place*, 23(3):1-16. <https://doi.org/10.1002/psp.2013>
- Beckmann, M., 1969, “On the distribution of urban rent and residential density”, *Journal of Economic Theory*, 1:60-67.
- Benjamini, Y. and Hochberg, Y., 1995, “Controlling the false discovery rate: a practical and powerful approach to multiple testing”, *Journal of the Royal Statistical Society, Series B*, 57(1):289-300.
- Bishop, B., 2008, *The Big Sort: Why the Clustering of Like-Minded America Is Tearing Us Apart*, Houghton Mifflin, Boston.
- Chen, W., Los, B., McCann, P., Ortega-Argilés, R., Thissen, M. and van Oort, F., 2018, “The continental divide? Economic exposure to Brexit in regions and countries on both sides of The Channel”, *Papers in Regional Science*, 97:25-54. <https://doi.org/10.1111/pirs.12334>
- Clark, W., 1991. “Residential preferences and neighborhood racial segregation: A test of the Schelling segregation model”, *Demography*, 28(1):1-19.
- Cliff, R. and Ord, J., 1981, *Spatial Processes: Models and Applications*, Pion, London.
- Crescenzi, R., Di Cataldo, M. and Faggian, A., 2018, “Internationalized at work and localistic at home: The ‘split’ Europeanization behind Brexit”, *Papers in Regional Science*, 97:117-132. <https://doi.org/10.1111/pirs.12350>
- Darmofal, D., 2008, “The political geography of the new deal realignment”, *American Politics Research*, 36:934-61. <https://doi.org/10.1177/1532673X08316591>
- Dunn, O., 1964, “Multiple comparisons using rank sums”, *Technometrics*, 6:241-252.
- Ellickson, B., 1971, “Jurisdictional fragmentation and residential choice”, *American Economic Review*, 61(2):334-339.
- Fossett, M., 2006, “Ethnic preferences, social distance dynamics, and residential segregation: Theoretical explorations using simulation analysis”, *Journal of Mathematical Sociology*, 30(3-4):185-274. <https://doi.org/10.1080/00222500500544052>
- Fujita, M., 1989, *Urban Economic Theory: Land Use and City Size*. Cambridge University Press, Cambridge
- Glaeser, E. and Ward, B., 2006, “Myths and Realities of American Political Geography”, *Journal of Economic Perspectives*, 20:119-144. <https://doi.org/10.1257/jep.20.2.119>
- Hermann, M. and Leuthold, H., 2001, “Weltanschauungen und ihre soziale Basis im Spiegel der Volksabstimmungen.”, *Swiss Political Science Review*, 7:39-63. <https://doi.org/10.1002/j.1662-6370.2001.tb00327.x>
- Hermann, M. and Leuthold, H., 2003, *Atlas der politischen Landschaften: ein weltanschauliches Porträt der Schweiz*, vdf Hochschulverlag AG, Zürich.
- Kawachi, I. and Berkman, L., 2003, *Neighborhoods and Health*, Oxford University Press.
- Kelejian, H. and Prucha, I., 1998, “A Generalized Spatial Two-Stage Least Squares Procedure for Estimating a Spatial Autoregressive Model with Autoregressive Disturbances.”, *The Journal of Real Estate Finance and Economics*, 17(1):99-121. <https://doi.org/10.1023/A:1007707430416>
- Kim, J., Elliott, E. and Wang, D., 2003, “A spatial analysis of county-level outcomes in U.S. Presidential elections: 1988-2000”, *Electoral Studies*, 22:741-761. [https://doi.org/10.1016/S0261-3794\(02\)00008-2](https://doi.org/10.1016/S0261-3794(02)00008-2)
- Kinsella, C., McTague, C. and Raleigh, K., 2015, “Unmasking Geographical Polarization and Clustering: a Micro-Scalar Analysis of Partisan Voting Behavior”, *Applied Geography*, 62(3):404-19. <https://doi.org/10.1016/j.apgeog.2015.04.022>
- Kruskal, W. and Wallis, A., 1952, “Use of ranks in one-criterion variance analysis”, *Journal of the American Statistical Association*, 47:583-621.
- Lang, C. and Pearson-Merkowitz, S., 2015, “Partisan sorting in the United States, 1972–2012: new evidence from a dynamic analysis”, *Political Geography*, 48:119-129. <https://doi.org/10.1016/j.polgeo.2014.09.015>
- LeSage, J. and Pace, K., 2009, *Introduction to Spatial Econometrics*, Statistics: A Series of Textbooks and Monographs. CRC Press.
- Levendusky, M. and Pope, J., 2011, “Red states vs. blue states: going beyond the mean”, *Public Opinion Quarterly*, 2(75):227-248. <https://doi.org/10.1093/poq/nfr002>
- Los, B., McCann, P., Springford, J., and Thissen, M., 2017, “The mismatch between local voting and the local economic consequences of Brexit”, *Regional Studies*, 51:786-799. <https://doi.org/10.1080/00343404.2017.1287350>
- McCann, P., 2018, “The trade, geography and regional implications of Brexit”, *Papers in Regional Science*, 97:3-8. <https://doi.org/10.1111/pirs.12352>
- McCarty, N., Poole, K. and Rosenthal, H., 2008, *Polarized America: The Dance of Ideology and Unequal Riches*. The MIT Press.
- McPherson, M., Smith-Lovin, L. and Cook, M., 2001, “Birds of a feather: Homophily in social networks”, *Annual Review of Sociology*, 27(1):415-444. <https://doi.org/10.1146/annurev.soc.27.1.415>
- Meltzer, A. and Richard, S., 1981, “A Rational Theory of the Size of Government”, *Journal of Political Economy*, 89:914-925.

<https://doi.org/10.1086/261013>

Mills, E., 1972, *Studies in the Structure of the Urban Economy*. Johns Hopkins Press, Baltimore.

Moran, P., 1948, "The interpretation of statistical maps", *Journal of the Royal Statistical Society. Series B*, 10:243-251.

Musterd, S., van Gent, W., Das, M. and Latten, J., 2015. "Adaptive behaviour in urban space; residential mobility in response to social distance", *Urban Studies*, 53(2):227-246. <https://doi.org/10.1177/0042098014562344>

Muth, R., 1969, *Cities and Housing*. Chicago University Press, Chicago.

O'Loughlin, J., Flint, D. and Anselin, L., 1994, "The Geography of the Nazi Vote: Context, Confession and Class in the Reichstag Election of 1930", *Annals of the Association of American Geographers*, 84:351-380. <https://doi.org/10.1111/j.1467-8306.1994.tb01865.x>

Ross, S. and Yinger, J., 1999. "Sorting and voting: a review of the literature on urban public finance". In: Ceshire, P. and Mills, E. editors, *Handbook of Regional and Urban Economics*, vol. 3. North-Holland, Amsterdam.

Rueda, D. and Stegmüller, D., WP 2014, "From Preferences to Voting: Redistribution and Left Parties in Industrialized Democracies". Prepared for presentation at the 72nd Meeting of the MPSA, Chicago.

Schelling, T., 1971, "Dynamic models of segregation", *Journal of Mathematical Sociology*, 1:143-186. <https://doi.org/10.1080/0022250X.1971.9989794>

Schmidheiny, K., 2006, "Income segregation and local progressive taxation: Empirical evidence from Switzerland", *Journal of Public Economics*, 90:429-458. <https://doi.org/10.1016/j.jpubeco.2005.09.003>

Strickler, R., 2016, "A 'Sorted' America? Geographic Polarization and Value Overlap in the American Electorate", *Social Science Quarterly*, 97(2):439-457. <https://doi.org/10.1111/ssqu.12202>

Tam Cho, W., Gimpel, J. and Hui, I., 2013, "Voter Migration and the Geographic Sorting of the American Electorate", *Annals of the Association of American Geographers*, 103(4):856-870. <https://doi.org/10.1080/00045608.2012.720229>

Tiebout, C., 1956, "A pure theory of local expenditures", *Journal of Political Economy*, 64(5):416-424. Tocqueville, A., 1994, *Über die Demokratie in Amerika*. Stuttgart: Reclam.

Vegetti, F., Fazekas, Z. and Méder, Z., 2017, "Sorting your way out: Perceived party positions, political knowledge, and polarization", *Acta Polit*, 52:479-501. <https://doi.org/10.1057/s41269-016-0029-6>

von Thünen, J., 1826, *Der isolierte Staat in Beziehung auf Landwirtschaft und Nationalökonomie*. Friedrich Perthes, Hamburg.

Westhoff, F., 1977, "Existence of equilibria in economies with a local public good", *Journal of Economic Theory*, 14:84-112.

Wing I. and Walker J., 2010, "The Geographic Dimensions of Electoral Polarization in the 2004 U.S. Presidential Vote". In: Páez, A., Gallo, J., Buliung, R. and Dall'erba, S. editors, *Progress in Spatial Analysis. Advances in Spatial Science (The Regional Science Series)*. Springer, Berlin-Heidelberg. https://doi.org/10.1007/978-3-642-03326-1_13

APENDIX A – RESULTS OF THE FACTOR ANALYSES

Table A.1: Factor scores for the period 1981-1990

Vote	Factor 1	Factor 2	Factor 3
Federal decree on the popular initiative for gender equality (counter-proposal)	0,72	0,31	0,2
Federal decree on the popular initiative the protection of consumer rights (counter-proposal)	0,67	-0,13	0,36
Federal decree on prolonging the federal finance order	0,01	0,01	0,62
New federal law on foreigners	-0,42	-0,05	0,39
Amendment to the Swiss penal code	0,2	-0,43	0,49
Popular initiative for the prevention of abusive prices	0,76	0,24	-0,06
Federal decree on the popular initiative for the prevention of abusive prices (counter-proposal)	-0,47	0,11	0,22
Federal decree on changes to fuel tax	0,36	-0,1	0,58
Federal decree on the constitutional article on energy	0,18	-0,4	0,28
Federal decree on the revision of nationality law in the Federal Constitution	0,18	-0,08	0,67
Federal decree aiming at facilitating certain naturalizations	0,21	-0,14	0,49
Federal decree on introducing tolls for heavy goods vehicles	-0,07	0,71	0,24
Federal decree on introducing tolls for national routes	0,21	0,62	0,41
Popular initiative for a real civilian service based on a proof through demonstration	0,79	0,06	0,17
Popular initiative against the abuse of bank client confidentiality and bank power	-0,15	0,8	0,03
Popular initiative against slashing the national soil	0,15	0,67	0,05
Popular initiative for a future without further nuclear power plants	0,62	0,09	-0,05
Popular initiative for a secure, parsimonious and ecologically sound energy supply	0,59	0,09	-0,12
Popular initiative for an effective protection of maternity	0,05	0,55	0,57
Federal decree on the constitutional article on broadcasting	0,29	0,11	0,76
Popular initiative for the compensation of victims of violent crimes	0,76	-0,17	0,11
Federal decree on abolishing primary school fees	-0,31	0,17	0,78
Federal decree on abolishing the government contribution to healthcare spending	-0,35	0,07	0,76
Federal decree on education fees	0,84	0,01	-0,08
Popular initiative on extending paid leave	-0,48	0,01	0,59
Popular initiative "right to life"	-0,11	0,34	0,74
Federal decree on abolishing the cantonal share of profits from banks' stamp duty	-0,02	0,28	0,76
Federal decree on the taxation raised from the sale of spirits	-0,07	-0,07	-0,41
Federal decree on the abolition of grants for the self-supply of breadstuffs	0,43	-0,38	0,5
Federal decree on the popular initiative to co-ordinate the start of the school year (counter-proposal)	0,78	-0,22	0,32
Federal decree on giving small and medium enterprises an advantage in cases of innovations	0,78	-0,25	0,16
Amendments to the Swiss Civil Code	0,51	-0,51	0,11

Popular initiative to ban vivisection	0,07	0,66	0,24
Federal decree on joining the United Nations	0,68	-0,03	0,43
Popular initiative on culture	0,18	0,16	0,3
Federal decree on the popular initiative on culture (counter- proposal)	0,62	0	-0,04
Popular initiative on vocational education	0,68	-0,15	0,09
Federal decree on the domestic sugar economy	-0,34	-0,51	-0,09
Federal decree on the popular initiative for the protection of tenants (counter-proposal)	0,42	0,58	0,38
Popular initiative for a just taxation of truck traffic	0,62	0,22	0,24
Amendments to the federal law on asylum	0,75	0,16	-0,17
Federal law on the residence and settlement of foreigners	0,67	0,14	0,42
Popular initiative for the people's co-determination of military expenditure	-0,36	0,08	0,12
Federal decree on the voting system for popular initiatives	-0,19	0,04	0,29
Federal decree on the Rail 2000 project	0,56	0,39	-0,06
Popular initiative for the protection of fens	0,59	0,17	0,26
Amendment to the federal law on health insurance	0,45	-0,07	0,41
Federal decree on the constitutional principles behind a coordinated transport policy	0,2	0,66	0,4
Popular initiative on lowering the retirement age to 62 for men and 60 for women	0,84	-0,02	-0,06
Popular initiative against real estate speculation	0,19	0,47	-0,25
Popular initiative for the shortening of labor time	0,57	0,38	0,06
Popular initiative for limiting immigration	0,85	0,08	0
Popular initiative for nature-oriented farming and against animal factories	0,34	0,73	0,08
Popular initiative for a Switzerland without army and a comprehensive policy of peace	0,75	-0,04	0
Popular initiative on introducing 130 and 100 kilometers per hour speed limits	0,27	-0,78	-0,16
Popular initiative "Stop the concrete - for a limitation on road making"	-0,05	0,91	0,02
Popular initiative for a highway-free countryside between Murten and Yverdon	-0,11	0,91	0
Popular initiative for a highway-free Knonauer Amt	-0,02	0,87	-0,01
Popular initiative for a highway-free area between Biel and Solothurn/Zuchwil	0,1	0,85	0,01
Federal decree on viticulture	-0,29	-0,37	0,51
Amendment to the federal law on the organization of the federal judiciary	-0,11	-0,67	0,11
Popular initiative to phase out nuclear power	0,61	0,27	-0,05
Popular initiative to stop the construction of any new nuclear power plants	0,52	0,27	0,28
Federal decree on the constitutional article on energy	0,69	0,1	-0,05
Amendment to the federal law on road traffic	-0,06	-0,78	0,15

Table A.2: Factor scores for the period 1991-2000

Vote	Factor 1	Factor 2	Factor 3
Federal decree on lowering the voting age to 18	0,04	0,74	-0,04
Popular initiative on promoting public transport	0,48	0,08	-0,15
Federal decree on reorganizing the federal finances	0,08	0,62	0,26
Amendment to the military penal code	0	0,35	0,44
Popular initiative for a financially bearable health insurance	-0,17	0,73	0,21
Popular initiative for the drastic and stepwise limitation of animal experiments	-0,38	0,49	-0,26
Federal decree on joining the Bretton Woods system	0,12	0,76	-0,07
Federal law on contributing to the Bretton Woods system	0,17	0,72	0,09
Federal law on water protection	0,23	0,67	0,2
Federal decree on the popular initiative against the malpractice of gene technology on humans (counter-proposal)	0,32	0,61	0,2
Federal decree on creating a civilian service alternative to military service	0,46	0,6	0,02
Amendments to the Swiss Penal Code and the Military Penal Code on sexual integrity	0,86	-0,05	-0,08
Popular initiative for the recovery of our waters	0,86	-0,07	-0,1
Federal decree on building a transalpine rail route	-0,14	0,58	0,09
Federal law on the standing orders of the Federal Assembly	0,62	0,42	-0,12
Amendment to the stamp duty law	0,69	0,32	-0,18
Federal law on farmland	0,82	0,23	-0,14
Federal law on the expenses of members of the Federal Assembly	0,65	-0,04	0,12
Federal law on the salaries of members of the Federal Assembly	0,64	-0,07	-0,23
Federal decree on the European Economic Area	0,84	-0,34	-0,26
Federal law to raise fuel taxes	-0,17	0,69	-0,11
Federal decree on lifting the ban on gambling establishments	-0,15	0,63	0,52
Popular initiative on banning animal testing	0,35	-0,01	0,04
Popular initiative "40 military training areas are enough- environment projection at military"	0,4	0,2	-0,67
Popular initiative for a Switzerland without new warplanes	0,43	0,17	-0,68
Federal decree on the misuse of weaponry	0,06	0,47	-0,17
Federal decree on whether Laufen should be part of the Basel- Landschaft canton	0,64	0,25	-0,1
Popular initiative on creating a new Swiss National Day on 1 August	0,36	0,15	0,39
Federal decree on a temporary halt to increase in the cost of health insurance	0,4	0,02	0,34
Federal decree on unemployment insurance	0,56	-0,22	-0,29
Federal decree on the financial order	-0,05	0,7	0,02
Federal decree on recovering money owed to the federal government	-0,08	0,69	0,03

Federal decree on measures for preserving social insurance	0,35	0,52	0,4
Federal decree on special excise taxes	0,35	0,48	0,46
Popular initiative on the reduction of alcohol problems	0,55	0,41	0,46
Popular initiative on the reduction of tobacco problems	0,53	0,33	0,51
Federal decree on roadbuilding	-0,04	0,88	0,14
Federal decree on continuing existing truck tolls	-0,1	0,87	0,24
Federal decree on varying tolls based on engine power or mileage	-0,13	0,8	0,35
Popular initiative for the protection of the alpine region from traffic	-0,31	0,75	0,08
Amendment to the aeronautical law	0,6	-0,13	-0,01
Federal decree on the constitutional article on the promotion of culture	0,72	0,23	-0,42
Federal decree on facilitated naturalization for foreign youth	0,87	0,02	-0,05
Federal law on Swiss troops in peacekeeping operations	0,89	-0,01	-0,02
Federal decree on abolishing price reductions on breadstuffs	0,57	0,48	0,33
Amendments to the Swiss Penal Code and the Military Penal Code	0,73	0,37	0
Federal law on health insurance	-0,3	0,34	0,56
Popular initiative for a healthy health insurance	0,29	0,04	-0,72
Federal law on foreigners	0,57	-0,09	-0,58
Federal decree on the popular initiative for an environmentally sound and efficient peasant farming (counter-proposal)	0,44	-0,07	0,44
Federal decree on dairy farming	0,34	-0,67	-0,03
Amendment to the farming law	0,32	-0,69	0,01
Federal decree on spending	0,33	-0,7	0,07
Amendment to the federal law on aged and bereaved insurance	0,18	0,26	-0,73
Popular initiative to extend aged and bereaved and invalidity insurance	0,14	0,1	0,8
Amendment to the federal law on purchasing land through agents abroad	0,76	-0,27	-0,23
Amendment to the constitutional article on languages	0,36	0,46	0,33
Federal decree on whether municipality of Vellerat (then part of the canton of Bern) should become part of the canton of Jura	0,08	0,46	0,35
Federal decree on abolishing the cantons' responsibilities for providing army equipment	0,65	0,33	0,26
Federal decree on abolishing the federal requirement to purchase distilling equipment	0,47	0,12	0,06
Federal decree on abolishing federal financing of parking areas at rail stations	0,58	0,04	-0,27
Federal decree on the popular initiative "peasants and consumers- oriented farming" (counter-proposal)	-0,14	0,73	0,04
Federal law on governmental and administrative organization	0,8	-0,02	-0,3
Popular initiative against illegal immigration	0,14	0,23	0,64
Amendment to the federal law on labor in trade and industry	-0,76	0,17	0,23
Popular initiative "EU accession talks in front of the people"	0,4	0,43	0,38
Popular initiative for a ban on arms exports	0,42	0,22	-0,57
Federal decree on ending the federal monopoly on producing and selling gunpowder	0,6	0,12	-0,17
Federal decree on financing unemployment insurance	-0,31	0,26	0,71
Popular initiative "youth without drugs"	-0,31	-0,45	-0,09
Federal decree on a balanced budget	-0,53	0,6	0,17
Popular initiative for the protection of life and environment against genetic engineering	0	0,38	-0,51
Popular initiative "Switzerland without secret police"	0,03	0,25	0,77
Federal law on truck tolls based on engine size	-0,16	0,75	-0,2
Popular initiative for well-priced foodstuffs and ecological farms	0,36	0,71	-0,14
Popular initiative "10th revision of the Aged and Bereaved Insurance without raising the retirement age"	0,29	0,02	-0,84
Federal decree on building and financing public transport infrastructure	-0,2	0,62	0,15
Federal decree for a temporary article in the Swiss Federal Constitution on grain	0,15	0,52	0,51
Popular initiative for a prudential drug policy	0,59	0,47	0,02
Amendment to the federal law on labor in trade and industry	0,41	0,46	-0,32
Federal decree on changes to the eligibility for membership of the Federal Council	0,3	0,4	0,55
Federal decree on constitutional regulations on organ transplantation	0,65	0,01	0,05
Popular initiative "house ownership for everyone"	-0,09	-0,12	0,28
Amendment to the federal law on spatial planning	0,39	-0,45	-0,11
Federal decree on a new Swiss Federal Constitution	0,82	-0,02	-0,31
Federal law on asylum	0,27	0,7	0,23
Federal decree on asylum and foreigners	-0,15	0,47	0,62
Federal decree on the medical prescription of heroin	-0,05	0,46	0,61
Federal law on disability	0,37	-0,13	0,11
Federal law on maternity insurance	0,7	-0,23	-0,57
Federal decree on reforming the judiciary	0,11	0,76	-0,04
Popular initiative for speeding up direct democracy	-0,56	0,56	0,04
Popular initiative for a just representation of women in federal authorities	0,64	0,36	0,2
Popular initiative for the protection of men against manipulations in procreation technology	-0,2	0,19	-0,04

Popular initiative on halving motorized road traffic	0,49	0,11	-0,47
Federal decree authorizing sectoral agreements between Switzerland and the European Union	0,81	-0,15	-0,01
Popular initiative on promoting solar energy	0,14	0,73	0,08
Federal decree on the popular initiative on promoting solar energy (counter-proposal)	-0,16	0,6	-0,17
Federal decree on the popular initiative on energy efficiency (counter-proposal)	0,35	0,5	-0,06
Popular initiative for regulating immigration	-0,09	0,29	-0,54
Popular initiative "more rights for people thanks to referendums with counter-proposals"	-0,75	0,2	0,18
Popular initiative against raising the female retirement age	0	0,28	0,8
Popular initiative for a flexible retirement age for men and women from 62 years on	-0,22	0,04	-0,5
Popular initiative on economizing on military and defense-for more peace and seminal jobs	0,59	-0,07	-0,65
Popular initiative for lower hospital expenses	0,42	-0,14	-0,77
Federal law on federal employees	0,37	-0,18	-0,78

Table A.3: Factor scores for the period 2001-2010

Vote	Factor 1	Factor 2	Factor 3
Popular initiative on joining the European Union	-0,28	-0,2	0,7
Popular initiative on lowering medicine prices	0,23	0,14	0,63
Popular initiative on lowering the urban speed limit to 30 km/h	0,72	0,52	-0,13
Amendment to the federal law on the Swiss army I	0,67	-0,16	0,32
Amendment to the federal law on the Swiss army II	0,14	-0,06	0,3
Federal decree on abolishing the requirement for a permit to establish a diocese	0,73	-0,15	0,27
Federal decree on expenditure	0,07	0,42	0,53
Popular initiative for an assured Aged and Bereaved insurance - tax on energy instead of work	0,06	0,54	0,16
Popular initiative for an authentic security policy and a Switzerland without army	0,17	-0,64	0,13
Popular initiative "Solidarity creates security: for a voluntary civilian peace service"	0,4	0,7	0,09
Popular initiative for a capital gains tax	0,4	0,76	0,08
Popular initiative on joining the United Nations	0,87	0,22	0,15
Popular initiative to reduce working hours	0,31	0,79	0,06
Amendment to the penal code regarding abortion	0,67	0,17	0,15
Popular initiative for mother and child	-0,6	-0,03	-0,21
Popular initiative on adding surplus gold reserves to the country's pension fund	-0,06	-0,54	0,46
Federal decree on the popular initiative on adding surplus gold reserves to the country's pension fund (counter-proposal)	0,45	0,27	0,27
Federal law on the electricity market	-0,64	-0,11	-0,03
Popular initiative against misuse of asylum rights	0,14	-0,7	0,15
Federal law on compulsory unemployment insurance and compensation for insolvencies	-0,65	-0,43	0,04
Federal decree on reforming the referendum process	0,24	-0,11	0,37
Federal decree on changing the cantonal contribution to financing hospital medication	0,44	0,05	0,03
Federal law on the Swiss army	0	0,23	0,6
Federal law on civil defense	0,2	0,65	0,36
Popular initiative "yes to fair rents"	0,1	0,76	0,22
Popular initiative for one Sunday a season free from motor vehicles-a test for four years	0,18	0,85	0,13
Popular initiative "health has to be affordable"	0,7	0,1	0,12
Popular rights for equal rights for the disabled	0,21	0,83	0,06
Popular initiative "electricity without nuclear power"	0,73	0,07	0,05
Popular initiative for prolonging the ban on new nuclear power stations	0,08	0,88	0
Popular initiative for a sufficient provision of vocational education	0,12	0,85	-0,03
Federal decree on the popular initiative for safe and efficient motorways (counter-proposal)	-0,37	-0,61	0,42
Amendment to the Obligations law	-0,57	0,1	-0,03
Popular initiative "life-long custody for non-curable, extremely dangerous sexual and violent criminals"	0,16	-0,22	-0,12
Amendment to the federal law on Aged and Bereaved insurance	0,57	-0,06	0,36
Federal decree on financing the Aged and Bereaved insurance	0,23	-0,72	0,23
Federal law that would affect taxation for married couples, families, private housing and stamp duty	0,25	-0,54	0,18
Federal decree on ordinary and facilitated naturalization (2nd generation)	0,8	0,48	-0,18
Federal decree on ordinary and facilitated naturalization (3rd generation)	0,79	0,48	-0,22
Popular initiative "postal services for all"	0,68	0,61	-0,23
Federal law on compensating members of the armed forces for loss of earnings	-0,08	0,75	-0,28
Federal decree on rebalancing the financial duties of the Federation and the Cantons	0,64	-0,02	0,09
Federal decree on the constitutional reordering of the budget	0,26	-0,13	0,01
Federal law on stem cell research	0,71	0,19	-0,07
Federal decree on Switzerland joining the Schengen Area	0,65	-0,07	0,5

Federal decree on whether registered partnerships for same-sex couples should be introduced	0,91	0,24	0,03
Federal decree on extending the agreement on free movement of people to new members of the European Union	0,91	0,08	0,07
Federal decree on the popular initiative for food from an agriculture free of genetic modification (counter-proposal)	0,42	-0,39	0,49
Federal labor law related to the opening times of shops in public transport hubs	-0,11	0,55	-0,25
Amendment to the constitutional article on education	0,6	-0,06	-0,06
Popular initiative on diverting profits from the Swiss National Bank into the national pension fund	-0,52	-0,68	0,24
Federal law on foreigners	-0,53	-0,69	0,16
Amendments to the federal law on asylum	-0,13	0,74	0,14
Federal law on assistance to Poland and other poorer EU countries	0,86	0,15	0,14
Amendment to the family allowances law	0,3	0,58	0,01
Popular initiative for a social unified health insurance	0,26	0,83	-0,2
Amendment to the disability insurance law	-0,13	-0,8	0,09
Popular initiative against fighter aircraft noise in tourism areas	0,35	0,61	0
Federal law on the corporate tax reform	0	-0,6	-0,11
Popular initiative for democratic naturalization	-0,4	-0,65	0,41
Popular initiative against publicly funded information campaigns by the government	-0,73	-0,52	0,24
Amendment to the constitutional article on health insurance	-0,72	-0,37	0,21
Popular initiative for the elimination of the statute of limitations with respect to pornographic crimes against children	-0,15	0,01	0,73
Popular initiative for a flexible retirement age	0,2	-0,12	0,68
Popular initiative for the restriction of the right of associations to appeal against building projects	0,6	0	0,28
Popular initiative for a sensible cannabis policy with effective protection of the youth	-0,01	0,85	-0,05
Amendment to the federal law on narcotics	-0,13	-0,39	-0,19
Federal decree on approving the renewal of the EU-Switzerland bilateral agreement on free mobility	0,87	0,09	-0,04
Constitutional article "Future with complementary medicine"	0,47	-0,22	0,24
Federal decree on the introduction of biometric passports	0,5	0,47	-0,25
Federal decree on a limited increase of the value added tax to continue financing disability insurance	0,75	-0,01	0,05
Federal decree on accepting the decision not to introduce the generic popular initiative	0,7	0,46	0,02
Federal decree on aviation fuel taxation	0,64	-0,23	0,24
Popular initiative "ban on exporting war supplies"	0,41	0,64	0,08
Popular initiative against the construction of minarets	-0,81	-0,29	0,01
Amendment to the constitutional article on research on humans	0,01	0,03	0,76
Popular initiative on providing enhanced legal protection for animals	0,05	-0,64	0,07
Amendment to the federal law on Aged and Bereaved insurance	0,79	0,21	-0,01
Amendment to the federal law on unemployment benefits	-0,06	-0,83	0,17
Popular initiative for the deportation of foreign criminals	0,53	0	0,25
Federal decree on the popular initiative for the deportation of foreign criminals (counter-proposal)	0,1	0,68	0,14
Popular initiative for fair taxes	-0,82	-0,32	0,04

Table A.4: Factor scores for the period 2011-2017

Vote	Factor 1	Factor 2	Factor 3
Popular initiative for the protection against gun violence	0,49	0,67	0,06
Popular initiative "an end to the limitless construction of second homes"	0,31	0,04	0,57
Popular initiative for tax-supported building society savings to buy living space for self-use and to finance energy saving and environmental measures	0,84	0,07	-0,01
Popular initiative "six weeks of vacation for everyone"	0,4	0,53	-0,17
Federal decree on using the state earnings from gambling for the public interest	0,69	0,27	-0,3
Federal law on the fixed book price agreement	0,44	-0,02	-0,62
Popular initiative on assistance with savings for home buyers	-0,55	-0,06	0,53
Popular initiative on reinforcing popular rights in foreign policy	-0,17	-0,71	0
Amendment to the federal law on healthcare	0,26	0,04	-0,53
Federal decree on the popular initiative on promoting music lessons for youth (counter-proposal)	-0,21	-0,29	0,09
Popular initiative on secure housing in old age	0,43	0,41	0,07
Popular initiative on a smoking ban	0,5	0,2	-0,07
Amendment to the federal law on animal diseases	0,42	0,65	-0,33
Federal decree on family policy	-0,03	0,15	0,67
Popular initiative against rip-off salaries	0,38	-0,35	0,53
Amendment to the federal law on spatial planning	0,75	0,49	-0,24
Popular initiative on the direct election of the Federal Council	-0,73	-0,21	0,14
Urgent modification of the federal law on asylum	-0,09	-0,66	-0,03
Popular initiative on the abolition of compulsory military service	0,76	0,43	0

Table B.2: Results of Dunn’s tests on the Gini coefficient of the income distribution on the “Left- Right” dimension

<u>Gini coefficient of the income distribution (1981-1990)</u>			<u>Gini coefficient of the income distribution (1991-2000)</u>		
	Left	Not Significant		Left	Not Significant
Not Significant	1.96		Not Significant	4.85	
	p = 0.02			p < 0.001	
Right	7.70	7.91	Right	3.09	-1.14
	p < 0.001	p < 0.001		p = 0.002	p = 0.13
Median “Left” = 0.317 Median “Not Significant” = 0.308 Median “Right” = 0.290			Median “Left” = 0.329 Median “Not Significant” = 0.316 Median “Right” = 0.318		

<u>Gini coefficient of the income distribution (2001-2010)</u>			<u>Gini coefficient of the income distribution (2011-2017)</u>		
	Left	Not Significant		Left	Not Significant
Not Significant	3.34		Not Significant	8.56	
	p = 0.001			p < 0.001	
Right	2.39	-0.49	Right	10.15	3.64
	p = 0.01	p = 0.31		p < 0.001	p < 0.001
Median “Left” = 0.316 Median “Not Significant” = 0.310 Median “Right” = 0.310			Median “Left” = 0.360 Median “Not Significant” = 0.336 Median “Right” = 0.328		

“Liberal-Conservative” dimension

Table B.3: Results of Dunn’s tests on median income on the “Liberal-Conservative” dimension

<u>Median income (1981-1990)</u>			<u>Median income (1991-2000)</u>		
	Conservative	Not Significant		Conservative	Not Significant
Not Significant	-9.29		Not Significant	-4.65	
	p < 0.001			p < 0.001	
Liberal	-9.39	2.96	Liberal	-9.66	7.55
	p < 0.001	p = 0.002		p < 0.001	p < 0.001
Median “Conservative” = 30’775 Median “Not Significant” = 33’600 Median “Liberal” = 34’850			Median “Conservative” = 45’650 Median “Not Significant” = 47’125 Median “Liberal” = 50’050		

<u>Median income (2001-2010)</u>			<u>Median income (2011-2017)</u>		
	Conservative	Not Significant		Conservative	Not Significant
Not Significant	-9.58		Not Significant	-9.77	
	p < 0.001			p < 0.001	
Liberal	-18.11	13.51	Liberal	-17.59	12.73
	p < 0.001	p < 0.001		p < 0.001	p < 0.001
Median “Conservative” = 52’200 Median “Not Significant” = 55’800 Median “Liberal” = 62’500			Median “Conservative” = 54’200 Median “Not Significant” = 59’150 Median “Liberal” = 68’400		

Table B.4: Results of Dunn’s tests on the Gini coefficient of the income distribution on the “Liberal- Conservative” dimension

Gini coefficient of the income distribution (1981-1990)

	Conservative	Not Significant
Not Significant	-7.20 p < 0.001	
Liberal	-12.48 p < 0.001	9.17 p < 0.001

Median "Conservative" = 0.279
 Median "Not Significant" = 0.304
 Median "Liberal" = 0.335

Gini coefficient of the income distribution (1991-2000)

	Conservative	Not Significant
Not Significant	-9.45 p < 0.001	
Liberal	-11.55 p < 0.001	5.03 p < 0.001

Median "Conservative" = 0.304
 Median "Not Significant" = 0.322
 Median "Liberal" = 0.338

Gini coefficient of the income distribution (2001-2010)

	Conservative	Not Significant
Not Significant	-7.55 p < 0.001	
Liberal	-10.93 p < 0.001	6.36 p < 0.001

Median "Conservative" = 0.297
 Median "Not Significant" = 0.311
 Median "Liberal" = 0.331

Gini coefficient of the income distribution (2011-2017)

	Conservative	Not Significant
Not Significant	-8.27 p < 0.001	
Liberal	-14.19 p < 0.001	9.89 p < 0.001

Median "Conservative" = 0.317
 Median "Not Significant" = 0.337
 Median "Liberal" = 0.371

"Ecological-Technocratic" dimension

Table B.5: Results of Dunn's tests on median income on the "Ecological-Technocratic" dimension

Median income (1981-1990)

	Ecological	Not Significant
Not Significant	5.57 p < 0.001	
Technocratic	3.59 p < 0.001	-1.21 p = 0.11

Median "Ecological" = 34'700
 Median "Not Significant" = 33'050
 Median "Technocratic" = 33'117

Median income (1991-2000)

	Ecological	Not Significant
Not Significant	0.71 p = 0.24	
Technocratic	3.34 p < 0.001	3.37 p = 0.001

Median "Ecological" = 48'000
 Median "Not Significant" = 47'400
 Median "Technocratic" = 45'938

Median income (2001-2010)

	Ecological	Not Significant
Not Significant	3.52 p < 0.001	
Technocratic	7.52 p < 0.001	5.90 p < 0.001

Median "Ecological" = 58'000
 Median "Not Significant" = 55'925
 Median "Technocratic" = 53'150

Median income (2011-2017)

	Ecological	Not Significant
Not Significant	-2.01 p = 0.03	
Technocratic	-2.64 p = 0.01	-1.20 p = 0.12

Median "Ecological" = 58'400
 Median "Not Significant" = 59'400
 Median "Technocratic" = 60'300

Table B.6: Results of Dunn's tests on the Gini coefficient of the income distribution on the "Ecological-Technocratic" dimension

Gini coefficient of the income distribution (1981-1990)

	Ecological	Not Significant
Not Significant	3.97 p < 0.001	
Technocratic	-0.25 p = 0.40	-4.26 p < 0.001

Median "Ecological" = 0.311
 Median "Not Significant" = 0.302
 Median "Technocratic" = 0.315

Gini coefficient of the income distribution (1991-2000)

	Ecological	Not Significant
Not Significant	11.34 p < 0.001	
Technocratic	6.87 p < 0.001	-2.46 p = 0.007

Median "Ecological" = 0.343
 Median "Not Significant" = 0.313
 Median "Technocratic" = 0.318

Gini coefficient of the income distribution (2001-2010)

	Ecological	Not Significant
Not Significant	5.85 p < 0.001	
Technocratic	4.90 p < 0.001	0.43 p = 0.33

Median "Ecological" = 0.323
 Median "Not Significant" = 0.308
 Median "Technocratic" = 0.307

Gini coefficient of the income distribution (2011-2017)

	Ecological	Not Significant
Not Significant	-4.40 p < 0.001	
Technocratic	-13.02 p < 0.001	-11.74 p < 0.001

Median "Ecological" = 0.327
 Median "Not Significant" = 0.333
 Median "Technocratic" = 0.373

1503 REGIONAL DISTRIBUTION OF FEDERAL TRANSFERS AND EXPENDITURE IN INDIA

ABSTRACT

Intergovernmental fiscal transfers for ensuring horizontal fiscal equity are well established in the federal systems. In the presence of significant regional disparities in India, the central government engages in large intergovernmental transfers to the poorer states for horizontal fiscal equalization. Despite this, the role of central government in addressing interstate fiscal disparities has been not measured comprehensively. Other than the intergovernmental transfers to state governments, the central government also directly spends on health, education, rural development, and various subsidies. All these central expenditures, bypassing the state budgets, have implications for regional redistribution and horizontal fiscal equalization. This paper prepares estimates on a long felt gap regarding the availability of data on central government's transfers and spending at the state level. Using these estimates, we examine progressivity of multiple channels of central transfers and spending; and their impact on horizontal fiscal equalization in India.

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1673 450 YEARS OF PORTUGUESE COLONIALISM IN INDIA: MISSIONARIES, EDUCATION, GENDER GAPS

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ABSTRACT

This paper explores the persistent role of colonial heritage for economic development using different types of geographical regression discontinuity design (GRDD) estimations. It gives a deep rooted explanation for the emergence of gender roles and provides one possible explanation for the economic catch-up of Goa after its liberation. The empirical strategy exploits peculiarities of the history of the colonisation of Goa. It was conquered by the Portuguese in 1510 and uninterruptedly held until 1961. I argue that persistent effects of these activities, in which the Catholic missionaries played a key role, can be seen up until today in terms of sex-ratios and the gender gap in education as measured by literacy rates. I use an old border that doesn't exist any more since almost 250 years between the so-called Old & New Conquests as my identification device. In the former parts the colonisers forbade sati, polygamy, childhood marriage, and gave women property rights at an early stage. Furthermore the missionaries brought structured education. My analysis, carried out on a village level, provides strong evidence that the early Portuguese colonial activities were the cause of (geographically) sharp within differences that are still measurable today. The analysis of multiple censuses over time suggests that there has been within-Goa convergence and that gaps are washing out. Furthermore I find tentative evidence for a horizontal diffusion throughout villages: also the Hindus within the Old Conquests exhibit systematically higher sex-ratios and lower educational gender gaps. From a methodological perspective I point out the weakness of certain GRD estimations that have been applied in Economics so far and propose a more transparent and rigorous way in which results could be reported in the future; thus potentially also speak to the literature that deals with the so-called "statistical crisis in science" (see e.g. Gelman and Loken, 2014).

Keywords: Geographic Regression Discontinuity Design (GRDD), Colonialism, Religion, India, Portuguese Empire, Gender Gap, Female Empowerment.

JEL Codes: F54, I24, I25, J16, N35, O15, O43, Z12.

1 INTRODUCTION

The Indian state of Goa, once the capital of the mighty Portuguese seaborne empire, was one of the poorest parts in all of South Asia at the time of the liberation from its colonisers in 1961. After receiving heavy transfers and infrastructural investments from the Indian government it managed to transform itself into what is essentially the most prosperous state in present day India⁶⁷. The picture is similar when it comes to the position of women in society: Goa is on top according to the most important indicators⁶⁸.

A more detailed investigation of the matter through the use of census data at a fine-grained level⁶⁹ reveals that those aggregate phenomena are to a substantial extent driven by four talukas (sub-districts) within Goa, all of which happen to have experienced a different colonial history than the other seven talukas.

Only by considering the various examples of failed development investments throughout the last decades, especially in Africa, Latin-America, and other parts of South Asia, the Goan case appears to be a worthwhile one to study. In addition to the overall economic success, it is crucial to understand the drivers for female empowerment which were mostly confined to specific parts. In numerous studies that examine the strong correlation between women empowerment and economic development, it is typically not clear in what direction the causation goes and whether the interrelationship is self-sustaining [Duflo, 2012; Doepke, Tertilt, and Voena, 2012]. In the history of Goa I identify several early "treatments" regarding the improvement of the position of females in society. These pre-date the experience of economic development by several hundred years and thus allow me to take a much stronger position on the causal link from the improved position of women towards economic prosperity.

The general economic success might be partly driven by the whole uniform Portuguese institutional setting (the civil code of 1871 - based on the Code Napoleon - who is still in place up until today): Goa for example is still the only state so far in India which has a uniform civil code that applies uniformly to all people, independent of religion or gender. This

⁶⁶ Please be aware that this is a very preliminary draft. Some figures, graphs, and several pieces of the text are still missing.

First and foremost I want to thank my academic supervisor, Matteo Cervellati, for his guidance and continuous support. So far I benefited from extensive conversations with Oded Galor, Nicola Gennaioli, Mara Squicciarini, Robson Tigré, Rocío Titiunik, Romain Wacziarg, Andrea Weber, and David Weil. I received very helpful comments from Ankush Asri, Stephen Broadberry, Jean-Paul Carvalho, Siddharth Chandra, Rui Esteves, Margherita Fort, Paolo Masella, Giovanni Prarolo, Anand Swamy, Eric Tagliacozzo, Felipe Valencia, seminar participants at the University of Oxford (Nuffield, Graduate Seminar Series), the Spring Meeting of Young Economists 2017, Michigan State University, CESifo Munich, EHES 2017 Tübingen, ASREC Europe 2017, the University of Bologna, and the Macro Lunch at Brown University.

⁶⁷ In terms of local GDP and HDI numbers as reported by the Planning Commission of the Government of India and several other indices of social progress.

⁶⁸ The Gender Vulnerability Index (GVI) 2017 by Plan India, or the National Family Health Survey 4 (NFS) from 2015/16 when it comes to the sex-ratio, female (access to) education, household bargaining power and domestic violence. According to the District Level Household and Facility Survey 4 (DLHS) from 2012/13 by the Ministry of Health the number of married women below age 18 in Goa went down to virtually zero. The same holds true for the number of induced abortions.

⁶⁹ Village and town level data from the Village Census Abstract and the District Census Handbook of Census India.

paper does not draw strong conclusions on that, but rather focuses on variations within Goa due to the presence of a "quasi experimental" econometric identification device that was an outcome of its peculiar historiography.

After being the first European power to round the southern tip of Africa in 1497, the Portuguese establish the capital of their subsequent thalassocracy in the Indian Ocean, the so-called *Estado da Índia*, in Goa in 1510. From then on it is uninterruptedly ruled for 450 years and thus makes it the longest constantly colonised piece of land in younger human history. One unique feature of the Portuguese colonisation strategy in the Indian Ocean was that they, unlike the Dutch or the British with their trading companies, interacted with the autochthonous people. Intermarriage of their soldiers with Hindu women was encouraged in order to create a loyal local population. Furthermore efforts were made to convert the populace to Catholicism. For that matter they were always accompanied by monks and priests which belonged to specific religious orders. The Franciscans and the Jesuits became the two most important players in the early colonial history of Goa. They built churches, a college, set up a network of parish schools, introduced structured education, and even brought the printing press.

Moreover the Lusitanians significantly altered the position of women in society: sat¹ and polygamy were forbidden and early childhood marriage was curbed. Furthermore women were granted property rights and could thus inherit from then on. This was conditional upon marrying a Christian and thus served as an additional incentive to convert. It has to be noted that these things were obviously not undertaken out of philanthropic motives. It was what the Portuguese believed to be a superior way of organising society, which they more or less successfully imposed on Goans. Further it should be noted that the early colonial years have been marked by tremendous hostility towards the Muslim population, which were preceded by hostility from the Bahmani Muslims towards the local Hindus prior to the European arrival. Around 1780 the Portuguese, albeit being economically and militarily already very weak, managed to extend the territory of Goa by the aforementioned seven sub-districts, the so-called *New Conquests*. At approximately the same time the Jesuits get forbidden and expelled due to exogenous events in Europe. A bit later, in 1839, all remaining religious orders get forbidden. Furthermore the people of the *New Conquests* were guaranteed religious freedom because the colonial government could not afford to pick up a fight with the landowning upper caste Hindus in those newly gained territories. It is thus ensured that the early missionaries did not carry out activities of any sort in those new dominions.

It is this historical "quasi experiment" alongside this border, which does not exist any more since 250 years, between the *Old-* and *New Conquests* that I use as my econometric identification device in order to apply a Geographic Regression Discontinuity Design (GRDD).

These estimations reveal that the gender gap in literacy rates jumps by around 4 percentage points on average in 2011 when the line is crossed. All other fundamentals that could drive economic activity, including several "placebo outcomes", stay constant at the same time. The discontinuity is thus driven by something unobservable which I trace back to Portuguese colonial activities. The same analysis carried out on the 1991 census⁷⁰ reveals that effect is twice as big and the within Goa gaps and disparities are much higher. Thus Goa underwent a within convergence process during its periods of economic growth: the poorer parts were catching up with the more prosperous *Old Conquests*, but the gaps alongside the old within border are still geographically sharp and measurable up until today. In addition the sex-ratio and the female literacy rate itself show a much more pronounced drop when one steps out into the *New Conquests* which did not experience missionary activities.

Furthermore, as later will become clearer, the historical quasi-experiment that I am exploiting allows me to potentially also tell apart what the long-term effects of differential cultural and institutional "treatments" are and how they interact. Something that is still not well understood by economists, as has been recently argued by [Alesina and Giuliano \[2015\]](#). My setup additionally allows me to draw tentative conclusions on the evolution of gender norms, which potentially deepens the understanding on how cultural norms and beliefs could change and evolve throughout time. I argue that a shift in the attitude towards women in the 16th century, both within village communities and the respective households, lead to the evolution of a different set of gender norms. These norms persisted locally and are the reason why educational gender gaps are lower and sex-ratios are higher in the parts that were colonised early. These places experienced the aforementioned "double-treatment": exposure to schools and structured education, and the early alleviation of the position of women in society. Especially in the context of a sub-continent which is still plagued by gender inequalities, even after decades of efforts to equalise females, this could serve as an important historical lesson on which one could rely.

For my econometric analysis, in order to potentially isolate causal effects, I redraw aforementioned abandoned border and use it to create a Geographic Regression Discontinuity Design (GRDD). I carry out different sets of estimations: a specifications in "naive" distances, specifications in polynomials in longitude and latitude [as famously put forward by Dell, 2010], and the more state-of-the-art implementation of what is called a GRD with a two dimensional score that allows me to uniquely pin down the location of every village in space and estimate heterogeneous treatment effects alongside the border [see Keele and Titiunik, 2015]. This would be equivalent to a "classical" RD [Imbens and Lemieux, 2008] with two running variables [Imbens and Zajonc, 2011].

I find that the 2011 gender gap in education as measured by the difference in literacy rates is around 4 percentage points higher in the *New Conquests*. This effect is substantial, given that the average literacy gap across Goa is around 8 percentage points. The magnitude of the effect that I identify at the cut-off is almost as high as the one from running a

⁷⁰ Which is the first one after Goa was upgraded from a Union Territory together with Daman and Diu to a state in 1987.

regression with just one dummy variable that indicates whether a village is in the Old-/New-Conquests. Furthermore the number of women per 1000 men is around 80 higher in the villages just on the inside of the old border as compared to those that are just on the outside.

The methodological contribution of this paper is that I implement the supposed ideal way to carry out geographic RDs [as suggested by Keele and Titiunik, 2015] in a more complete way: I show that the other specifications that were put forward so far in the economics literature may lead to spurious conclusions in my settings. I cannot make substantial claims on outcome variables such as the female labour force participation. Those seemed to be robust in the specifications in "naive" distances and with polynomials in longitude/latitude, but when I apply the more demanding RD estimation with two running variables at each border point, there seems to be too much heterogeneity alongside the boundary in order to infer clear effects, i.e. the point estimate keeps changing its sign

In order to further improve spatial RDs, I argue that we just have to stop to discard a clearly identified and visualisable feature within our data: space. Just by making use of simple spatial interpolation techniques such as kriging we could present the analysed data in a way that puts the reader immediately in a position to infer whether there is an actual jump alongside some specified border or not.

Through an extensive historical narrative, the analysis of historical census data, and the verification of numerous "placebo outcomes", I try to convince the reader that the root of these differences lie in the early improvement of the position of women and the early exposition to organised education in the Old Conquests. I also argue that these cultural values not only were transmitted vertically throughout generations, but also horizontally within village communities. The latter is elicited by the fact that the distribution across space of the educational gender gap and the sex-ratios for Hindus, which constitute the main religious group in contemporary Goa, is systematically different in the Old Conquests as shown by non-parametric statistical tests (higher sex-ratios and lower literacy gaps). It thus seems that effect that I am describing is not something that stems from "being Christian".

Very recent sociological research argues, that religion played an ambiguous role in the early-modern onset of Portuguese colonialism, as compared to other cases where religion is highlighted as a strong marker and maker of cultural difference [Henn, 2014]. This stems mostly from the fact that in Goa, things seem to be somewhat molten together: Christian converts kept a lot of Hindu practices up until today (e.g. the dowry system, clothing, ...). I am trying to convince the reader, that even though Hindu and Christian culture seems to be somewhat molten together, what mattered most for contemporary economic outcomes was the common historical experience of those families and villages in the Old Conquests. I thus connect to the broad literature of long-term comparative development by providing a deep rooted explanation for Goa's success and its geographic gender disparities. My study argues that, albeit having no clear measurable impact during early stages apart from the differential sex-ratios, the historical experience turned out to be important once education became widely available after the liberation in 1961. A certain set of beliefs towards education and the status of women was conducive for the appreciation of education and made people more likely to send their kids to school. This effect through missionaries on education was already shown to be important in the Latin American context by Valencia Caicedo [2014] and Waldinger [2017]. The additional feature of the Goan context is the second part of what I call a "double treatment". Female literacy were rising fast in the Old Conquests, while a lot of villages in the New Conquests still had female literacy rates of below 50% up until the 1990's.

Broadly speaking I am contributing to the strand of literature that tries to link historical events to contemporary economic outcomes, emphasising the importance of history for economic development, as e.g. summarised by Nunn [2009, 2014b] or more recently by Michalopoulos and Papaioannou [2017]. Within this sub-field, the present study tries to assess the long-term impacts of colonialism in the specific context of the Portuguese seaborne empire [the historical seminal study still being Boxer, 1969] and the Indian Ocean trade. Contributions focusing on Asia in this respect almost exclusively study the impact of Britain's influence in India [Banerjee and Iyer, 2005; Iyer, 2010; Gaikwad, 2015]. Recently there is some work that tries to assess the long-term impacts of Protestant missionaries in the territories of the British East India Company [Mantovanelli, 2013], and of colonial educational investments therein [Chaudhary and Garg, 2015]. Supposedly one reason why not much attention was paid so far to Lusitanian legacies, was that the Portuguese empire was a "forgotten empire", amongst historians and even more so amongst economic historians up until recently [Marcocci, 2012, p. 33]. Arguments, explanations and a description of the development in the field of Portuguese "overseas history", including a summary of the 2003 e-JPH debate are described in detail by Ferreira [2016].

Unlike, e.g. Acemoglu, Johnson, and Robinson [2002] or Bruhn and Gallego [2012] I am not comparing supposedly good and bad colonial policies in order to assess their long-term effects. My study aims to deliver an assessment of the interaction of colonial policies, which implicitly aimed more at a shift in beliefs and values, and the presence of Christian missionaries. The general rules on how property was taxed or economic activity took place were pretty much homogeneous throughout all of Goa.

More specifically I am contributing to the very recent literature on the long-term effects of (Catholic) missionary orders. Studies on Africa and India generally focus on protestant missions: e.g. Cag'e and Rueda [2016] point out the positive impact of the printing press that was present in protestant missions in Africa & Nunn [2014a] documents the beneficial impact of protestant missions on women in Africa. Woodberry [2004, 2012] documents the strong correlation between e.g. educational attainment and the presence of Protestant missions. This is the first work that specifically tries to assess the impact of Catholic missionaries in Asia within this highly localised "Goan-setting" that heavily reduces the concern of omitted variable problems. Since I also can clearly distinguish the area of influence of the two main orders, the

Franciscans and the Jesuits, before their expulsion at least, this work can be seen along the line of what Valencia Caicedo [2014] and Waldinger [2017] are doing in Latin America by comparing the differential impact of the different orders. Waldinger [2017] claims that the mendicant orders had a more beneficial impact on contemporary economic conditions in Mexico and Valencia Caicedo [2014] underlines the heavily beneficial impact of the Jesuits in the Guaraní area in contemporary Paraguay, Argentina & Brazil. Having a clear geographic distinction between Jesuits and Franciscans, my setup also allows me to draw the tentative conclusion that the Jesuit imprint was felt stronger and lasting longer. The areas where the Jesuits were historically active today have the highest sex-ratios and still the highest shares of Christians. This is corroborated by the fact that they became the virtual overlords of Goa throughout the 16th and 17th centuries [Borges, 1994; Velinkar, 1984]. Albeit the average literacy rates being a bit lower in the former Jesuit districts, the jump at the border towards the New Conquests is much more pronounced (apart from the few points that deliver point estimates with reversed signs).

From a methodological point of view I am pointing out potential weaknesses of the common RD specification put forward by Dell [2010], which has been increasingly popular recently. This relates to recent work on the “statistical crisis in science” [most famously described by Gelman and Loken, 2013, 2014]. Especially what they call a “garden of forking paths” or “researcher degrees of freedom” potentially applies to geographic RD’s in general. Simply by increasing the number of potential outcome variables on both sides of a geographic cut-off, one increases his probability of finding a statistically significant jump. Thus the danger of running into false positives is very high. The two solutions that I propose will alleviate these concerns tremendously.

2 HISTORICAL BACKGROUND

2.1 Geography

The contemporary Indian state of Goa, lapped by the blue expanse of the Arabian Sea in the west, admeasures an area of only around 3700 square kilometres and is located mid-way on the west coast of India. Technically its around 120km long coastline is part of the Konkan Coast, to its south the Malabar Coast begins. Goa stretches out to a width of about 60 kilometres in an east-west direction and extends to a length of about 105 kilometres from north to south. To the east, Goa (and the whole Konkan) are separated from the Deccan highlands of Karnataka, the neighbouring state to the west and south, by the mountain ridge of the Western Ghats. Thus from the outset it can already be seen that my study focuses on a geographically very restricted area that allows me to hold constant important features of first nature geography such as climate, soil quality, and the like. Consequently a potential omitted variable bias is not that much of a concern.

Politically the state is divided into two districts and eleven sub-districts, so-called talukas: Pernem, Bardez, Bicholim, Tiswadi, Sattari, and Ponda being part of North Goa; and Mormugao, Salcete, Sanguem, Quepem, and Canacona being part of South Goa.

Goa enjoys a salubrious, sub-tropical, monsoon type of a climate with alternating wet and dry seasons.

Linguistically it belongs to the Konkani-speaking region that reaches from Thane in Maharashtra, the neighbouring state in the north, to Mangalore in Karnataka in the south. The current population comprises about 1.2 million people of whom 65 percent are Hindus, 27 percent Christians, and 6 percent Muslims according to the 2011 Indian Census. It stands out from its neighbors’ culture by apparently European that is, Portuguese, features in its architecture, folklore, and cuisine. Generally this is true mostly for specific parts of Goa, namely in the so-called *Old Conquests*, as will become clearer later.

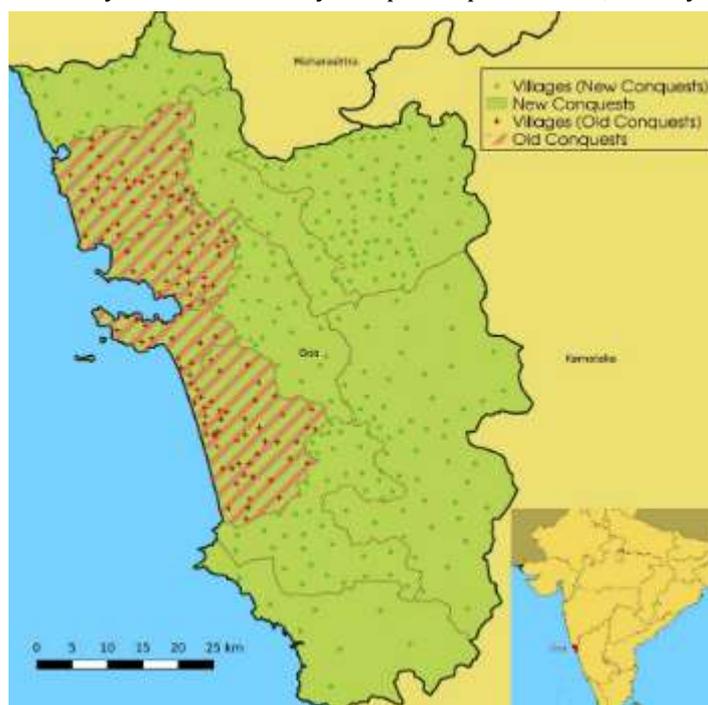


Figure 1: The location of Goa on the Indian west coast.

2.2 Portuguese Conquest

The Portuguese were the first foreign power to arrive and the last one to depart from the sub-continent of India, their 450 year long stay thus marks one of the longest uninterrupted periods of colonisation in history. The lusitanian adventure in the Indian Ocean starts in 1498 when Vasco da Gama lands in the port of Calicut with the famous first sentence *"We are looking for Christians⁷¹ and spices!"*. Later, in 1510, Alfonso de Albuquerque captured the Islands of Goa (its territory roughly equivalent to today's taluka of Tiswadi) from the Sultan of Bijapur. By 1543, the Portuguese had annexed the adjoining lands of Bardez in the north and Salcete (including today's taluka of Mormugao) in the south. These three territories have been designated as *Velhas Conquistas*, the Old Conquests.

It soon became the capital of the Portuguese *Estado da Índia* and rose to one of the world's most magnificent cities of the 16th century. It became an important trading post that connected China, Japan, the Moluccas (the famous "Spice Islands") and India with Europe. It was also referred to as *Goa Dourada*, the golden Goa, and supposedly was comparable in size to the major cities in Europe back then [Srivastava, 1990]. The extensive prosperity was caused by trade, mainly with spices, and was facilitated by naval superiority. For which the foundation was essentially laid by Henry the Navigator and his successors in the 15th century. They managed to prevent the secrets of the demanding maritime navigation in the Indian Ocean from spreading to other European nations for around 100 years, up until the Dutch traveller and later secretary to the viceroy in Goa, Jan Huyghen van Linschoten, copied all the information and published it in his *Itinerario* in 1596 [see e.g. ?]. Due to this catch-up in knowledge by the ascending Dutch provinces, the Portuguese quickly lost their pre-eminence in the Indian Ocean around 1600. Their entrance with the newly formed East India Company, the so called Vereingde Oostindische Compagnie (VOC), marked the beginning of a sharp decline of the whole Portuguese seaborne empire in general, and of its capital Goa in particular.

One of the distinct features of the Portuguese colonisation strategy was their zeal to convert the local populace to Christianity, and their enmity towards Muslims. Mass conversion campaigns were flanked by the destruction of temples and mosques. In Goa the result was an exodus of Hindus and Muslims, of which the former were by far the biggest religious group, and a rising number of Christians who soon became the overwhelming majority. The village communities, the so-called *Gaunkaris* (or *Comunidades*), around which economic and social life was organised were typically left in tact. The only requirement was that taxes and tributes were collected by the *Gaunkars* and transferred to the viceroy in Goa.

The key feature of the Portuguese colonising "strategy" as opposed to all other European colonisers was, that they always encouraged their men to intermarry with local, in this case Hindu, women. The aim was to generate a local populace which is loyal to the colonial government and thus reduce the potential for uprisings and revolts. Upon marriage with a Portuguese *soldado*, which made him a *casado* then, women were granted property rights. Thus their position in society was strengthened and they could inherit in case their husband died. Prior to that women were typically burned on the pyre of their dead man (sat'i). This clearly served as an additional incentive for local females to convert.

2.2.1 The Portuguese Trading (Colonising?) System

The state government in Goa was a macrocosm of that of the other areas and forts⁷². Each had a captain, usually assisted by a "vedor da fazenda", other minor officials such as clerks, and more important the factor, who supervised the royal trade in the area. There were also various clerics, a judge, and in the larger areas a municipal council. The object of all these forts and captains was to enable the Portuguese to achieve several economic aims. These may be listed as: a monopoly of the spice trade to Europe, a monopoly on the trade between various specified ports within Asia; the control, direction and taxation of all other trade in the Indian Ocean; private trade, done on their own behalf by most Portuguese living in Asia [Pearson, 1988].

Most of the official positions ensured high revenues to their holders. Distinction between public and private funds supposedly must have been blurred. The bulk of the officials' salary came in the form of several privileges and perquisites, such as the right to collect a certain tax⁷³ [Pearson, 1988]. Since they got rewards into their own pockets, they somehow had an incentive to extract. Probably one of the sources for the corruption that is described as endemic in numerous historical records [e.g. Boxer, 1969]. The biggest chunk of the state revenue was derived from customs duties.

Generally speaking, instead of exploiting the comparative advantage of their Cape-route in the East India trade and to supply Europe with as much spices as possible, they focused on taxing the already existing Indian Ocean trade and extracting as much as possible from the local (mostly Muslim) traders that operated between the Moluccas (the so-called "spice islands"), Malacca (close to nowadays Kuala Lumpur) and the Red Sea. Their lack of manpower⁷⁴ and the notorious inefficiency of the Portuguese colonial system can be viewed as the root cause of its later downturn.

One important implication of all this for my present study on Goa is that the respective colonial rulers never really were interested in developing the hinterlands or making meaningful public investments, at least not until the eve of the 19th

⁷¹ Prester John was thought to be in India at that time, plus they had evidence that the early apostles converted Indians already 1500 years ago.

⁷² In total the Portuguese empire comprised of XX forts in year XXYX [Boxer, 1961]

⁷³ The posts were seen as property from which the holder expected to make a profit, and thus they were willing to pay much more for a lucrative post than for one with few opportunities for pickings, even if the status of the latter was higher than that of the former. In a sale of 1618 more than twice as much was paid for the post of judge of the Goa customs house as for the captaincy of the whole city for example.

⁷⁴ The whole *Estado da Índia*, from Mozambique to Nagasaki, never had more than 10.000 soldiers [Boxer, 1969].

century. Portuguese "interference" happened almost exclusively through the Catholic missionaries, above all the Franciscans and the Jesuits.

2.2.2 Decline of the Seaborne Empire

As already indicated, a sharp decline of the whole seaborne empire set in at around 1600, when the rapidly ascending trading company of the Dutch Provinces, the VOC, entered the Indian ocean. Throughout the 17th and 18th centuries, the Portuguese thalassocracy was deprived of almost all its strongholds. Albeit the Dutch made two serious efforts to capture Goa, it constantly remained under Portuguese control.

Goa's customs revenues fell by almost one half between 1600 and the 1630s. Estimates of the value of her sea trade, based on these customs figures, show a decline from 2,700,000 cruzados in 1600 to 1,800,000 in 1616/17, 1,400,000 in 1635, and a minuscule 500,000 by 1680 [Pearson, 1988]. Goan capitalists vanished as the economy deteriorated. Additionally the Portuguese crown devoted its meagre resources mostly to Brazil for it was generally always higher valued than the possessions in the east.

It seems that there was a rise of country trade in the later sixteenth century as the *carreira* to Portugal declined.

One of the leading historians of the field, Malyn Newitt, suggests people to take care on the differentiation between the different periods. they have been different and must thus be treated differently Newitt [2005]. I would argue that, when we read the history of Goa, we need to do likewise.

2.2.3 The New Conquests of Goa

In 1763 the Portuguese were able to capture Ponda from the Marathas (Jesuit loan?, na das war gg defense Marathas?). In 1764 Sanguem, Quepem, and Canacona were placed under Portuguese jurisdiction because of an invasion by Hyder Ali. During hostilities between the Bohsles and the Raja of Kolhapur, the Portuguese took advantage of the situation and captured Pernem, Bicholim and Sattari and annexed them to Goa. By 1788 the modern territorial boundaries of Goa had been chalked out. The new parts were termed as the *Novas Conquistas* (New Conquests). They extended the area of Goa to the north, south and east; the Old Conquests make up about 785 square kilometres, the New Conquests a little under 3000. The latter were little valued at the time, but it was here that large deposits of iron ore were later exploited. By the end of the eighteenth century Portuguese India consisted of this enlarged Goa, and a moribund Diu and Daman⁷⁵.

The attitude towards the autochthonous population was by far not as hostile as it was during the 16th century in the Old Conquests. The locals were even guaranteed religious freedom. What is more, the main proponents of the proselytism in the 16th century, that is, the religious orders, were not present anymore: the Jesuits were expelled in 1759 and all other remaining orders were forbidden in 1835 [de Souza, 1990, p 107].

Goa remained Lusitanian until the 19th December of 1961, when the Indian Army drove out the colonisers with Operation Vijay. Thus Goa today marks the territory of the longest-held European colony in all of Asia, if not the world.

2.2.4 Why could the Portuguese rule uninterruptedly for 450 years?

In the early days of Lusitanian presence, their main opponents were the different Indian empires which were far superior by almost any means to the Portuguese (and most certainly to all other European powers at that time as well), except for naval technologies and strategies. All of those Indian empires were land based entities and their rulers didn't care too much about the coastline. The trade in the Arab Sea and the Indian Ocean was carried out by several trading guilds, most of which were of Muslim faith, since hundreds of years prior to the arrival of Europeans. Since the Portuguese Seaborne Empire was meant to be a trading empire with coastal outposts scattered around the world, a so-called thalassocracy, there was not much conflict of interest with the autochthonous ruling classes of the south Asian subcontinent in the first place.

⁷⁵ The Portuguese lost the extensive lands and quite prosperous town of Bassein to the Marathas in 1739; the New Conquests were somehow seen as a sort of compensation for the losses in the north.



Figure 2: The expansion of Goa

Later on, when the British became the overlords of India, they had little intention to conquer the small remaining Portuguese parts due to the strong ties of Portugal to the English crown. Catherina de Braganza married Charles II (part of her dowry was Mumbai, or Bom Bahia as the Portuguese called it). Later the Methuen treaty makes Portugal essentially a British trading puppet.

2.3 Christianity

From the historical introduction so far it is not hard to tell, that the *Estado português da Índia* in its early days during the 16th and early 17th century⁷⁶ was more or less a theocratic entity. During this time, its state machinery was fully geared towards the needs of evangelisation. Later on, as their seaborne empire and the Portuguese state itself were continuously declining, they lost their zeal for proselytisation. From the 16th century on, Goa, which before had experienced the presence of Hindu and Muslim rulers alike, was now subjected to probably the most dominant themes of Portuguese imperialism: christianisation and acculturation.

Especially the Muslims of Goa were exposed (has tradition in POR, think of Ceuta) to harsh brutality. In the first place, the Hindu majority enjoyed independence in order to remain a certain degree of local support. There is a "conversion-by-conviction-or-by-coercion debate" of how much the christianisation efforts harmed the local population of Goa and how cruel they were [see e.g. [Kamat, 1999](#), p. 42 for a discussion].

2.4 The Role of Women

Generally speaking, the Portuguese tried to change as little as possible when they arrived. They deliberately left the economy in the hinterland, which was organised on a village level, as much in tact as possible in order to e.g. maintain a stable tax base. This was especially true for the *New Conquests*, once they were acquired. The colonial government needed these pieces of land for agricultural purposes and thus didn't want to interfere with the Hindu land-owning class. Certainly one of the reasons why people in those parts that were acquired around 1780 were guaranteed complete religious freedom.

The few main "interventions" they tried to make regarding customs in the Goan society actually specifically concerned females.

Discrimination against women was (and still is to some extent, it has to be remarked) apparent in several ways on almost the entire sub-continent of south Asia: early childhood marriages, polygamy, the interdiction of remarriage, the prohibition of property rights (girls could thus not inherit from their families or passed away husbands), sati (a practice

⁷⁶ It is important to distinguish between the different, in some respects distinct, periods of the Portuguese thalassocracy when it comes to analysing the respective historical narratives as [Newitt \[2005\]](#) strongly emphasises.

where the widow is burned alive on the pyre of her husband)⁷⁷, and infanticide⁷⁸ (since the 1970's rather feticide). [Da Silva Gracias \[1996\]](#), Chapter 1, draws an extensive picture of the status of women in Indian society at the time of the Portuguese arrival.

Upon his arrival, Afonso the Albuquerque issued the so-called *Politica dos Casamentos*, a mixed marriage policy between his men and native women. He incentivised this by endowing those couples with cash, a house, cattle, and land [see e.g. [Da Silva Gracias, 1996](#); [Kamat, 2000](#)]. These Portuguese soldiers were then referred to as *casados*. The main purpose, it is said, was to create a "white" identity in the *Estado* and to develop a community which is loyal⁷⁹ toward the Portuguese. Intermarried women, which had to convert to Christianity, thus could suddenly claim all the privileges of a born Portuguese.

Also upon their arrival, the Portuguese immediately forbade practices that supposedly appeared barbaric to them: the tonsuring of widows and the practice of sati. Later on polygamy (1567) and childhood marriages were also forbidden (sati was abolished in the *New Conquests* only in 1884). Whether all those laws were effectively serving their purpose at the time they were implemented must be questioned. The historical narrative suggests that people tended to continue with traditional practices. But it has to be acknowledged that there existed at least written laws that tried to curb the discrimination against women at a very early stage. Also in the sixteenth century, women were granted the right to inherit property of their *husbands and fathers in the absence of sons. These things generally affected only Christian women since the Portuguese had no real hold on the Hindu village communities. They had influence on the Christians though via the well-established net of churches and parishes that was set up by the Catholic orders.*

All those measures of course were designated to serve one purpose: Christianisation. Women were provided with incentives to convert to Christianity. Furthermore Hindu widows and orphans were only entitled to the property of their ancestry in case they converted. Regarding the *New Conquests*, Hindu women were only permitted at the end of the 19th century to opt out of their Hindu law and seek justice under Portuguese law.

Later on the Portuguese civil code of 1867, which was extended to the colonies in 1869, regulated all the above mentioned things more clearly and formally and further improved the position of (Christian) women. The code was uniform for all citizens, irrespective of caste or sex. It guaranteed equality of the sexes with respect to property, protected the interests of widows and it contained laws concerning the family. Hindus generally were subject to the so called *Codigo dos Usos e Costumes* (in the *New Conquests* it was promulgated in 1853). When Portugal became a republic in 1910, the civil code was further expanded, e.g. by the possibility to annul or divorce a marriage.

Albeit socio-religious customs prevented women to a large extent from taking advantage of all these legislations, it cannot be stressed enough that their sheer existence and partial exertion were a major achievement, brought about at a comparatively very early stage in history.

2.4.1 The Dowry System

Dowry, as practised in India, is an amount of money, property, ornaments and other gifts that the family of the bride has to pay on the occasion of the marriage to the bridegroom or his family. Though dowry is prohibited by law in India, it is widely practised. Since most marriages in India are arranged by the families, dowry is decisive in finding a suitable bridegroom. Moreover, in practice, dowry is not a onetime payment, but the husband and his family continue to expect and demand money and other gifts from the wife's family, the denial of which leads to a lot of tension and violence. Consequences of dowry include female foeticide, discrimination against girls, late marriages for many girls, unsuitable matches for girls, lowering of women's status, breakdown of marriages, increase in mental diseases, increased rate of suicide and impoverishment in poor and middle class families and so on.

It could be argued that the sheer religious differences across the *Old-* and *New-Conquests* would explain the differences in female literacy rates and the educational gender gap that I observe across the old Border which doesn't exist anymore. The implicit driver for the preference for males being the dowry system. This can be rejected since the Christians, albeit partly adopting Portuguese culture, still kept many ancient Hindu practices. One of them being the dowry system [see e.g. [Ifeka, 1989](#); [Hickman, 2007](#); [Kumar, Kiran, and Gone, 2013](#)].

2.4.2 Education of Women

It has to be mentioned that in early times the education of women was generally neglected. Only some girls of upper strata were exposed to home schooling. If females benefited at all at early stages from Portuguese and missionary's interventions from an educational point of view, then the historical narrative again strongly suggests that this exclusively was the case for the *Old Conquests*. In this process the Catholic church played a significant role, although the precise motives and channels being somewhat opaque, scholars agree on the importance of the church in this respect [[Neill, 1985](#); [Xavier, 1993](#); [Da Silva Gracias, 1996](#); [Emma Maria, 2002](#)]

2.4.3 Women and the Church

⁷⁷ Even though it must be noted that the ban on sati was temporarily lifted in the 16th century due to pressure from the population.

⁷⁸ Albeit there are no records on female infanticides in Goa, it is reported that daughters on average were treated worse than sons. They were breastfed for shorter periods and were also later on poorer fed. Male children were also provided with better medical care as well since they were regarded as an asset according to social customs. Thus the disease survival rate of boys was reported to be higher [[Da Silva Gracias, 1994](#)].

⁷⁹ n.b.: the British, on the other hand, typically discouraged marriage (or even interference) with the local populace.

As already mentioned, Catholic missionaries played a significant role in the process of raising the status of women in the Goan society. Numerous letters and decrees display the concern of church officials towards the plight of women. Through their ability to influence the government substantially, several achievements have to be ascribed to their efforts. Especially when it comes to the ban of polygamy and the encouragement of widow remarriages.

Around the turn towards the 17th century, the church started to set up several homes that served as shelters for women. At around the same time the first nunnery was started in the city of Goa. Colonial government forbade the *satī*. They also passed laws to allow Hindu widows to marry again. They also requested the king to impose strict punishments on those who violated the rules of monogamy.

Goan women in general could (officially) opt out of an unhappy or undesirable marriage from 1910 on [Da Silva Gracias, 1996, p. 144].

"It must be admitted that unlike other religions, Christianity gave their women due respect and position which was an impetus for others to reform their society. The Christians were neither treated as chattels nor were they treated as properties. They were not treated as door-mats but as human beings with rights and privileges. They enjoyed the proprietary rights, they were consulted in all matters of importance, they attended all functions and so on. The position which the Christian women enjoyed was in fact a matter for envy for non-Christian women. Even the Hindu reformists in the later years, became fervent advocates to criticise the disparaged position of the Hindu women. The Portuguese themselves were instrumental to improve the position of non-Christian women through several state laws in the 17th and 18th centuries." [Xavier, 1993]

"Christian missionaries were the first to put women on the agenda of Indian social reform and drew attention to the low social status of women. They felt that education alone would help them to oppose things like sati, female infanticide, child marriage, and enforced widowhood." [Basu, 1993]

"Historically, the Portuguese have displayed a deep concern for women's rights and their egalitarian sense has reflected itself in the people of Goa. One can see this in the equal access to education and the resultant freedom to choose a full time profession, the increase in the age of marriage and the Portuguese Uniform Civil Code, later called the Uniform Civil Code which gives the daughter an equal right to her father's inheritance and property." [D'Costa, 2007]

"The State and the Church played a significant role in upgrading their [the Women's] position. The Portuguese rule seemed to have made a difference to the status of women. As a result the conditions of women in Goa were far better than their counterparts elsewhere in India." [Da Silva Gracias, 1996]

Generally speaking, scholars agree that there are several root conditions that need to be met in order to begin with the empowerment of women in India: the abandonment of polygamy, early childhood marriage, *sati* and the permission for women to possess property and be able to remarry as widows [see e.g. Khanday, Shah, Mir, and Rasool, 2015]

2.5 Goan Catch-up & Development after 1961

Since the Portuguese government was not willing to give up on Goa, the Indian government decided to take it over by force. Operation Vijay can be described as a success in the sense that the number of casualties was very low and the later transition towards "normality" took place comparatively smooth. Especially when one takes into account that the territory was ruled for 450 years by a European power.

Fact is that Goa back then can be described as one of the poorest regions in India: the number of schools was very low and education was tailored towards an elite that was close to the colonial government, only less than 5% of the villages had electricity, and so forth.

Once the Indians took over, transfers in form of infrastructural investments were flowing from the government in Delhi. This was especially true for the construction of primary and secondary schools [Varde, 1977; Malvankar, 2015]. As the later census data suggests, these investments were highly successful and were one of the reasons for Goa's immense catchup. One thing that has to be thought of here is that this is not the usual outcome when we look back at the history of development aid and infrastructural investments in structurally weak areas. The effect of decades of foreign aid in numerous countries across all continents has to be described as mild at best. This holds also true for different parts of India, mostly in its North. So why could Goa be so different?

This study shows that the aggregates in terms of educational improvement (as measured by literacy rates, both for males and females) were in the beginning driven by the *Old Conquests* of Goa, and that the other parts only started to catch-up in the 1980's and 1990's. I try to convince the reader that one of the main reasons for this phenomenon lies in Goa's differential history. Due to the penetration of those four districts that are "Missionary Goa" by monks and priests for centuries, even in remote villages, people became familiar with the concept of structured education and potentially also saw the returns to it, even without being able to participate by themselves. This is what I would describe as a "taste for education" that becomes important once schools become widely available and accessible for children of all backgrounds. Out of a similar reasoning this also differentially contributed to female education. Since the position of females were alleviated by a bundle of "rules" early on (regarding *satī*, polygamy, childhood marriage) and these diffused intergenerationally throughout time, families were much more likely to also send their daughters to schools, once the Indian government made them available.

It should be mentioned here already that the government did not preferentially treat the *Old Conquests*. This is crucial to point out, otherwise one might conclude that the effect that I am describing stems from differential infrastructural investments that eventually made those parts more prosperous. Rather the opposite was true: it was obviously known

that the *New Conquests* did worse on average, especially the parts in the hinterland, thus it was aimed to harmonise the regions and the *New Conquests* received more rather than less investments from the time on when the Maharashtrawadi Gomantak Party, representing lower castes and social classes, came into power in 1962.

Table 1: An overly simplified sketch of the two historically distinguishable parts of Goa.

Historical Narrative - A Quick Overview	
Old Conquests	New Conquests
<ul style="list-style-type: none"> Conquered in 1510 (Tiswadi) & 1543 (Bardez, Salcete/Mormugao) Experienced the heydays of the Portuguese <i>Estado da Índia</i> where the so-called "golden Goa" had supposedly up to 100.000 inhabitants Network of parishes/schools from early days College(s) [printing press] Sati, polygamy, early childhood marriage curbed from early 16th century on Women can inherit and remarry already in the 16th century 	<ul style="list-style-type: none"> Acquired in peculiar ways in different stages around 1780 No "early" economic impetus since the Portuguese thalassocracy was already at the bottom when these parts were acquired Missionaries never enter Structured education arrives late Polygamy and early childhood marriage ubiquitous until the 20th century. Laws improving the position of women being implemented from late 19th century on
<ul style="list-style-type: none"> Uniform civil code of 1871 (still in place makes Goa the only state so far in India which has a uniform civil code, applying to all people across religions, female and male) From 1961: uniform investments from Indian government (schools, electricity,...) 	

3 DATA

The main arguments of the present study are based on 1991 and 2011 Indian census data. The respective Village Census Abstracts contain the number of males/females for each village/town, whether they are literate, and if they participate in the labour force. This allows me also to compute a sex-ratio for each unit of observation, not by age-cohorts though.

From the so called District Census Handbook (DHCb) I obtain village/town-level data that I use as control variables in some specifications (number of doctors and nurses, number of primary schools). My sample then consists of 70 towns and 335 villages in contemporary Goa. In a next step I geolocalise all villages and towns via a tool called [India Place Finder \[Mizushima Laboratory, 2013\]](#)

For robustness checks I employ nightlight data from the DMSP-OLS program which have been shown to correlate highly with regional economic activity [[Croft, 1978](#); [Elvidge, Baugh, Kihn, Kroehl, and Davis, 1997](#); [Chen and Nordhaus, 2010](#); [Henderson, Storeygard, and Weil, 2012](#)]. Geographic information (i.e. the respective shapefiles) on the location of borders and (sub-)districts has been obtained from the [Project \[2016\]](#) which was cross-checked with exactly georeferenced maps and numerous historical sources, all of which are cited throughout the paper. An important note of caution for the implementation of GRDDS in general is, that the widely used data on sub-national units and their border from the [GADM project \[GADM, 2012\]](#) are not precise enough for a full fledged GRD design.

Historical information on the location of churches and parishes in the 18th century (before the expulsion of the missionaries) come partly from [Borges \[1994\]](#) and [Gomes \[2003\]](#). A map of the location of Jesuit "sites" in Salcete and contemporary Mormugao & Tiswadi from [Borges \[1994\]](#).

For descriptive statistics (share of religious groups, etc) I use data from the so called A-Series from the 2011 census. I unfortunately cannot observe the literacy broken down for each religious group for villages, only for towns. The latter information is then used for the non-parametric statistical tests in table 6.

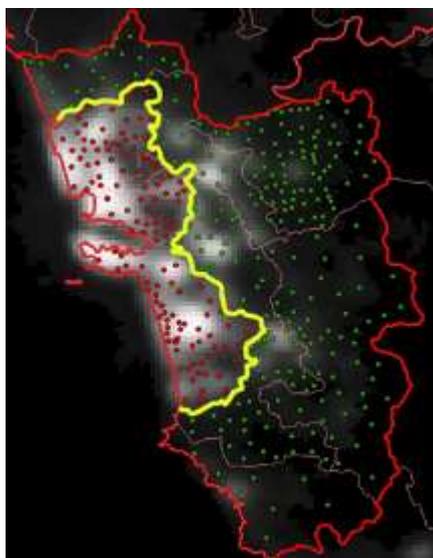


Figure 3: Goa at night in 2013 with all villages and towns; red dots demarcate the ones in the Old Conquests ("Missionary Goa")

4. ECONOMETRIC SPECIFICATIONS

Generally speaking, the living standards in Goa are higher than in its neighbouring states. This average "Goa-effect" is e.g. observable in higher literacy rates for both males and females. Digging a bit deeper into the data, it is also easy to identify average differences between the *Old Conquests* and the *New Conquests*, this suggests that there is also something like a "within-Goa-effect". The historical narrative, which was outlined in detail in [Chapter 2](#) and summarised in [Table 1](#), strongly suggests that these differences are due to the different degrees of Portuguese colonial penetration and missionary influence.

In order to improve upon these plain correlations and to try to potentially isolate causal effects, this set-up, displaying a historical quasi-experiment, lends itself especially well to the use of a specific type of a *Regression Discontinuity Design* (RDD): a spatial- or geographic RDD (GRDD). In general, the "classical" RDD type of research design has tremendously gained popularity throughout the last years [as e.g. summarised by [Lee and Lemieux, 2010](#)]. This is largely due to the potentially high credibility that is attributed to it. One of the strengths of RD designs is, that a known treatment assignment rule exists and is enforced. The GRDD differs from a standard RDD when it comes to the cut-off that splits units into treatment- and control-groups. It is argued that such a geographic cut-off, usually a border of any kind, occurs in an as-if random fashion. GRDD designs, such as the one in the present study, fall short of some of the premises of an ideal RD design. Since I do not have geo-referenced individual data, it is impossible for me to get observations arbitrarily close to the boundary. Thus GRDDs in general rely on "ignorability assumptions" within a certain band around the border. Thus many, if not all, will fall short of the RD ideals that were outlined in the "classical" RD literature. Nevertheless it has been demonstrated that such a set-up can lend itself especially well to provide convincing evidence about causal effects when carried out carefully by the researcher [[Keele and Titiunik, 2015, 2016](#); [Keele, Lorch, Passarella, Small, and Titiunik, 2017](#)].

The reason why in this study an RD is the ideal tool to isolate causal effects is the geographical heterogeneity of Goa in the East-West direction in terms of market access. The villages (and towns) on the coast are on average more prosperous due to tourism (trade), whereas the villages in the hinterland suffer from their remoteness. The villages alongside the abandoned border that I use as my RD identification device on the other hand are highly comparable in fundamentals as the balancing checks in [Table 5](#) show. By just looking at villages very close to each other on either side of this border, jumps in terms of literacy and sex-ratios cannot be explained by observables and thus need further investigation. As was already indicated, I am tracing these discontinuities back to the long-term exposure of differential historical experiences.

In order to point out the differences in the estimated effects but also to depict the evolution of the GRDD literature⁸⁰, being mostly restricted to Political Sciences and Economics, on its path towards more credible empirical analyses of geographically heterogeneous effects, in the present study I am carrying out my empirical analysis in three different ways in order to flesh out potential pitfalls and weaknesses. These are essentially all possible ways that have been applied in the literature so far:

1. A spatial RD in "naive" distances, ideally estimated non-parametrically through a local linear regression, identical to classic RD's (e.g. [[Michalopoulos and Papaioannou, 2014](#); [Eugster, Lalive, Steinhauer, and Zweimu"ller, 2017](#)]).
2. A polynomial-in-longitude/latitude specification including covariates for a certain band around the border (e.g. [Dell \[2010\]](#); [Becker, Boeckh, Hainz, and Woessmann \[2016\]](#); [Oto-Peral'ias and Romero-A'vila \[2017\]](#)).
3. A GRDD (following the nomenclature of [Keele and Titiunik \[2016\]](#)) which resembles a two-dimensional RD that is estimated non-parametrically at every point of the cut-off. For the time being this clearly resembles the "gold-standard" in spatial RD settings (so far only applied by [Keele and Titiunik \[2015, 2016\]](#); [Keele et al. \[2017\]](#)).

In the Economics literature, especially the sub-field that tries to link historical events to contemporary economic outcomes, the second specification in which the outcome variable is regressed on a dummy variable whether the unit was treated or not and a set of control variables (including polynomials in longitude and latitude that control for the position), seems to be the most popular one.

The methodological difficulties that arise in those spatial settings were clarified by [Keele and Titiunik \[2015\]](#). They further show that their ideal GRDD designs lead to identification of local treatment effects at the cut-off under a two-dimensional continuity assumption [thus generalising [Hahn, Todd, and van der Klaauw, 2001](#)]. They also point out the potential problems arising with GRDD designs and other spatial RD set-ups in general. All of them will be discussed and addressed within the present study. An essential difference to "classical" RD's with two forcing variables, individual points at the boundaries of GRDD's have a clear interpretation.

I second their critique and take their approach one step further and propose a way to consistently visualise the heterogeneous treatment effect alongside any RD-border (this is what I call a GRDDseries)⁸¹. Furthermore I argue that all investigated outcome variables should also be visualised by simple spatial interpolation techniques such as Kriging. This will give the reader a feeling of the spatial dimension of the data generating process. The two techniques combined, I

⁸⁰ I restrict all my discussion to the - generally more credible - subset of studies wherein experiments are based on adjacent areas.

⁸¹ I am especially grateful for extensive in-person feedback on this by Roc'io Titiunik herself.

assert, would allow us to identify false positives that any technique that reports one homogenous treatment effect for the full border might deliver.

4.1 Discussion of GRD Identification Issues

One potential problem is that the continuity assumptions needed for identification will hold less often in geographical settings because agents may sort around the boundaries and thus undermine the design's validity.

Another issue could be so called compound treatments. In the context of historical applications, this could be additional events or policies that affected the region that is subject to study in exactly the same geographical dimension.

4.2 Naive Distances

This simpler version of a spatial RD uses the perpendicular distance of each observation to the boundary as its score for the estimation. This geographically "naive" measure of distance ignores how the units are spatially distributed since the shortest distance towards the border does not determine the exact location in the two-dimensional space [ass e.g. pointed out in [Keele and Titiunik, 2015](#), p. 137].

This specification allows to estimate an average effect which will mask considerable heterogeneity along the border. Yet, as I will show, this type of analysis is capable of delivering a quick intuition of what the data can potentially tell. Especially when it comes to the visualisation of this set-up with a "standard" RD-plot.

In this setting units around a narrow band around a border are assumed to be valid counterfactuals. This design may mask underlying heterogeneity and thus may not allow to evaluate the plausibility of the needed identification assumptions. A naive GRD design is still appropriate in some circumstances, e.g. when the boundary of interest is short and defines a homogeneous region. Technically it is only fully valid when treatment effects are constant at all boundary points $b \in \mathcal{B}$.

Ideally such specifications are measured non-parametrically via local linear regressions as is state-of-the art in "classical", ideally with data driven robust confidence intervals as suggested by [Calonico, Cattaneo, and Titiunik \[2014\]](#). As already mentioned before, such estimations are capable of delivering information about an average effect alongside the full cut-off, which can be very misleading about the actual effect that is subject to study as I will demonstrate in [5](#). Yet, as I would argue, such estimations can reveal important information about a certain underlying pattern in the data to the researcher.

4.3 Polynomial Specifications

In some applications where observable characteristics are different on both sides of the cut-off, it might be reasonable to control for those observables in order to still be able to obtain meaningful results. Estimation though has to be carried out by means of a parametric adjustment method or by a matching estimator as e.g. suggested by [Keele, Titiunik, and Zubizarreta \[2015\]](#).

The next specification that I bring to the data uses an RD polynomial that contains geographic information within a standard regression framework as proposed by [Dell \[2010\]](#) and also implemented by [Becker et al. \[2016\]](#) and [Oto-Peralías and Romero-A'vila \[2017\]](#):

$$y_{ib} = \alpha + \gamma \times \text{MissionaryGoa}_i + f(\text{geolocation}_i) + \mathbf{x}'_i \beta + \phi_b + \varepsilon_i, \quad (1)$$

where y_{ib} is the outcome variable of interest for village i on border segment b . MissionaryGoa_i denotes a dummy variable that equals 1 if the village is inside the old, non-existing border and was exposed to early Portuguese colonial rule and missionary influence. $f(\text{geolocation}_i)$ represents the RD polynomial which is supposed to control for smooth functions of geographic location and is going to take on varying forms across different specifications. Finally, vector \mathbf{x}_i contains a set of control variables and ϕ_b represents a set of boundary segment fixed effects. With the latter geographic treatment effect heterogeneity is meant to be captured. This might be desirable in some settings, but the obvious drawback is that this approach masks the heterogeneity that potentially is capable of delivering deeper insights into the problem at hand. A GRD clearly improves upon that by delivering a point estimate at every point of the border, and overcomes the arbitrariness in the choice of the number and location of border segment fixed effects.

Another drawback is that there are no clear formalised suggestions for the bandwidth selection in such an estimation procedure as were put forward for non-parametric methods [[Imbens and Kalyanaraman, 2012](#); [Calonico et al., 2014](#)].

4.4 GRD (two running Variables)

Discuss [Imbens and Zajonc \[2011\]](#) and [Papay, Willett, and Murname \[2011\]](#) basics. These were brought into a geographic context by [Keele and Titiunik \[2015\]](#). Therein they develop in detail their so-called GRD. The difference is, that the comparability of treated and control units need not occur in a certain band around the geographic discontinuity, a border in most of the cases. The effect in this type of setting is measured at *any* point of the border. One of the huge advancements is therefore, that one can obtain heterogeneous treatment effects alongside the border. [Keele and Titiunik \[2015\]](#) suggest to visualise results than with an average treatment effect curve that is measured alongside the whole length of the discontinuity which is subject to study. I further propose a way how to depict those estimates graphically on a map.

All estimated with [Calonico, Cattaneo, and Titiunik \[2015\]](#); [Zubizarreta and Kilcioglu \[2016\]](#)

In order to account for spatial correlation, a non-parametric estimation method, which by now is standard in the "classical" RD setting in any case, is to be preferred.

One drawback when it comes to the data-driven selection procedures that select specific bandwidths for the estimation [Imbens and Kalyanaraman, 2012; Calonico et al., 2014], that they in some cases are not capable of dealing adequately with sparse boundary points where there are no observations close to the border.

To sum up, the effect identified in a GRDD is not a point estimate but a line of treatment effects along the whole cut-off, displaying the magnitude of the heterogeneous effect at each point. As compared to "classical" RD's with two forcing variables, here the heterogeneity has a clear interpretation. In essence this can be highly valuable since geographic patterns in the results would potentially affect the interpretation of the results.

5. SPATIAL REGRESSION DISCONTINUITIES

5.1 Average Effects

Before we move to the spatial RD's, the following tables should give the reader just a coarse feeling of what the data looks like. The units of observations here are already the towns and villages that are then also used for the GRD; 141 of which are in "Missionary Goa" and 246 are located in the *New Conquests*. As described in detail already before, the latter were not exposed to the Christian monks and priests and women were formally made equal to men only with the Portuguese civil code of 1871. Given that Goa up until today is the only state in all of India with such a legal institution that equalises all people, irrespective of gender or religion, the late 19th century could still be described as remarkably early.

Column 1 in Table 2 shows that the villages in the *Old Conquests* have on average a 6 percentage points higher literacy rate in 2011. The intercept reveals that the average outside is around 75%.

Looking at the literacy gap, i.e. the female literacy rate subtracted from the male literacy rate, the observed gender discrepancy is approximately half the size in "Missionary Goa". Those parts of Goa also have on average 54 females per 1000 males more as Table 4 reveals.

Table 3: Average effects (OLS with dummy)

	Dependent variable:			
	Literacy rate 2011			
	(1)	(2)	(3)	(4)
I(Village in Old Goa)	0.062*** (0.006)	0.046*** (0.008)	0.036*** (0.006)	0.022*** (0.007)
Dist. to Coast		-0.001*** (0.0003)		-0.001*** (0.0003)
Dist. to hist. Goa			-0.002*** (0.0002)	-0.002*** (0.0002)
Constant	0.755*** (0.004)	0.776*** (0.008)	0.813*** (0.007)	0.831*** (0.009)
Observations	402	402	402	402
R ²	0.225	0.243	0.365	0.380
Adjusted R ²	0.223	0.239	0.362	0.375
Residual Std. Error	0.056 (df = 400)	0.055 (df = 399)	0.050 (df = 399)	0.050 (df = 398)
F Statistic	116.055*** (df = 1; 400)	64.011*** (df = 2; 399)	114.657*** (df = 2; 399)	81.239*** (df = 3; 398)

Note:

*p<0.1; **p<0.05; ***p<0.01

	Dependent variable:			
	Literacy gap 2011			
	(1)	(2)	(3)	(4)
I(Village in Old Goa)	-0.050*** (0.005)	-0.037*** (0.006)	-0.047*** (0.005)	-0.035*** (0.007)
Dist. to Coast		0.001*** (0.0003)		0.001*** (0.0003)
Dist. to hist. Goa			0.0002 (0.0002)	0.0002 (0.0002)
Constant	0.105*** (0.003)	0.087*** (0.006)	0.098*** (0.006)	0.082*** (0.008)
Observations	402	402	402	402
R ²	0.220	0.238	0.223	0.240
Adjusted R ²	0.218	0.234	0.219	0.234
Residual Std. Error	0.046 (df = 400)	0.045 (df = 399)	0.046 (df = 399)	0.045 (df = 398)
F Statistic	112.803*** (df = 1; 400)	62.234*** (df = 2; 399)	57.100*** (df = 2; 399)	41.871*** (df = 3; 398)

Note: *p<0.1; **p<0.05; ***p<0.01

5.2 Balance Tests and Pre-Treatment

One important condition that needs to be satisfied when it comes to RD estimation in general is that before the "treatment" there was no effect observable across the considered response variables. In my setting this turns out to be literally impossible since during the 15th century no data was recorded and detailed quantitative historical records in general are non-existent. I thus have to rely on historical narratives. The point is best made by simply presenting a quote from a Goan history book:

Table 4: Average effects (OLS with dummy)

	Dependent variable:			
	Sex Ratio 2011			
	(1)	(2)	(3)	(4)
I(Village in Old Goa)	0.054*** (0.012)	0.067*** (0.016)	0.076*** (0.013)	0.088*** (0.017)
Dist. to Coast		0.001 (0.001)		0.001 (0.001)
Dist. to hist. Goa			0.002*** (0.0005)	0.002*** (0.0005)
Constant	0.974*** (0.007)	0.956*** (0.017)	0.924*** (0.016)	0.908*** (0.021)
Observations	402	402	402	402
R ²	0.047	0.050	0.077	0.080
Adjusted R ²	0.044	0.046	0.072	0.073
Residual Std. Error	0.117 (df = 400)	0.117 (df = 399)	0.116 (df = 399)	0.116 (df = 398)
F Statistic	19.667*** (df = 1; 400)	10.589*** (df = 2; 399)	16.557*** (df = 2; 399)	11.460*** (df = 3; 398)

Note: *p<0.1; **p<0.05; ***p<0.01

"Their country had never enjoyed the same unity that it has had since the Portuguese conquest in 1510. Before that date, the different districts belonged to different kings and different kingdoms, so that Goa, as we know it now, was never one country. Its various parts have been welded into one whole, [...]" [?]

Due to the constant conflicts between the Hindu Vijanaghara empire and the Muslim Bahmani sultanate, the border changed several times in non-systematic ways within the territory of present day Goa. It is thus outruled that anything of significance happened right across or alongside the abandoned border that I consider for my GRDD design.

Table 5 shows that the villages I am comparing on both sides of the border are highly comparable in size, population, and the number of households. It is thus outruled that any observed effects are spuriously driven by comparing big with small or urban with rural villages. From the comparable household size it can also be inferred that the observations are approximately comparable when it comes to socio economic factors.

What is more, so-called features of first nature geography such as climate, rainfall or the quality of soil are equally comparable. A quantitative analysis is not reported due to the fact that there is no variation within the data. The border

only stretches only around 40 km north-south, and those values are typically reported on gridded datasets with a larger scale.

Table 5: Balancing Checks

	<i>Dependent variable:</i>		
	Area (1)	Village Population (2)	Households (3)
Village in Old Goa	-128.319 (131.624)	-96.405 (728.531)	22.835 (171.350)
Constant	671.759*** (89.337)	3,559.673*** (491.721)	817.053*** (115.653)
Observations	89	90	90
R ²	0.011	0.0002	0.0002

Note: *p<0.1; **p<0.05; ***p<0.01
These results are based on a 3km bandwidth.

5.3 RD Estimates

5.3.1 Naive Distances

	Left	Right
Number of Obs	141	246
Eff. Number of Obs	55	52
Order Loc Poly (p)	1	1
Order Bias (q)	2	2
BW Loc Poly (h)	3827.8325	3827.8325
BW Bias (b)	6672.3411	6672.3411
rho (h/b)	0.5737	0.5737

	Coeff	Std. Err.	P>|z|	CI Lower	CI Upper
Conventional	0.0405	0.0143	0.0045	0.0126	0.0685
Bias-Corrected	0.0442	0.0143	0.0019	0.0163	0.0722
Robust	0.0442	0.0168	0.0085	0.0113	0.0772

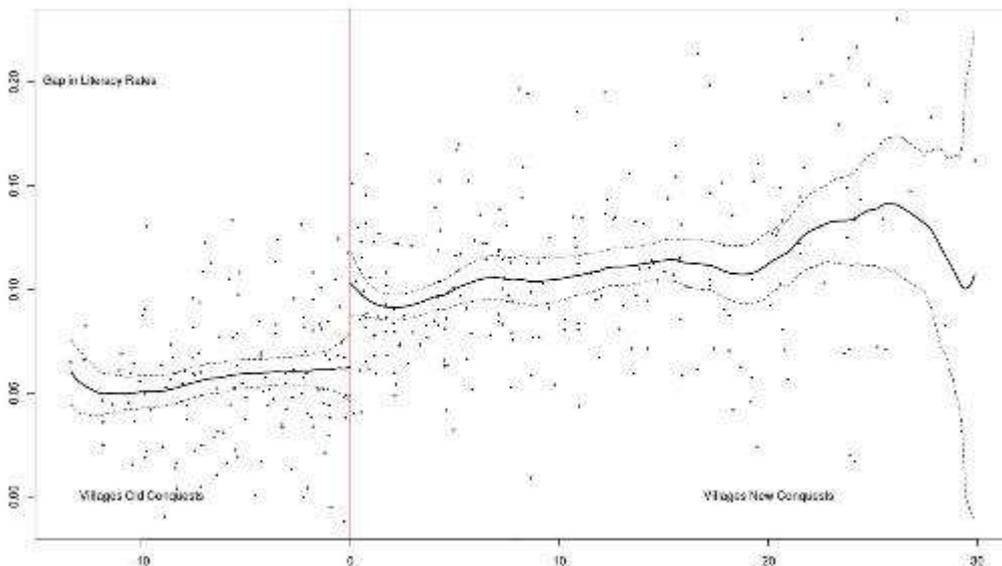


Figure 4: The gender gap in literacy rates visualised: all villages in "naive" distances to the cut-off (local linear regression, 95% CIs)

5.3.2 Polynomials in Longitude/Latitude

This specification, put forward by [Dell \[2010\]](#), is usually preferred within the Economics literature. It is well suited to report an average treatment effect alongside a given border. But as we will see later with e.g. the female labour force participation, it could be misleading in some circumstances and produce false positives. As the more detailed visualisation in form of the GRDDseries shows, this is due to strong effects that occur locally and drive the average effect. The spatial interpolation exercises then visually confirm that there seems to be in fact no "action" in terms of this variable at the RD border.

Table 6 shows the average treatment effects for all considered outcome variables. The estimations are robust towards all potential bandwidths.

Table 6: Polynomial specifications with controls & border segment FEs

	Dependent variable:					
	lit_gap (1)	lit_rate (2)	male_lit_ra (3)	fem_lit_ra (4)	fem_lab_pa (5)	sex_ratio (6)
Village in Old Goa	-0.029*** (0.010)	0.032** (0.012)	0.019* (0.011)	0.048*** (0.015)	-0.061*** (0.018)	0.082*** (0.025)
Segment FE	YES	YES	YES	YES	YES	YES
Poly. lat/long	YES	YES	YES	YES	YES	YES
Controls (Edu,Medi)	YES	YES	YES	YES	YES	YES
Observations	77	77	77	77	77	77
R ²	0.569	0.470	0.433	0.518	0.367	0.463
Adjusted R ²	0.435	0.306	0.258	0.368	0.170	0.297
Residual Std. Error (df = 58)	0.030	0.038	0.034	0.045	0.057	0.077
F Statistic (df = 18; 58)	4.256***	2.858***	2.466***	3.457***	1.866**	2.782***

Note: *p<0.1; **p<0.05; ***p<0.01
These results are based on a 3km bandwidth.

5.3.3 GRDD (2011)

In this section I employ the technique proposed by [Keele and Titiunik \[2015\]](#) which measures the RD in space by considering a two-dimensional score as running variable and push it one step further by carrying out this estimation for each point of the border. The figures should be read as follows: the plotted lines represent each point on the discretised RD border (500m distances inbetween) and its point estimate including a 90% confidence interval. The color indicates whether the estimate is significant at the 10% level or not. The version of the GRDDseries below displays the estimation of the identical specification, only with a forced selection radius of approximately 20km. This is just to increase the precision of the point estimates by forcing more observations into the estimation. Since a triangular kernel which weighs each observation in the regression by its distance to the respective boundarypoint is used, this should not be much of a concern. Since the bandwidth selection of the CTT algorithm is not very meaningful in some cases when one has to deal with sparse observations, I decide to drop each estimation where less than 10 observations were chosen on each side of the border. This is arbitrary, but estimations with 20+ observations arguable make more sense than ones with five or ten.

These resulting GRDDseries provide the reader with a transparent visualisation of the heterogeneous treatment effect across the whole border.

Figure 5.3.3 shows the main specification under scrutiny. The signs of the point estimates essentially never change their sign. Due to the small sample size the confidence intervals do overlap with zero quite often, but the majority of the point estimates at least gets significant once the algorithm is forced to select more observations.

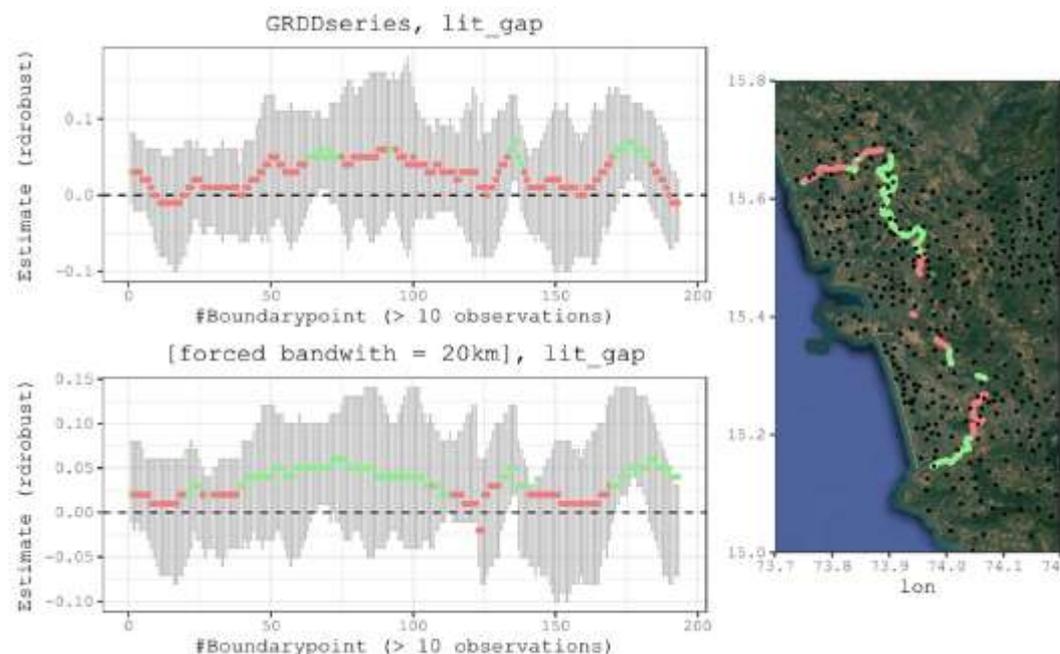
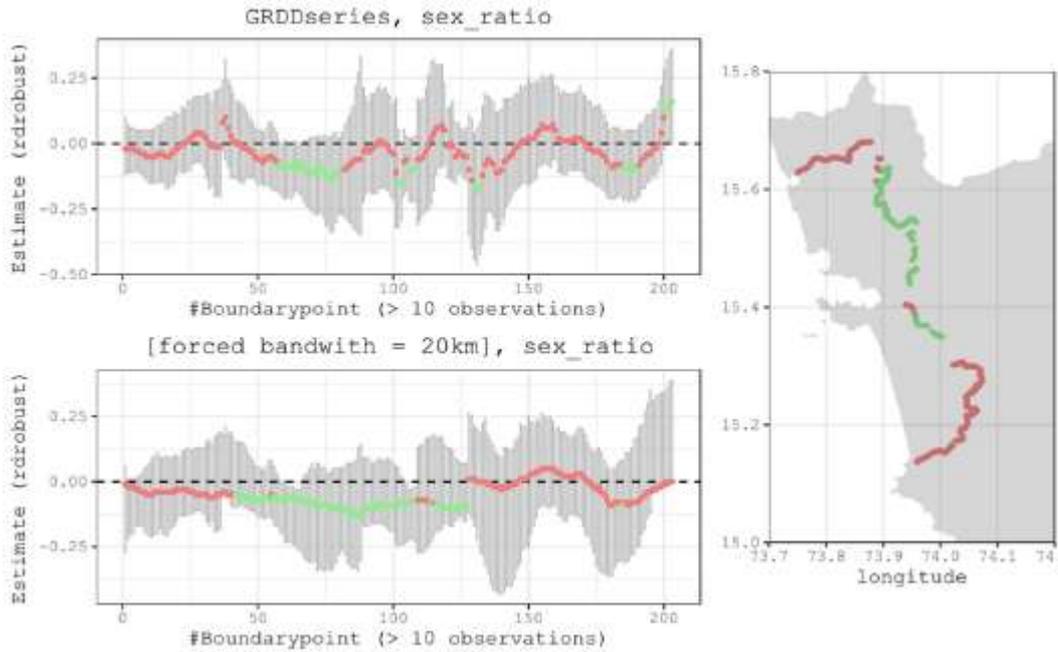
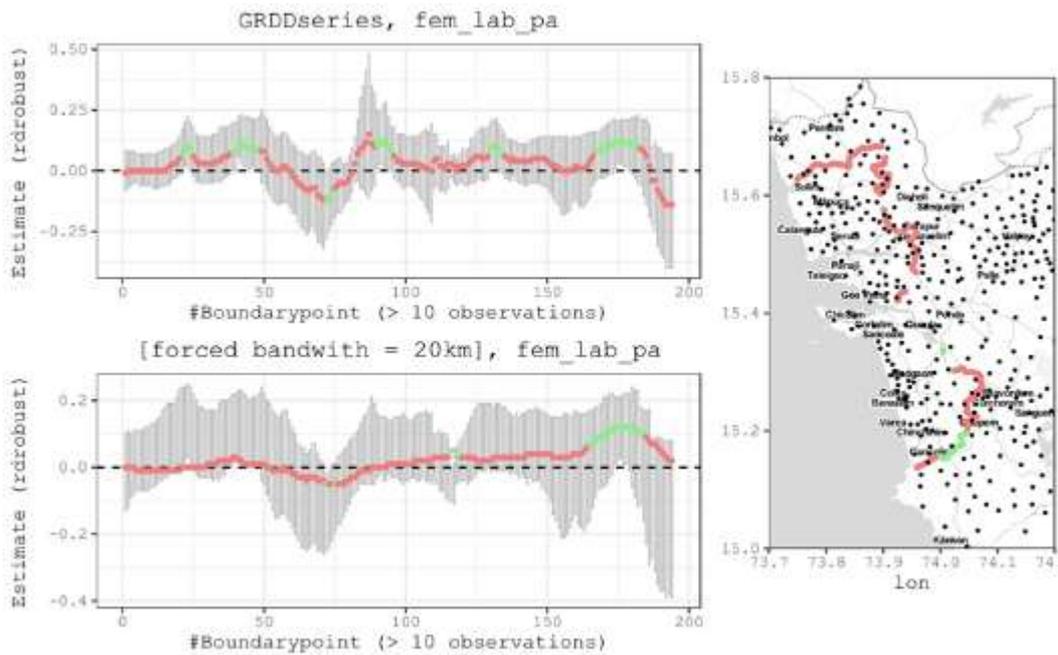


Figure 5: GRDDseries and spatial visualisation of the literacy gap in 2011



5.3.4 GRDD (1991)

The exercise describe above is repeated in the same manner on the census from 1991, which is the first one after Goa became a full state of India. Before it was organised as a so-called Union Territory together with the other former Portuguese colonies Daman & Diu and the censuses were reported differently. Only from 1991 the reporting was carried out on the village level that I need for my RD estimations.



The estimations reveal that the observed jumps were around two times the size in 1991 as compared to 2011, which indicates that there was a convergence process taking place that seemingly harmonised the regions within Goa.

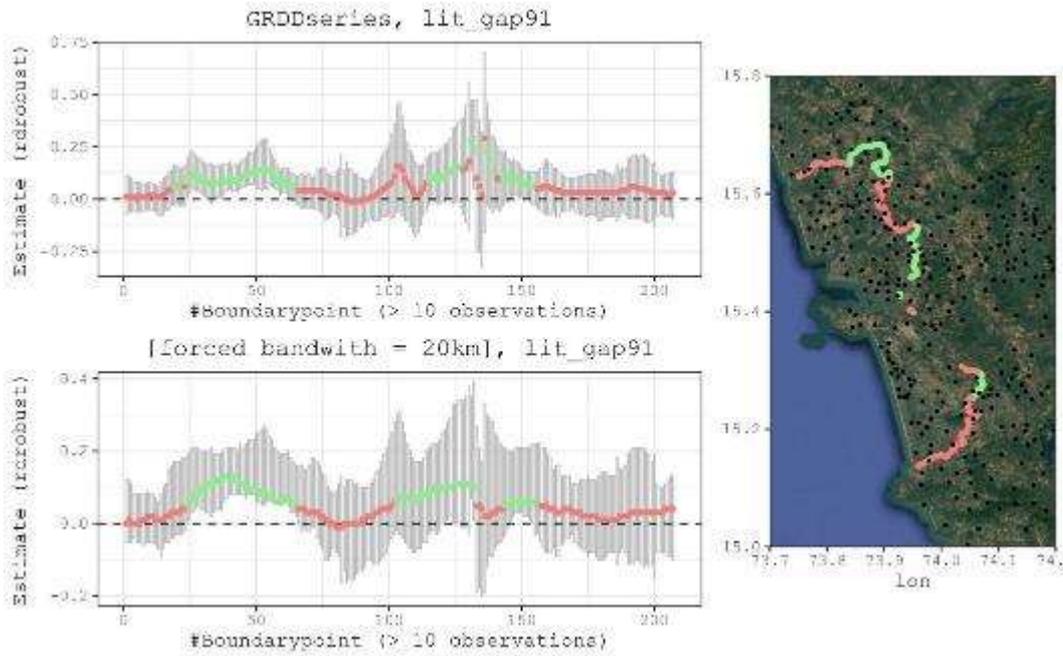
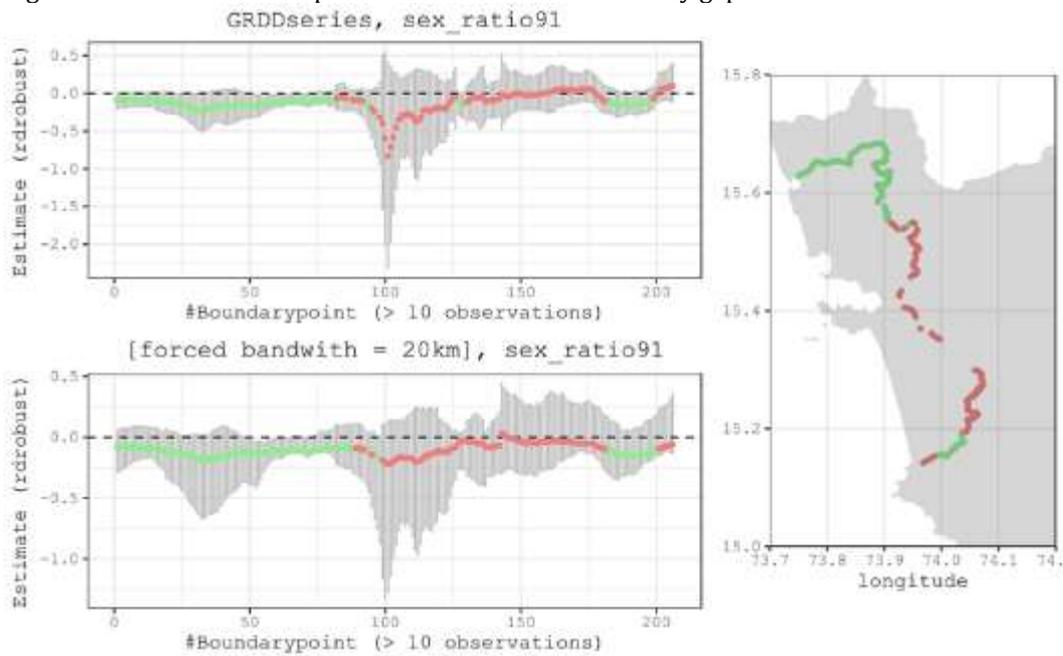


Figure 6: GRDDseries and spatial visualisation of the literacy gap in 1991



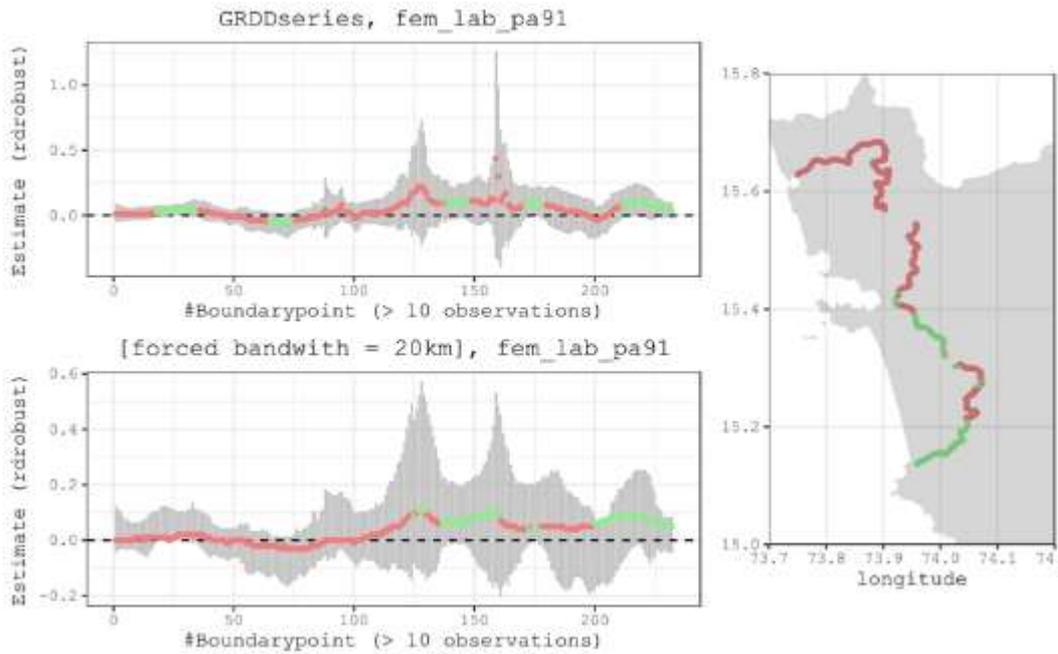


Table 7: Polynomial specifications with controls & border segment FEs (ATE in 1991)

	<i>Dependent variable:</i>				
	lit_gap91	lit_rate91	fem_lit_ra91	fem_lab_pa91	sex_ratio91
	(1)	(2)	(3)	(4)	(5)
Village in Old Goa	-0.079*** (0.021)	0.073*** (0.026)	0.116*** (0.032)	-0.046** (0.019)	0.079** (0.034)
Segment FE	YES	YES	YES	YES	YES
Poly. lat/long	YES	YES	YES	YES	YES
Controls (Edu,Medi)	YES	YES	YES	YES	YES
Observations	70	70	70	70	70
R ²	0.391	0.576	0.537	0.347	0.275
Adjusted R ²	0.176	0.427	0.374	0.117	0.019
Residual Std. Error (df = 51)	0.062	0.077	0.096	0.056	0.102
F Statistic (df = 18; 51)	1.818**	3.851***	3.290***	1.506	1.075

Note:

*p<0.1; **p<0.05; ***p<0.01

These results are based on a 3km bandwidth.

5.3.4 Spatial Interpolation - Kriging

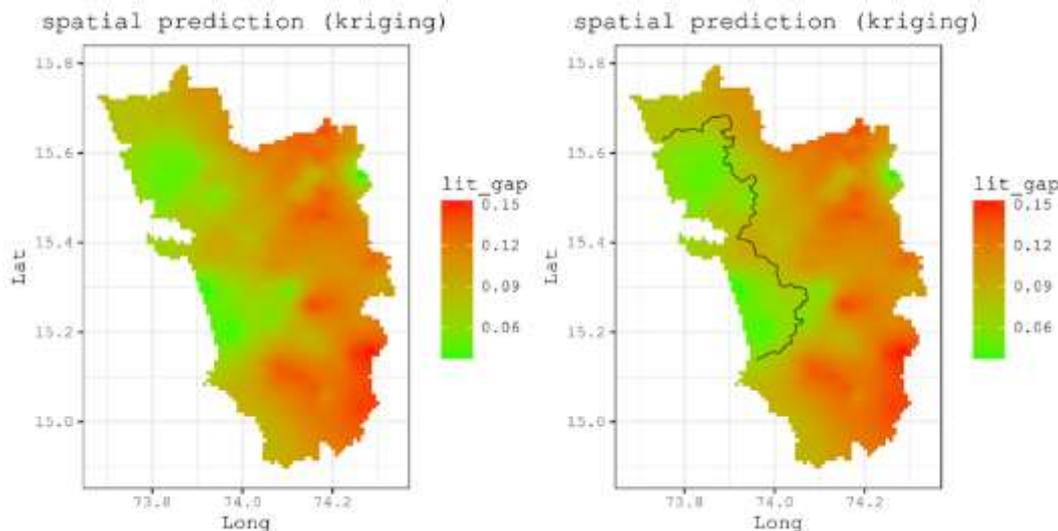
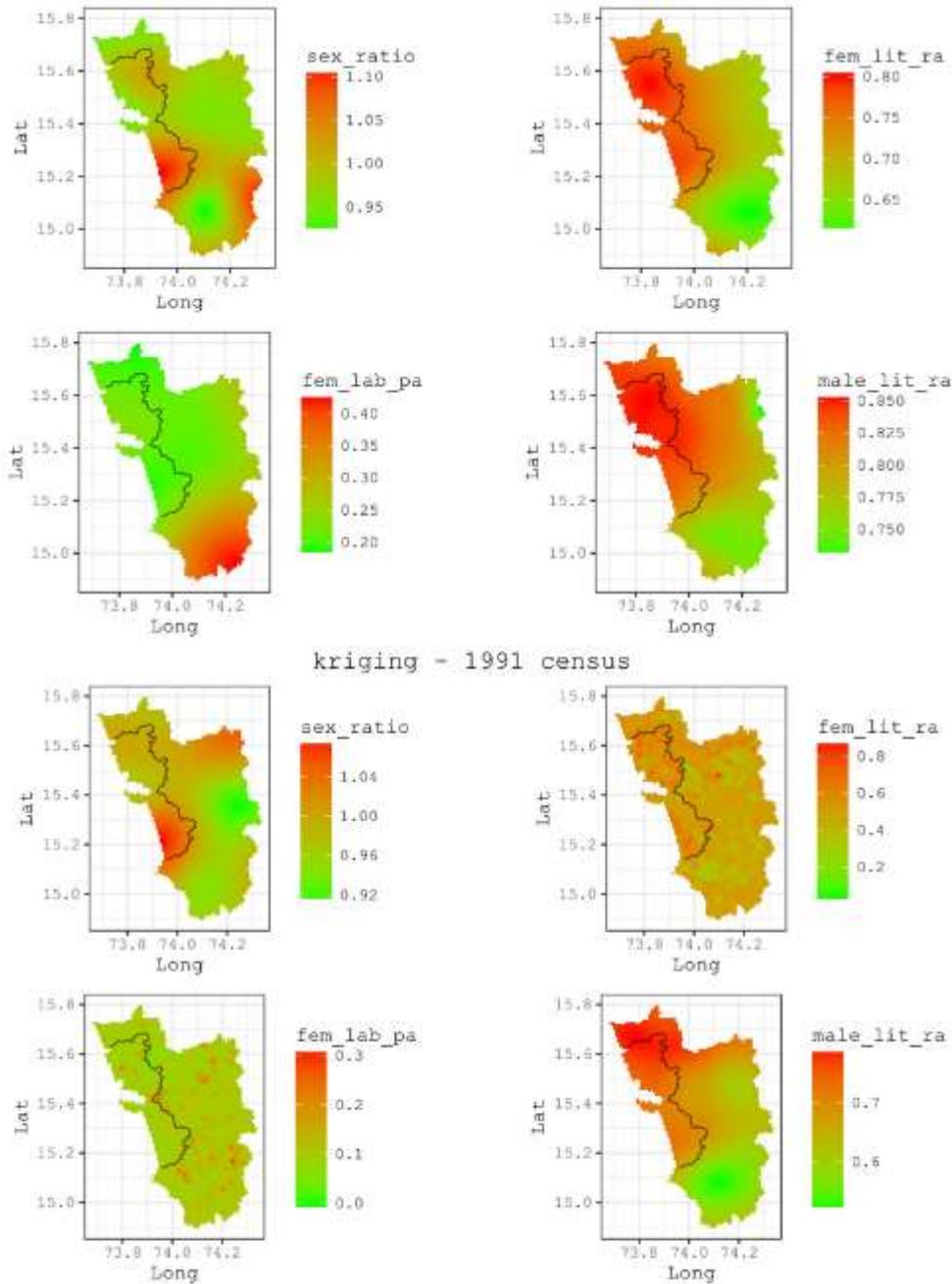


Figure 7: Spatial interpolation, village level 2011



5.4 Falsification Tests

In this subsection I try to convince the reader of the robustness of my results and provide deeper analyses of whether the results so far can be interpreted as a genuine effect of the historical Portuguese presence on (female) education and sex-ratios in Goa. They aim to rule out that the identified effect reflects other things such as selective expansion, in which case the results may reflect pre-existing differences.

5.4.1 Different Bandwidths

All "classic" GRD specifications are robust towards different bandwidths ranging from 1 to 10km. This can also be visually inferred from the pictures of the spatial interpolation exercises. For the GRDDseries specifications this is not relevant in any case, since the algorithm by [Calonico et al. \[2014\]](#) does data-driven bandwidth selection by itself.

5.4.2 Pseudo Borders

When the border is moved in both directions and the estimation carried out on those fictional lines, all of the relevant specifications lose significance. This can also be inferred visually from the spatially interpolated pictures.

5.4.3 Intermediate Step: Colonial Census of 1851

One might argue that the observed effects are an artefact of something that happened after the Portuguese had left, or was due to something that was not caused by their presence. I thus analyse the recently digitised Portuguese colonial censuses starting from 1776 which were recently digitised by a group of economic historians [[de Matos, 2013, 2016](#)]. The first one which is reported on a village level and is thus compatible with how I carry out the analysis is from 1851. For all of those data-points I know in which district they are, and thus whether they are within the *Old-* or *New Conquests*.

The exact location of the villages is almost impossible to obtain since the names changed multiple times over the years and some villages were merged with each other. An RDD on this dataset is thus not feasible. But as figure 8 demonstrates, in order to make the point it suffices to report a simple descriptive statistic. It plots the histogram of the sex-ratio for each village and demonstrates firmly that the one's in the "treated" districts are far off from the ratios in the other villages. It is thus safe to argue that the effect I was talking about was already in place before the Indian government took over and even before Portugal moved away from being a monarchy.

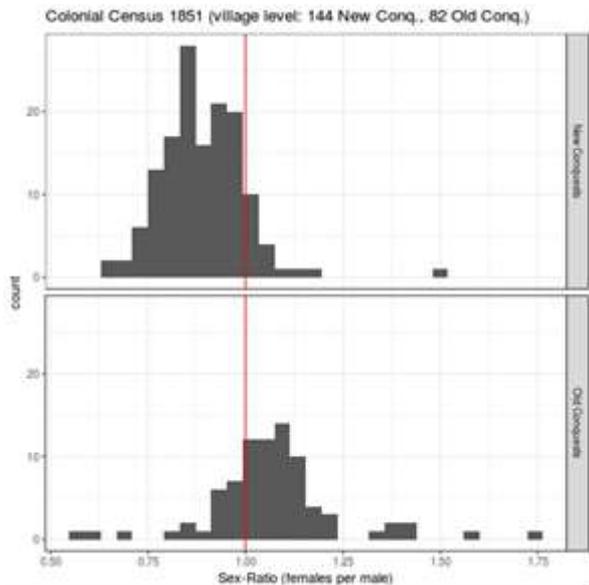


Figure 8: Sex-ratios at the village level in 1851.

5.5 Placebo Outcomes

Table 8: Placebo outcomes with the polynomial in longitude/latitude specification

	<i>Dependent variable:</i>		
	PrimSchools	nonGovmedicoverage	medicoverage
	(1)	(2)	(3)
Village in Old Goa	-0.179 (0.273)	-0.744 (0.862)	-0.107 (0.503)
Segment FE	YES	YES	YES
Poly. lat/long	YES	YES	YES
Observations	77	77	77
R ²	0.114	0.122	0.071
Adjusted R ²	-0.021	-0.010	-0.070
Residual Std. Error (df = 66)	0.990	3.123	1.823
F Statistic (df = 10; 66)	0.845	0.921	0.506

Note: *p<0.1; **p<0.05; ***p<0.01
These results are based on a 3km bandwidth.

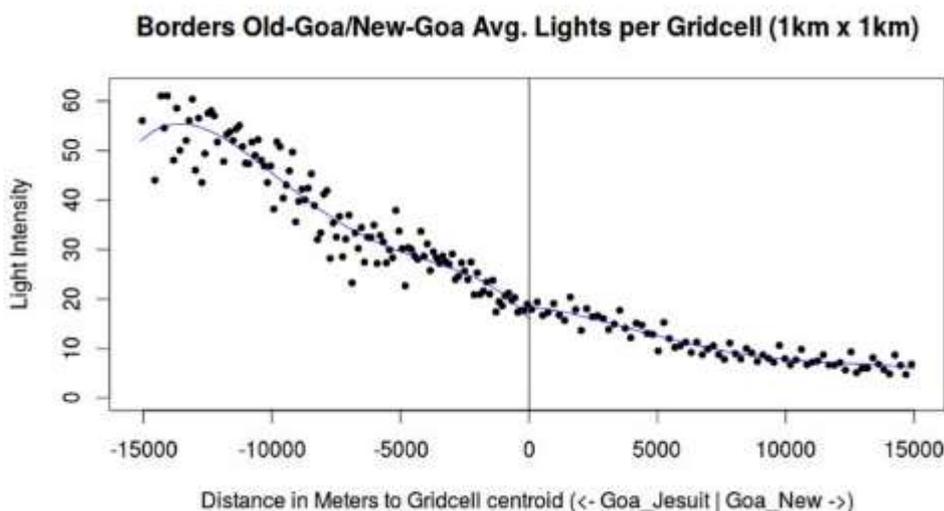


Figure 9: The effects do not seem to be driven by economic activity

6. THE PERSISTENT EFFECTS: MECHANISMS

Table 9: The dependent variables broken down by religion (for the 44/26 statutory towns)

Var	Group	mean(Old)	mean(New)	t-test	Wilcox rank-sum	Kruskal-Wallis
lit_gap	Muslim	0.0890	0.0494	0.1026	0.1911	0.1891
	Hindu	0.0775	0.0646	0.0501	0.0296	0.0292
	Christ	0.0444	0.0378	0.5477	0.2075	0.2054
fem_lit	Muslim	0.6778	0.6814	0.8415	0.7964	0.7919
	Hindu	0.7701	0.7758	0.4645	0.2579	0.2554
	Christ	0.8072	0.8243	0.3016	0.4253	0.4219
sex_ratio	Muslim	0.8825	0.8776	0.9111	0.5696	0.5656
	Hindu	0.9445	0.8870	0.0113	0.0150	0.0147
	Christ	1.0290	1.1318	0.0001	0.0000	0.0000

7 CONCLUSION

This paper has put forward a deep rooted explanation for the emergence of gender roles by examining the effects of the long-term presence of Portuguese colonisers in the Indian state of Goa. They, inter alia, significantly altered the position of women in society at a very early stage in history. In addition they interfered culturally by introducing what I call a "taste for education": their accompanying missionaries set up a network of churches, parishes with schools and even set up a college and brought the printing press. After the sharp downturn of the Portuguese thalassocracy in the 17th century, also the Goan economy was in a continual decline up until its liberation. Interventions by the late Salazar dictatorship to boost economic growth only masked deep structural problems and appeased the urban upper classes. When the Indian government took over in 1961, only a few villages had electricity and the number of schools was low. Once schools and a broader infrastructure became widely available throughout all of Goa, the catchup process, initially driven by iron-ore mining in remote areas and the port in Mormugao, began.

A more disaggregate analysis reveals that this process was experienced differently by parts of Goa that are referred to as the *Old Conquests*. These territories were colonised in a different period and experienced an entirely different colonial reign: Catholic missionaries spread the word of Christ, built schools within their network of parishes even in the most remote places, and thus induced something that I would describe as a "taste for education". A further cultural intervention in the 16th century regarded the position of women in society: sati, polygamy, and early childhood marriage were forbidden. Additionally females received property rights upon conversion to Christianity (in the 19th century women of all religions formally received property rights due to the Portuguese civil code which was based on the Code Napoleon).

The heavy aggregate increase in male and female literacy rates from 1961 was driven by the four districts of the *Old Conquests*. Once education became available, boys and girls were sent almost equally to schools. In the *New Conquests* female literacy rates began to increase significantly only during the last two or three decades. This mechanism also manifests itself in the sex-ratios, which were historically always heavily male biased in the *New Conquests* (which is e.g. shown by the colonial census of 1851 in figure 8). In the *Old Conquests* they were always significantly above 1 and only began to fall slowly from 1961 onwards, mostly probably driven by migration⁸².

In order to isolate causal effects and to show that the observed patterns were actually driven by the early Portuguese "interventions", I make use of the spatial interpretation of a technique from causal inference called Regression Discontinuity Design (RDD). This allows me to compare villages and towns on either side of this border which has no meaning any more since 250 years in a close-to-random manner: as the balancing checks showed, they are highly similar in size, population, household composition, and features of first nature geography such as rainfall, soil quality and the like. Also anything that regards the infrastructural treatment by the Indian government from 1961 on was shown to be comparable when it came to the placebo checks (number of schools, doctors/nurses, medical coverage).

The last concern could be that those outcomes are driven by economic activity or the prosperity of villages in general. The only way to verify this at the disaggregate level is to look at light emissions measured from outer space by satellites which has been shown to proxy very well with local GDP [Henderson et al., 2012]. These light data exhibit no jump alongside my RD-border. What is more there is also no observable difference in the slope of the respective fitted lines, thus also a kink RD design does not exhibit significant coefficients⁸³.

Having applied the method of elimination on all thinkable observables, I am thus confident to conclude that the observed differences were driven by the only thing in which the villages and towns differ(ed): their differential "cultural" experiences in the distant past which were induced by the Portuguese presence.

The alleviation of the position of women in society and especially within the households throughout the 16th century led to a cultural shift and to the emergence of a different set of gender norms on a sub-continent which historically was always plagued by discrimination towards females. Albeit the jump in the observed gaps in education (as measured by the male & female literacy rate differences) between the two territories shrank from around eight percentage points in 1991 down to 4 percentage points in 2011, they are still observable today. The sex ratios on the other hand do not exhibit

⁸² See e.g. the Goa Development Report 2011 by the Planing Commission of India

⁸³ The latter might be more appropriate in general since light does not exhibit jumps by nature but fades out continually. If there was something systematically different on both sides of the border, we should observe different first derivatives, i.e. slopes, on either side of the border.

such a convergence pattern. The villages just inside the old border that I use as my identification device have around 80 women more for each 1000 men.

That I am not describing something that is driven by the distance of the villages to the coastline can also be visually inferred from the spatial prediction techniques (kriging) that I used in chapter 4.4: the literacy gap is four to five percentage points almost uniformly across the *Old Conquests* without any observable gradient.

Aside from the spatial RD estimations I find evidence that there was diffusion of attitudes towards women within communities (as summarised in table 6): Hindus in the towns of the *Old Conquests* - on aggregate - exhibit systematically different sex-ratios and educational gaps than their counterparts in the *New Conquests*. The effect that I am describing throughout this paper thus does not seem to be entirely driven by "being Christian".

All in all, the results lead me to tentatively conclude that the early colonial experience in the form of a cultural treatment seemed to be more important than the uniform institutional and legal treatment that all Goans - independent of gender and religion - experienced from the 1871 civil code on. Compatible with this would be the interpretation that the infrastructural investment, pretty much uniformly received from the Indian government, was just more effective in the *Old Conquests* in the long-run. In order to semantically frame it in terms of the current frontier of the long-run development literature: it thus could be the case that what matters most is the interaction of "culture" with institutions and infrastructure, and that none of them alone are sufficient conditions for economic prosperity [Alesina and Giuliano, 2015].

From a methodological point of view I showed that the geographic RD representation by Dell [2010] might lead us to spurious conclusions under certain circumstances. In order to alleviate this problem, I argue that we just have to stop to discard a clearly identified and visualisable feature within our data: space. Just by making use of simple spatial interpolation techniques such as kriging we could present the analysed data in a way that puts the reader immediately in a position to infer whether there is an actual jump alongside some specified border or not. I then put forward a simple way in which one could visualise the methodology proposed by Keele and Titiunik [2015]. The two-dimensional RD estimations for every point alongside the discretised border can be both plotted in form of a "GRDDseries" and at their respective position in space at a map; visualised next to each other. In case the RD estimates change signs multiple times and the coefficients are insignificant most of the time, the researcher then probably has to conclude that the response variable under inspection does not exhibit a jump at the cut-off. Of course these procedures demand a lot from the data, but if we want to meet the high standards of the so-called "credibility revolution in applied Economics" also for spatial RD estimations, we should start to implement them.

REFERENCES

- Acemoglu, D., S. Johnson, and J. A. Robinson (2002): "Reversal of Fortune: Geography and Institutions in the Making of the Modern World Income Distribution," *Quarterly Journal of Economics*, 117, 1231–1294.
- Alesina, A. and P. Giuliano (2015): "Culture and Institutions," *Journal of Economic Literature*, 53, 898–944.
- Banerjee, A. and L. Iyer (2005): "History, Institutions, and Economic Performance: The Legacy of Colonial Land Tenure Systems in India," *American Economic Review*, 95, 1190–1213.
- Basu, A. (1993): *Women and Missions: Past and Present*, Berg Publishers, chap. Mary Ann Cooke to Mother Teresa: Christian Missionary Women and the Indian Response, 187–208.
- Becker, S. O., K. Boeckh, C. Hainz, and L. Woessmann (2016): "The Empire Is Dead, Long Live the Empire! Long-Run Persistence of Trust and Corruption in the Bureaucracy," *The Economic Journal*, 126, 40–74.
- Borges, C. J. (1994): *The Economics of the Goa Jesuits, 1542-1759: An Explanation of Their Rise and Fall*, Concept Publishing Company, New Delhi.
- Boxer, C. R. (1961): *Four centuries of Portuguese expansion, 1415-1825: a succinct survey*, Witwaterstrand University Press, Johannesburg.
- (1969): *The Portuguese Seaborne Empire, 1415-1825*, The History of Human Society, Hutchinson, London.
- Bruhn, M. and F. A. Gallego (2012): "Good, Bad, and Ugly Colonial Activities: Do they Matter for Economic Development?" *Review of Economics and Statistics*, 94, 433–461.
- Cagé, J. and V. Rueda (2016): "The Long-Term Effects of the Printing Press in SubSaharan Africa," *American Economic Journal: Applied Economics*, 8, 69–99.
- Calonico, S., M. D. Cattaneo, and R. Titiunik (2014): "Robust Nonparametric Confidence Intervals for Regression-Discontinuity Designs," *Econometrica*, 82, 2295–2326.
- (2015): "rdrrobust: An R package for Robust Nonparametric Inference in Regression-Discontinuity Designs," *R Journal*, 7, 38–51.
- Chaudhary, L. and M. Garg (2015): "Does history matter? Colonial education investments in India," *The Economic History Review*, 68, 937–961.
- Chen, X. and W. Nordhaus (2010): "The Value of Luminosity Data as a Proxy for Economic Statistics," NBER Working Papers 16317, National Bureau of Economic Research, Inc.
- Croft, T. A. (1978): "Nighttime images of the earth from space," *Scientific American*, 239, 86–98.
- Da Silva Gracias, F. (1994): *Health and Hygiene in Colonial Goa, 1510-1961*, Concept Publishing Company, New Delhi.
- (1996): *Kaleidoscope of Women in Goa 1510-1961*, Concept Publishing Company, New Delhi.
- D'Costa, L. (2007): "Women in post-1961 Goa: Problems and Challenges," *Campus Social - Revista Lusófona de Ciências Sociais*, 249–255.
- de Matos, P. T. (2013): "Population Censuses in the Portuguese Empire, 1750- 1800. Research notes." *Romanian Journal of Population Studies*, 7, 5–25.
- (2016): "Counting Portuguese colonial populations 1776 - 1875: a research note," *The History of the Family*, 21, 267–280.
- de Souza, T. R. (1990): *Goa through the Ages - Volume II: An Economic History*, Concept Publishing Company, New Delhi, chap. Rural Economy and Life, 78–116, no. 6 in Goa University Publications Series.

- Dell, M. (2010): "The Persistent Effects of Peru's Mining Mita," *Econometrica*, 78, 1863–1903.
- Doepke, M., M. Tertilt, and A. Voena (2012): "The Economics and Politics of Women's Rights," *Annual Review of Economics*, 4, 339–372.
- Duflo, E. (2012): "Women Empowerment and Economic Development," *Journal of Economic Literature*, 50, 1051–1079.
- Elvidge, C. D., K. E. Baugh, E. A. Kihn, H. W. Kroehl, and E. R. Davis (1997): "Mapping city lights with nighttime data from the DMSP Operational Linescan System," *Photogrammetric Engineering and Remote Sensing*, 63, 727–734.
- Emma Maria, S. A. (2002): *Women in Portuguese Goa, 1510-1835*, IRISH, Tellicherry.
- Eugster, B., R. Lalive, A. Steinhauer, and J. Zweimueller (2017): "Culture, Work Attitudes and Job Search: Evidence from the Swiss Language Border," *Journal of the European Economic Association*, forthcoming.
- Ferreira, R. (2016): "Taking Stock: Portuguese Imperial Historiography Twelve Years after the e-JPH Debate," *e-journal of Portuguese History*, 14, 54–70.
- GADM (2012): "GADM database of Global Administrative Areas, version 2.0," Tech. rep., <http://gadm.org/>.
- Gaikwad, N. (2015): "East India Companies and Long-Term Economic Change in India," *mimeo*, Yale.
- Gelman, A. and E. Loken (2013): "The Garden of Forking Paths: Why Multiple Comparisons Can Be a Problem, Even When There Is No 'Fishing Expedition' or 'p-Hacking' and the Research Hypothesis Was Posited Ahead of Time," *mimeo*, Columbia.
- (2014): "The Statistical Crisis in Science," *American Scientist*, 102, 460.
- Gomes, O. J. (2003): *The Religious Orders in Goa (16th - 17th Centuries)*, Konkani Sorospot Prakashan.
- Hahn, J., P. Todd, and W. van der Klaauw (2001): "Identification and Estimation of Treatment Effects with a Regression-Discontinuity Design," *Econometrica*, 69, 201–209.
- Henderson, J. V., A. Storeygard, and D. Weil (2012): "Measuring Economic Growth from Outer Space," *American Economic Review*, 102, 994–1028.
- Henn, A. (2014): *Hindu Catholic Encounters in Goa: Religion, Colonialism, and Modernity*, Indiana University Press.
- Hickman, L. A. (2007): "Exploring the Impact of the Media on the Arranged Marriage and Dowry System in Goa, India," Ph.D. thesis, Wilfrid Laurier University.
- Ifeka, C. (1989): "Hierarchical Woman: The 'Dowry' System and its Implications among Christians in Goa, India," *Contributions to Indian Sociology*, 23, 261–284.
- Imbens, G. W. and K. Kalyanaraman (2012): "Optimal Bandwidth Choice for the Regression Discontinuity Estimator," *Review of Economic Studies*, 79, 127–155.
- Imbens, G. W. and T. Lemieux (2008): "Regression discontinuity designs: A guide to practice," *Journal of Econometrics*, 142, 615–635.
- Imbens, G. W. and T. Zajonc (2011): "Regression Discontinuity Design with Multiple Forcing Variables," *mimeo*.
- Iyer, L. (2010): "Direct versus indirect colonial rule in India: Long-term consequences," *The Review of Economics and Statistics*, 92, 693–713.
- Kamat, P. (1999): *Farar Far: Local Resistance to Colonial Hegemony in Goa, 1510-1912*, Institute Menezes Braganza.
- (2000): *Goa and Portugal, History and Development*, Concept Publishing Company, New Delhi, chap. Peasantry and the colonial state in Goa (1946-1961), 133–158, no. 10 in XCHR Studies Series.
- Keele, L. J., S. Lorch, M. Passarella, D. Small, and R. Titiunik (2017): "An Overview of Geographically Discontinuous Treatment Assignments With an Application to Children's Health Insurance," in *Advances in Econometrics*, ed. by M. D. Cattaneo and J. C. Escanciano, Emerald Group Publishing, vol. 38.
- Keele, L. J. and R. Titiunik (2015): "Geographic Boundaries as Regression Discontinuities," *Political Analysis*, 23, 127–155.
- (2016): "Natural Experiment Based on Geography," *Political Science Research and Methods*, 4, 65–95.
- Keele, L. J., R. Titiunik, and J. R. Zubizarreta (2015): "Enhancing a Geographic Regression Discontinuity Design Through Matching to Estimate the Effect of Ballot Initiatives," *Journal of the Royal Statistical Society: Series A*, 178, 223–239.
- Khanday, M. I., B. A. Shah, P. A. Mir, and P. Rasool (2015): "Empowerment of Women in India - Historical Perspective," *European Academic Research*, 2, 14494–14505.
- Kumar, A. V., B. Kiran, and J. T. Gone (2013): "The Impact of the Dowry System In Christian Communities," Tech.rep., Dharmaram Vidya Kshetram, <http://www.catholicethics.com/forum-submissions/the-impact-of-the-dowry-system-in-christian-communities>.
- Lee, D. S. and T. Lemieux (2010): "Regression Discontinuity Designs in Economics," *Journal of Economic Literature*, 48, 281–355.
- Malvankar, A. (2015): "Education and society in Goa under Portuguese rule," *Journal of Social and Economic Development*, 17, 298–311.
- Mantovanelli, F. G. (2013): "The Protestant Legacy: Missions and Literacy in India," *Job Market Paper*, Boston College.
- Marcocci, G. (2012): *A Consciência de um Império: Portugal e seu Mundo (s'ecs. XV-XVII)*, Imprensa da Universidade de Coimbra, Coimbra.
- Michalopoulos, S. and E. Papaioannou (2014): "National Institutions and Subnational Development in Africa," *Quarterly Journal of Economics* (2014), 151-213.
- Michalopoulos, S. and E. Papaioannou, eds. (2017): *The Long Economic and Political Shadow of History, Volume I. A Global View*, CEPR Press.
- Mizushima Laboratory (2013): "India Place Finder," Tech. rep., Department of Oriental History, Graduate School of Humanities and Sociology, The University of Tokyo, <http://india.csis.u-tokyo.ac.jp/>.
- Neill, S. (1985): *A History of Christianity in India 1701-1858*, vol. 2, Cambridge University Press.
- Newitt, M. D. D. (2005): *A History of Portuguese Overseas Expansion: 1400 - 1668*, Routledge.
- Nunn, N. (2009): "The Importance of History for Economic Development," *Annual Review of Economics*, 1, 65–92.
- (2014a): "Gender and missionary influence in colonial Africa." in *Africa's Development in Historical Perspective*, ed. by E. Akyeampong, R. Bates, N. Nunn, and J. A. Robinson, Cambridge University Press, 489–512.
- (2014b): "Historical Development," in *Handbook of Economic Growth*, ed. By P. Aghion and S. Durlauf, North-Holland, vol. 2, 347–402.
- Oto-Peralías, D. and D. Romero-Avila (2017): "Historical Frontiers and the Rise of Inequality. The Case of the Frontier of Granada," *Journal of the European Economic Association*, forthcoming.
- Papay, J. P., J. B. Willett, and R. J. Murnane (2011): "Extending the Regression-Discontinuity Approach to Multiple Assignment Variables," *Journal of Econometrics*, 161, 203–207.
- Pearson, M. N. (1988): *The Portuguese in India*, vol. 1 of *The New Cambridge History of India*, Cambridge University Press.
- Project, I. V. B. (2016): "Indian Village Boundaries Project," Tech. rep., Data{Meet}, <http://projects.datameet.org/indian-village-boundaries/>.
- Srivastava, H. C. (1990): *Goa through the Ages - Volume II: An Economic History*, Concept Publishing Company, New Delhi, chap.

Demographic History and Human Resources, 55-77, no. 6 in Goa University Publications Series.

Valencia Caicedo, F. (2014): "The Mission: Human Capital Transmission, Persistence and Culture in South America," *Job Market Paper, UPF*.

Varde, P. (1977): *History of Education in Goa: From 1510 to the Present Day*, Panaji: Goa Vidya Pratishthan.

Velinkar, J. (1984): "Jesuit Educational Style in Sixteenth Century Goa," *Indica*, 21, 17-27.

Waldinger, M. (2017): "The Long-Run Effects of Missionary Orders in Mexico," *Journal of Development Economics*, forthcoming.

Woodberry, R. D. (2004): "The Shadow of the Empire: Christian Missions, Colonial Policy, and Democracy in PostColoPost Societies," Ph.D. thesis, University of North Carolina at Chapel Hill.

——— (2012): "The Missionary Roots of Liberal Democracy," *American Political Science Review*.

Xavier, P. D. (1993): *Goa: A Social History*, Rajhauns Vitaran.

Zubizarreta, J. R. and C. Kilcioglu (2016): "designmatch: Construction of Optimally Matched Samples for Randomized Experiments and Observational Studies that are Balanced by Design," .

7 APPENDIX

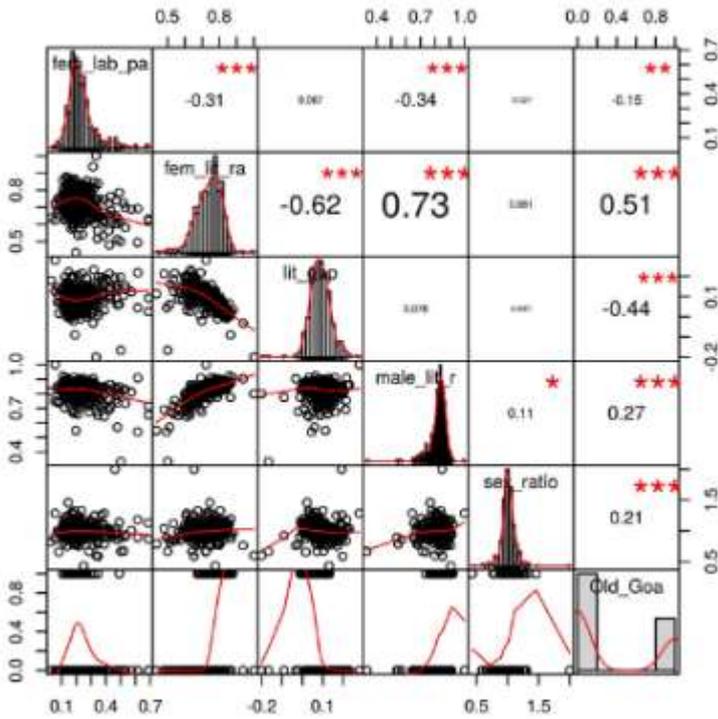


Figure 10: Correlation matrix of all considered outcome variables at the village level (2011 census)

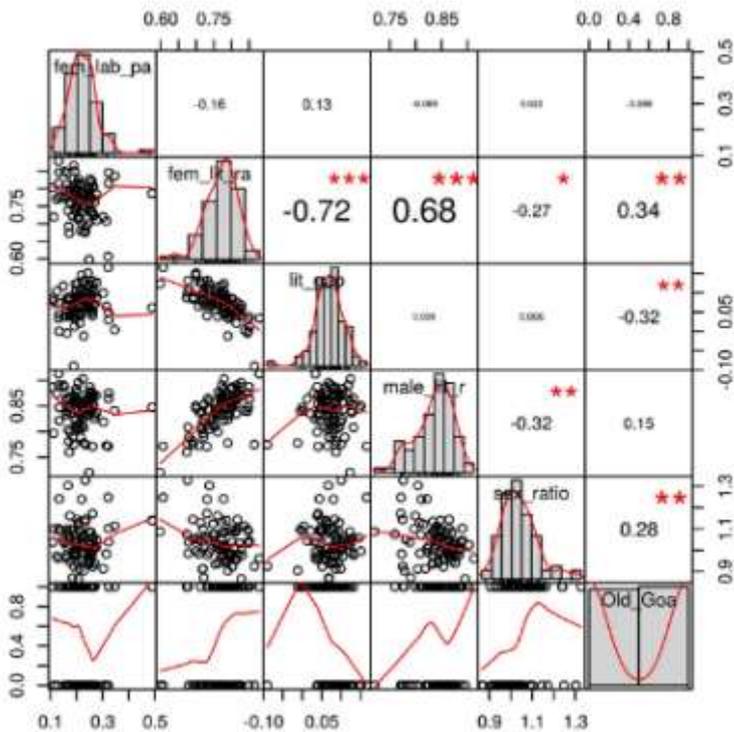


Figure 11: Correlation matrix of all considered outcome variables at the village level, within a 5km bandwidth of the RD border (2011 census)

Table 10: Shares only for Christians

	Name	lit	m_lit	f_lit	lit_gap
1	Pernem	0.797	0.838	0.755	0.083
2	Bardez	0.869	0.884	0.856	0.028
3	Tiswadi	0.856	0.871	0.842	0.029
4	Bicholim	0.864	0.889	0.838	0.051
5	Satari	0.848	0.873	0.823	0.049
6	Ponda	0.825	0.855	0.797	0.058
7	Mormugao	0.817	0.85	0.785	0.065
8	Salcete	0.807	0.834	0.785	0.049
9	Quepem	0.73	0.77	0.694	0.076
10	Sanguem	0.763	0.804	0.726	0.078
11	Canacona	0.815	0.84	0.794	0.046

Table 11: Shares only for Muslims

	Name	lit	m_lit	f_lit	lit_gap
1	Pernem	0.707	0.732	0.678	0.054
2	Bardez	0.714	0.744	0.678	0.066
3	Tiswadi	0.704	0.724	0.683	0.041
4	Bicholim	0.758	0.781	0.732	0.05
5	Satari	0.825	0.843	0.807	0.035
6	Ponda	0.721	0.755	0.682	0.073
7	Mormugao	0.749	0.784	0.712	0.072
8	Salcete	0.728	0.752	0.702	0.05
9	Quepem	0.708	0.739	0.676	0.063
10	Sanguem	0.714	0.756	0.669	0.087
11	Canacona	0.726	0.765	0.681	0.084

Table 12: Shares only for Hindus

	Name	lit	m_lit	f_lit	lit_gap
1	Pernem	0.802	0.844	0.758	0.086
2	Bardez	0.821	0.849	0.791	0.058
3	Tiswadi	0.819	0.853	0.781	0.071
4	Bicholim	0.805	0.846	0.762	0.084
5	Satari	0.761	0.819	0.699	0.12
6	Ponda	0.813	0.855	0.769	0.086
7	Mormugao	0.799	0.837	0.754	0.083
8	Salcete	0.817	0.844	0.787	0.057
9	Quepem	0.753	0.793	0.711	0.082
10	Sanguem	0.744	0.802	0.685	0.117
11	Canacona	0.748	0.799	0.696	0.103

PY.3. RSAI Young Researchers Prize

1153 COMPARISON OF THE PERFORMANCE OF SPECIAL ECONOMIC ZONES (SEZS) IN THE PHILIPPINES**Arianne Dumayas**

Faculty of Economics, Chuo University

ABSTRACT

Economic zones have been a top development strategy for many developing countries. Most countries have started implementing economic zone strategy as an effort to liberalize the economy, capture foreign investments, and increase exports. As the economies march towards liberalization, the underlying goals of these economic zones have consequently transformed from mainly export-oriented to technology and innovation-oriented zones. Furthermore, the management of zones have changed from government-initiated or government-operated to public-private partnership or purely private. Like other countries, the earliest form of economic zones in the Philippines are free trade zones and export processing zones. Special economic zones in the Philippines also started as solely government-led and managed zones but eventually, the participation of private sector was allowed in 1995. As of 2016, the number of economic zones stood at 348 zones and majority of these zones are developed and managed by the private sector. While the number of economic zones has continuously increased, the performance of these economic zones, particularly at the disaggregated level, has been rarely examined. This study aims to contribute to a better understanding of the performance of selected economic zones in the Philippines. This study seeks to identify which zones performed better than others. This study also aims to examine whether development of more private economic zones and IT Parks and Centers have any impact on the performance of existing public economic zones. To compare the performance of selected economic zones, this paper devises a performance index calculated based on three commonly identified static measure of outcome: investment, exports, and employment. The dynamics of the performance is analyzed based on three trends: long-term trend (base period of 1995-2000 or 2001-2005 vs. latest period 2011-2015), latest trend (2006-2010 vs. 2011-2015), and comparison of long-term and recent performance. The long-term trend shows that public economic zones have declined, while IT Parks and Centers have expanded significantly. The recent trend indicates resurgence of all public economic zones and continuous growth of most IT Parks and Centers. The comparison between long-term and latest performance reveals two categories of zones: zones which performed consistently well and zones which have deteriorated steadily. The zones with consistent better performance are mostly private manufacturing economic zones and IT Parks and Centers. On the other the hand, the zones with decaying performance are mostly manufacturing economic zones located in areas with huge number of established economic zones.

1. INTRODUCTION

Economic zones are often instituted to attain various development goals such as industrial development, regional development, infrastructure development, knowledge-transfer and spillovers. Economic zones also come in different names and forms such as industrial agglomeration, industrial parks, technology parks, and export processing zones. Many countries have started implementing economic zone strategy as an effort to liberalize the economy, capture foreign investments, and increase exports. As the economies continue forward into liberalization, the underlying goals of these economic zones have consequently evolved from mainly export-oriented to high technology and innovation-oriented zones. Furthermore, the management of zones have changed from government-initiated or government-operated to public-private partnership or purely private.

Like other countries, the earliest form of economic zones in the Philippines are free trade zones and export processing zones. As early as 1923, there were already proposals to convert existing ports to free trade zones, but this did not push through until the late 1960s (Castro, 1982). The Philippines would later embark on three main stages of economic zones development: government-led EPZ from 1970-1994; private sector-driven special economic zone (SEZ) from 1995-1999; and Information Technology(IT) industry-centered SEZ from 2000-present. The first export processing zone is established in Mariveles, Bataan in 1972. Additional public economic zones were established in the following years: Baguio City Export Processing Zone(BCEPZ) in 1980 and Mactan Export Processing Zone(MEPZ) in 1979, and Cavite Export Processing Zone(CEPZ) in 1986.

For more than two decades, the development and operation of economic zones lies solely on the government, however significant policy shift has occurred with enactment of Special Economic Zone Act of 1995. This act allowed the participation of the private sector in the development and management of economic zones. The act also modified the prevailing export orientation of the first-generation economic zone as it allowed firms to engage in non-export activities. Furthermore, in addition to traditional manufacturing activities, incentives were expanded to other activities such commercial/trade services, utilities and facilities, and real estates. In 2000, amendments were made to Special Economic Zones act to encourage and support the investments in information technology(IT) through the establishment of IT Parks/Buildings and offering incentives to IT enterprises. During this time, the IT and business processes outsourcing(IT-BPO) have just started to gain traction and government have started to take notice of its potential so appropriate incentives and support were extended to this industry. Subsequent board resolutions were approved to establish additional types of economic zones and activities: Medical Tourism Park/Center (2006), Retirement Ecozone Park/Center (2006), Tourism Economic Zones (2012), and Agro-Industrial Economic Zone.

As of 2016, there are 348 economic zones that are actively operating in the Philippines. A huge majority of these are private economic zones and IT Parks and Centers. The current Duterte administration is actively pursuing the plan to

establish special economic zones in every province and city and region nationwide (Mercurio,2017). The Philippines Economic Zone Authority have recently approved the establishment of five special economic zones in Tawi-Tawi, the southernmost island in Mindanao (Campos, 2017).

While there seems to be unwavering enthusiasm towards the development of additional special economic zones in the Philippines, the performance of these economic zones, particularly at the disaggregated level, has been rarely discussed. Manasan (2013) reviewed the performance of export processing zones and special economic zones and pointed out both positive and negative experiences. The establishment of Philippines Economic Zone Authority (PEZA) has been lauded to be successful not only in increasing investments, exports, and employment but also in creating in good investment climate through its one-stop-shop model. On the other hand, special economic zones are found to have weak backward linkages and huge number of firms are involved in low-technology and low-value added activities.

This study aims to contribute to a better understanding of the performance of selected economic zones in the Philippines. This study seeks to identify which zones performed better than others. This study also aims to examine whether encouraging more private economic zones and IT Parks and Centers have any impact on the performance of existing economic zones. This paper aims to provide answers to the following questions: How do selected economic zones perform in terms of investment, exports, and employment from 1995-2015? Are there any variations in performance across economic zones? Which zones are performing better? What is the impact of promotion of private economic zones and inclusion of IT Parks and Centers on the performance of public economic zone?

To analyze the performance of selected economic zones, this paper devised a performance index calculated based the three commonly identified static measure of outcome: investment, exports, and employment. The study computes indices for four periods (1995-2000, 2001-2005, 2006-2010,2011-2015). The paper analyzes the dynamics of the performance based on three trends: long-term trend (base period of 1995-2000 or 2001-2005 vs. latest period 2011-2015), latest trend (2006-2010 vs. 2011-2015), and comparison of long-term and recent performance. Moreover, this study also ranks the performance of zones during the four periods.

This paper is organized as follows: Section 2 provides a review of related literature; Section 3 presents the methodology; Section 4 discusses results of the research; Section 5 summarizes and concludes the paper.

2. REVIEW OF RELATED LITERATURE

Special Economic zones are commonly defined geographic area with differentiated rules and regulations from the national territory which are commonly instituted to attract investments, promote exports, and generate employment (Carter and Harding, 2011; Baissac, 2011). Special economic zones come in various forms which includes export processing zones free zones, free ports, foreign trade zones, export processing zones, trade and cooperation zones, and economic technological development zones (Baissac,2011).

Over the past years, special economic zones have evolved, specifically, in terms of zone objective, incentives, structure, location, and ownership (Aggarwal,2010). In terms of objective, establishment of SEZ have developed from facilitating trade and generating employment to fostering high-skilled and high-technological activities, stimulating economic activity, and diversifying export composition. The incentives within SEZs have also evolved from traditional tax-related incentives to various incentives such as infrastructure, services, industrial policies, labor policies, and corporate taxation. The structure of SEZs have also advanced from stand-alone industrial estates to integrated industrial townships. The economic activity within SEZ have also evolved from trade-oriented and labor-intensive to capital intensive to high-technology intensive SEZ. The location pattern of SEZs also changed from areas that are located near the port areas to various parts of the country with the aim of integration with host economies. The ownership and management of SEZ started as government-created and management but starting from 1980s, privately-developed and managed zones have emerged.

The inclusion of private sector in the development of management of economic zones can be attributed to both push and pull factors (Farole,2011). The push factors include difficulty for many countries to cover the associated costs of economic zones and need to revitalize failing economic zones programs. The pull factor involves the opportunity to profit for the private companies from real estate ventures and services to the firms. The first private economic zone is established in Dominican Republic in 1969 and this model was followed by other Latin American countries such as Costa Rica, El Salvador, Honduras, Nicaragua, Guatemala, and Colombia (Farole, 2011). Asian countries like Thailand, Philippines, and Vietnam have initiated private economic zones from 1990s. The number of private zones in developing and transitioning economies have increased from 25 % of zones in 1980s to 62 % in 2007 (FIAS, 2008).

The comparison of efficacy of public economic zones over private economic zones or vice-versa is a highly debated topic, although anecdotal evidence shows that private SEZs are likely to be more effective (Baissac, 2011; FIAS, 2008). However, no comprehensive empirical analysis has been conducted to address this question. Private economic zones might have successful business operation but offer limited or negative economic contribution. On the other hand, public economic zones may fail to deliver profit but provide socio-economic impact.

Assessing the performance of economic zones is often difficult and context-specific. To evaluate the success of economic zones, a framework based on the outcomes of the objectives can be outlined(Farole,2011). The framework identifies two types of outcomes: static and dynamic. Static economic benefits are relatively short term and pertains to outcomes when economic zones are used as instruments of trade and investment policy. The static economic benefits are often measured through the following indicators: employment, foreign-direct investments, foreign exchange through exports, and value-

added. Meanwhile, dynamic economic benefits include non-traditional economic activities, hard and soft technology transfer, the encouragement of domestic entrepreneurship, and the promotion of economic openness.

3. DATA AND METHODOLOGY

This study adopts a methodology similar to Tantri (2011) in evaluating the performance of seven economic zones in India. Tantri (2011) constructed two different types of indices: general profile index and trade performance index. The general profile index included indicators such as geographical area, total exporting units, concentration of units, employment, and investment. The trade performance index is calculated based on total exports, total imports, net foreign exchange earnings, value addition of SEZ, per capita exports, share in total exports and import of SEZs, sectoral concentration index, geographical concentration index, import intensity of exports, compound annual growth rate of exports and imports, and growth rate of exporting units. Both indices were computed for five different time periods from 1986-2008. The changes in performance of zones over the past years are evaluated in two ways: first, comparing the ranking of each zone for the latest available year over the rankings of zones in base year; and second, ranking of each zone for the latest available year.

Due to limited data availability, this paper only constructs performance index and not general profile index. This paper devises a basic performance index based on three static measure of outcome: investments, exports, and employment. The study computes indices for four periods (1995-2000, 2001-2005, 2006-2010, 2011-2015). In contrast to Tantri (2011), this study covers 35 zones which are already operating between 1995-2005. These zones are divided into three groups: 1st group or public zones which are in operation before 1995; 2nd group or economic zones which started functioning in 1995-2000; and 3rd group or economic zones which began operation from 2001-2005. This study chooses to expand the number of zones to help identify the impact of policy changes, particularly, with the expansion of private economic zones and inclusion of IT Parks and Centers. The paper analyzes the dynamics of the performance based on three trends: long-term trend (base period of 1995-2000 or 2001-2005 vs. latest period 2011-2015), latest trend (2006-2010 vs. 2011-2015), and comparison of long-term and recent performance. In addition to this, this paper analyzes performance of zones based on their ranking in the four periods. The evaluation of performance of zones over the past years in based on absolute value of index and ranking. This paper uses indicators sourced directly from PEZA.

Indicators were transformed into index using the min-max formula below:

$$Y_t = \frac{(X - X_{min})}{(X_{max} - X_{min})}$$

Where X is the actual value of the indicator, Xmin is the minimum value in the series, and Xmax is the maximum value in the series.

The indicators were given equal weights in computing the performance index using the formula below:

$$PI = \left(\frac{1}{3}\right) \sum_{t=a}^e Y_t$$

The composite index value for each zone ranges from zero to one. The closer the index value to 1 signifies good performance. This paper also identifies the statistical significance of the variations in performance of zones using one-way analysis of variance (ANOVA). ANOVA is commonly used to established whether there are any statistically significant differences among the means of independent groups.

4. RESULTS AND DISCUSSION

4.1 SEZ in the Philippines

In the Philippines, Special Economic Zones or ecozones are defined as selected with highly developed or have the potential to be developed into agro-industrial, industrial tourist/recreation, commercial, banking, investment, and financial centers (PEZA, 1995). There are 5 types of special economic zones: industrial estates or manufacturing SEZ, export processing zones (EPZ), free trade zones, tourism ecozones, and IT Parks/Buildings. The development of these economic zones aims to generate exports, create employment, and encourage investments, particularly foreign investments. Moreover, the establishment of special economic zones in suitable and strategic locations aims to drive a sound and balanced industrial, economic and social development of the country (PEZA, 1995).

The economic zone development strategy in the Philippines have undergone three main transition: government-led EPZ (1970-1994); private sector-driven SEZ (1995-1999); and Information Technology (IT) industry-centered SEZ (2000-present). The first phase of economic zone development (1970-1994) began in late 1960s. RA 5490 or Export Processing Act in 1969 legislated the creation of the Mariveles, Bataan as the first free port zone. Three more public EPZ were inaugurated in the following years: Baguio City Export Processing Zone (BCEPZ) and Cavite Export Processing Zone (CEPZ) in 1980, and Mactan Export Processing Zone (MEPZ) in 1986. The second phase (1995-1999) of economic zone development started with the enactment of RA 7916 or the Special Economic Zone Act of 1995. The act enabled the private sector to participate in the development and management of economic zones. The act also expanded incentives to firms who firms engaging in non-export activities such as commercial/trade services, utilities and facilities, and real estates. The third phase (2000-present) of economic zone development commenced in 2000 when amendments were made to Special Economic Zones act to encourage and support the investments in IT industry through the establishment of IT Parks/Buildings and provision of incentives to IT enterprises.

The number of economic zones has increased from 2 in 1970s to 348 in 2016 (Figure 5). There is a remarkable increase in number of economic zones from 1996 after private-sector was allowed and incentives were given to IT industry. Majority of the established economic zones from 2000s-present are IT Parks/Buildings.

Figure 1. Cumulative Number of Economic Zones



Source: author’s construction based on Philippines Economic Zones Authority (PEZA) statistics

As of July 2016, there are 348 special economic zones that are operating in the Philippines and additional 145 zones are being developed (Table 1). Almost 70% of active economic zones are IT Parks/Centers and around 20 % are manufacturing SEZs. IT Parks/Centers also constitute the largest number of planned economic zones.

Table 1. Active and Planned Economic Zones

Types of Economic Zones	Active	Planned
IT Parks/Centers	234	104
Manufacturing Economic Zone	72	29
Agro-industrial Economic Zone	21	6
Tourism Economic Zones	19	6
Medical Tourism Parks/Center	2	
Total	348	145

Source: author’s construction based on Philippines Economic Zones Authority (PEZA) statistics

There is a massive number of private economic zones in the Philippines (Table 2). Except for economic zones that are managed by PEZA or by local government, almost all economic zones in the Philippines are developed and managed by private sector. PEZA currently manages four manufacturing economic zones: Baguio City Economic Zone, Cavite Economic Zone, Mactan Economic Zone, and Pampanga Economic Zone. Bataan Economic Zone is formerly under PEZA but was converted into Freeport Area of Bataan (FAB) in 2009 through Republic Act 9728 (AFAB, 2009). FAB is managed by the Authority of Freeport Area of Bataan (AFAB), a government-owned and controlled corporation.

Table 2. Type of SEZ Management

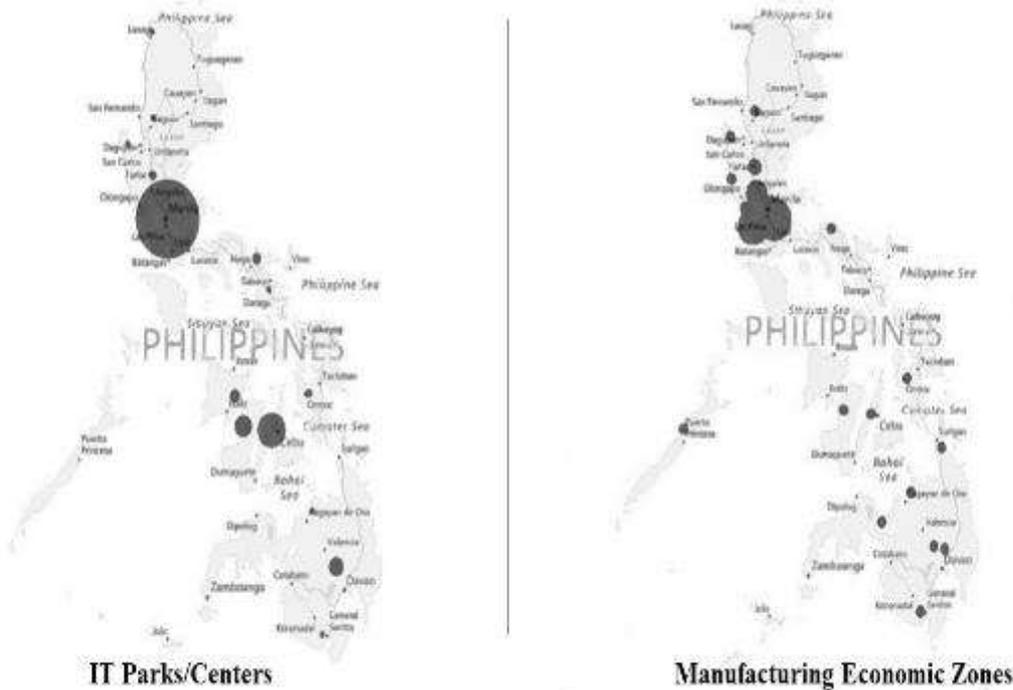
Type of SEZ	Public	Private
IT Parks/Centers	6	228
Manufacturing Economic Zone	9	63
Agro-industrial Economic Zone	1	20
Tourism Economic Zone	0	19

Source: author’s construction based on Philippines Economic Zones Authority (PEZA) statistics

Meanwhile, the ownership or management structure within private SEZ varies. The developers of IT Parks/Centers are involved in the management of multiple number of IT Parks/Centers. The developers of IT Parks/Centers also happen to be the top real estate companies in the Philippines such as Robinsons Land Corporation, SM Prime Holdings, Ayala Land Inc., and Megaworld Corporation. On the other hand, developers or operators of manufacturing SEZ typically operate single zone, except for Carmelray Industrial Corporation and Laguna Technopark Inc.

While balanced development is one of the key aims of economic zone policy in the Philippines, economic zones are clustered in few areas in the country. IT Parks/Centers and Manufacturing SEZ tend to concentrate in few and relatively developed areas of the country. More than half of IT Parks/Centers are located within Metro Manila (Figure 2). While several IT Center/Parks have chosen to locate in secondary or tertiary centers of Cebu Negros Occidental, Davao Del Sur, Laguna, and Iloilo. More second and third tier cities are being geared up to host IT Centers/Parks through Next Wave Cities (NWC) Program. The NWC program is a joint effort by both government and public sector: Department of Science and Technology- Information and Communications Technology Office (DOST-ICTO) and IT Business Process Association of the Philippines (IBPAP).

Figure 2. Location of IT Parks/ Centers and Manufacturing Economic Zone

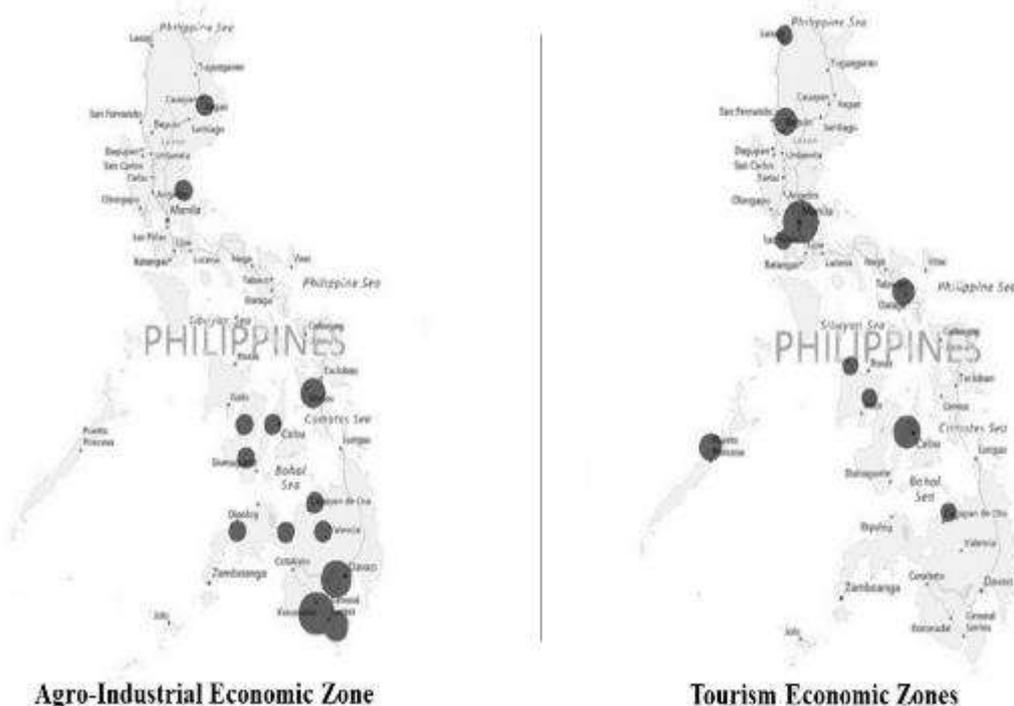


Source: author’s construction based on Philippines Economic Zones Authority (PEZA) statistics

Meanwhile, manufacturing SEZ are heavily concentrated in Southern Luzon, Metro Manila and Central Luzon (Figure 2). Southern Luzon was developed as highly-industrialized region under the Calabarzon Project in 1990s. Under this project, massive infrastructure projects such as superhighways, ports, and industrial estates were constructed in the five Southern Luzon provinces of Cavite, Laguna, Batangas, Rizal, and Quezon. Meanwhile, a few manufacturing zones are dispersed in other regional growth centers of Cebu, Baguio, and Davao.

Agro-industrial SEZ and Tourism SEZ are relatively scattered across the country. Agro-industrial economic zones are mostly located in Mindanao island or Visayan island (Figure 3). Tourism SEZ are dispersed in different locations but a couple of zones are in Metro Manila, Cebu, and Palawan.

Figure 3. Location of Agro-industrial Economic Zones and Tourism Economic Zones



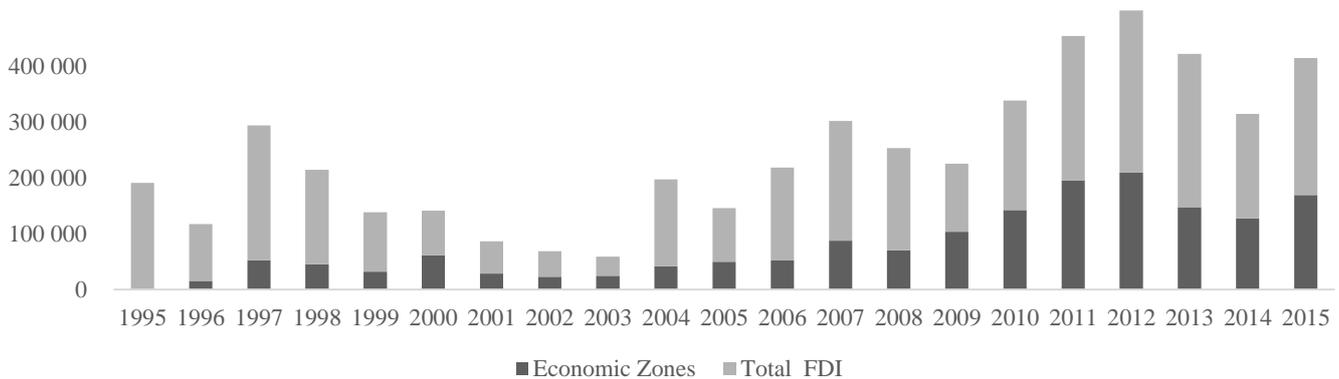
Source: author’s construction based on Philippines Economic Zones Authority (PEZA) statistics

4.2 Performance of Economic Zones: National Level

The flow of foreign direct investments (FDI) at the national level have undergone a boom-bust cycle with significant decline in 1999-2003 (Figure 4). Nevertheless, the amount of FDI have increased from 1995-2015. The erratic flow of FDI is often attributed to unstable political situation in the country. For instance, the 2001-2003 period which had the

lowest level of FDI coincides with the overthrow of Estrada administration due to corruption charges and succession in power of Arroyo administration who was also frequently smeared by political scandals. The impact of economic zones in generating FDI was minimal in 1995. However, in conjunction with increasing number of economic zones, the share of FDI coming from economic zones has significantly risen. Economic zones generate 69% share of the national FDI in 2015.

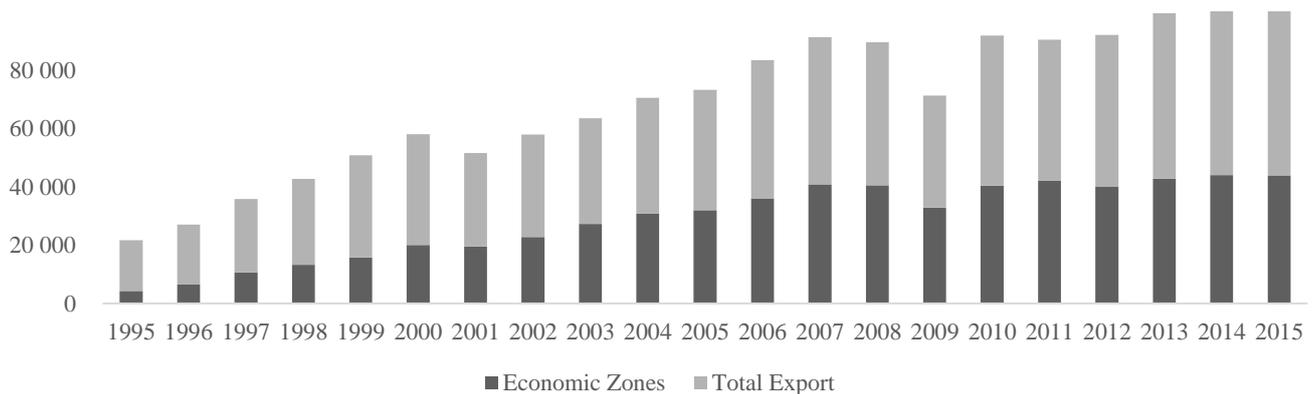
Figure 4. Total Flow of FDI and Share from Economic Zones (Million PHP) 1995-2015 (Nominal Values)



Source: author’s construction based on 1995-2015(PEZA); total FDI (PSA)

In contrast to flow of FDI, the value of exports has been expanding consistently from 1995-2015(Figure 5). The slight dip in exports in 2001 coincides with political instability after the ouster of Estrada administration. The value of exports had also fell in 2009 after the global financial crisis of 2008. The share of exports from economic zones was already relatively substantial at 25% in 1995. The impact of economic zones in exports has prominently increased over the past 20 years. Economic zones have become the most dominant source of exports in the country with 75% share in 2015.

Figure 5. Volume of Total Export and Share from Economic Zones (Million USD) 1995-2015 (Nominal Values)



Source: author’s construction based on 1995-2015(PEZA); total FDI (PSA)

The number of employment generated at the national level has been gradually increase from 1995-2015(Figure 6). However, this growth in employment lags significantly behind rapid population growth. Moreover, despite recent strong economic growth of 6-7% annual gross domestic product(GDP) increase, unemployment rate of 5-6% remains the one of highest in Southeast Asia region (ASEAN Secretariat, 2017).

In contrast to investments and exports, the impact of economic zones on employment generation is relatively weak ranging from 1%- 3% share. The plausible reason behind the marginal effect of economic zones on employment is the analysis only included data on direct employment. The data on indirect employment is incomplete and difficult to estimate so it was not considered in the analysis.

Figure 6. Total Employment and Share from Economic Zones(Millions) 1995-2015



Source: author’s construction based on 1995-2015(PEZA); total FDI (PSA)

4.3 Evaluation of Performance of Economic Zones: Disaggregated Level

The selected economic zones in this study have relatively diverse characteristics (Table.3). There are 4 zones which belong to 1st group or public economic zones; 11 zones which fall under the 2nd group or zones which began operation between 1995-2000; and 20 zones which are under 3rd group or zones which started functioning between 2001-2005. In terms of type, 29 zones are industrial or manufacturing economic zones and 5 are IT Parks/Centers. In terms of corporate ownership, majority or 20 economic zones are 100% Filipino and the rest are joint-partnership with foreigners. The top foreign investor in Japan. The selected zones are in different areas, but majority are concentrated in few areas: 9 zones in Laguna, 8 zones in Metro Manila, and 5 zones in Cavite. The land area of selected economic zones varies widely. The biggest economic zone in terms of land area is Bataan Economic Zone with 1733.37 hectares and smallest zone is Summit One Office Tower with 0.25 hectares.

Table 3. Key Characteristics of Selected Economic Zones

Group	Economic Zones	Type	Management	Corporate Nationality	Province	Area(Has)
1	Baguio City Economic Zone	Manufacturing	Public	100% Filipino	Benguet	116.25
1	Bataan Economic Zone	Manufacturing	Public	100% Filipino	Bataan	1733.37
1	Cavite Economic Zone	Manufacturing	Public	100% Filipino	Cavite	278.51
1	Mactan Economic Zone	Manufacturing	Public	100% Filipino	Cebu	119.37
2	Carmelray Industrial Park I	Manufacturing	Private	100% Filipino	Laguna	270.00
2	First Cavite Industrial Estate	Manufacturing	Private	60% Filipino & 40% Japanese	Cavite	71.77
2	Gateway Business Park	Manufacturing	Private	80% Filipino and 20% Indonesian	Cavite	110.05
2	Laguna International Industrial Park	Manufacturing	Private	60% Filipino and 40% Korean	Laguna	34.88
2	Laguna Technopark - SEZ	Manufacturing	Private	61% Filipino & 39% Japanese	Laguna	314.90
2	Leyte Industrial Development Estate	Manufacturing	Private	100% Filipino	Leyte	424.70
2	Light Industry & Science Park I	Manufacturing	Private	65.6% Filipino; 24.4% American; 10% Japanese	Laguna	71.75
2	Luisita Industrial Park	Manufacturing	Private	60% Filipino & 40% Japanese	Tarlac	29.40
2	Toyota Sta. Rosa (Laguna) - SEZ	Manufacturing	Private	60% Filipino & 40% Japanese	Laguna	81.67
2	Victoria Wave Special Ecozone	Manufacturing	Private	99.94% Filipino and 0.16% Hongkong	Metro Manila	50.00
2	Amkor Technology - SEZ	Manufacturing	Private	100% Filipino	Metro Manila	14.08
3	Angeles Industrial Park	Manufacturing	Private	100% Filipino	Pampanga	32.00
3	Calamba Premiere International Park	Manufacturing	Private	60% Filipino- and 40% Korean	Laguna	65.63
3	Carmelray Industrial Park II	Manufacturing	Private	100% Filipino	Laguna	143.03
3	Cocochem Agro-Industrial Park	Manufacturing	Private	100% Filipino	Batangas	42.00
3	Daiichi Industrial Park	Manufacturing	Private	100% Filipino	Cavite	55.02
3	First Philippine Industrial Park	Manufacturing	Private	70% Filipino & 30% Japanese	Batangas	331.85
3	Greenfield Automotive Park - SEZ	Manufacturing	Private	100% Filipino	Laguna	65.95
3	Jasaan Ecozones	Manufacturing	Private	60% Filipino % 40% Japanese	Misamis Oriental	25.25
3	Light Industry & Science Park II	Manufacturing	Private	65.6% Filipino; 24.4% American; 10% Japanese	Laguna	68.01
3	Lima Technology Center	Manufacturing	Private	60% Filipino and 40% Japanese	Batangas	280.17
3	Macroasia - SEZ	Manufacturing	Private	100% Filipino	Metro Manila	22.69
3	Mactan Economic Zone II	Manufacturing	Private	100% Filipino	Cebu	119.37
3	New Cebu Township	Manufacturing	Private	100% Filipino	Cebu	86.16
3	People’s Technology Complex	Manufacturing	Private	100% Filipino	Cavite	58.99
3	West Cebu Industrial Park	Manufacturing	Private	60% Filipino and 40% Japanese	Cebu	169.92
3	Eastwood City Cyberpark	IT Parks/Centers	Private	82.69% Filipino and 17.31% Foreign	Metro Manila	13.29
3	E-Square Information Technology Park	IT Parks/Centers	Private	100% Filipino	Metro Manila	24.37

3	Northgate Cyberzone	IT Parks/Centers	Private	100% Filipino	Metro Manila	18.71
3	RCBC Plaza	IT Parks/Centers	Private	100% Filipino	Metro Manila	1.05
3	Summit One Office Tower	IT Parks/Centers	Private	100% Filipino	Metro Manila	0.25

Source: author’s construction based on Philippines Economic Zones Authority(PEZA) statistics

The performance indices of the 1st and 2nd group of zones are calculated at four different time periods, while the 3rd group of zones are estimated at three different time periods (Table 4). The calculated performance indices vary across zones and time periods. To test variation in performance across zones, one-way ANOVA is conducted (Table 5). The result confirms that there is statistically significant in performance index across different zones

To examine the dynamics of the performance of the zones over the years, the study analyzes three different trends: long-term, recent, and consistency of performance. First, the long-term trend which compares average performance in the base period (1995-2000 or 2001-2005) and latest period (2011-2015) is analyzed. Second, the recent performance based on 2006-2010 and 2011-2015 is evaluated. Third, the consistency of performance based on the two earlier analysis is examined.

Table 4. Performance Index: 1995-2000

Group	Economic Zones	1995-2000	2001-2005	2006-2010	2011-2015
1	Baguio City Economic Zone	0.358	0.176	0.269	0.347
1	Bataan Economic Zone	0.241	0.12	0.076	0.114
1	Cavite Economic Zone	0.56	0.468	0.468	0.51
1	Mactan Economic Zone	0.536	0.313	0.317	0.347
2	Carmelray Industrial Park I	0.266	0.167	0.224	0.149
2	First Cavite Industrial Estate	0.053	0.087	0.088	0.097
2	Gateway Business Park	0.357	0.3	0.431	0.211
2	Laguna International Industrial Park	0.113	0.051	0.052	0.05
2	Laguna Technopark - SEZ	0.749	0.921	1	1
2	Leyte Industrial Development Estate	0.132	0.049	0.138	0.131
2	Light Industry & Science Park I	0.328	0.218	0.115	0.147
2	Luisita Industrial Park	0.053	0.051	0.051	0.08
2	Toyota Sta. Rosa (Laguna) - SEZ	0.021	0.012	0.097	0.049
2	Victoria Wave Special Ecozone	0.187	0.014	0.003	0.005
2	Amkor Technology - SEZ		0.121	0.163	0.193
3	Angeles Industrial Park		0.008	0.005	0.027
3	Calamba Premiere International Park		0.07	0.17	0.213
3	Carmelray Industrial Park II		0.125	0.18	0.121
3	Cocochem Agro-Industrial Park		0.009	0.012	0.014
3	Daiichi Industrial Park		0.003	0.005	0.011
3	First Philippine Industrial Park		0.041	0.275	0.419
3	Greenfield Automotive Park - SEZ		0.011	0.022	0.02
3	Jasaan Ecozone		0.067	0.025	0.034
3	Light Industry & Science Park II		0.091	0.15	0.098
3	Lima Technology Center		0.095	0.087	0.264
3	Macroasia - SEZ		0.033	0.037	0.024
3	Mactan Economic Zone II		0.072	0.079	0.07
3	New Cebu Township		0.004	0.004	0.006
3	People's Technology Complex		0.095	0.058	0.09
3	West Cebu Industrial Park		0.032	0.134	0.134
3	Eastwood City Cyberpark		0.056	0.096	0.177
3	E-Square Information Technology Park		0.037	0.143	0.168
3	Northgate Cyberzone		0.006	0.057	0.18
3	RCBC Plaza		0.026	0.051	0.034
3	Summit One Office Tower		0.002	0.004	0.007

Source: author’s construction based on Philippines Economic Zones Authority(PEZA) statistics

Table 5: Test of Variance

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	4.014313	34	0.118068	26.80506	1.62E-32	1.568705
Within Groups	0.369994	84	0.004405			
Total	4.384307	118				

Source: author’s construction based on Philippines Economic Zones Authority(PEZA) statistics

The analysis of the long-term trend of economic zones performance reveals some interesting patterns (Table 6). The performance of 1st group or public economic zones has declined from 1995-2015. The zone with biggest decline in performance index is Bataan Economic Zone with -53% decline. On the other hand, Baguio City Economic Zone and Mactan Economic Zone managed to limit the drop to -3% and -9% respectively. More than half of economic zones under the 2nd group have also experienced weakened long-term performance. On the other hand, most of the zones under 3rd

group have experienced better performance. The zone with largest improvement in Northgate Cyberzone with 3141% increase. The decline in performance of many earlier zones suggests the existence of competition from newer zones. While competition may result to decline in performance of some zones, it is eventually beneficial, especially for firms and employees. The expansion in number of zones offers higher chances of finding zones that can meet their requirement. Moreover, some companies prefer to deal with private zones than government office to avoid delay and corruption (Farole, 2011). Subsequently, the increase in number of economic zones and firms can lead to additional job opportunities and higher exports and investments. As illustrated in the case of the Philippines, the growth in number of economic zones corresponds with increase in number of firms, investments, export, and employment.

Table 6. Performance Indices (Base Period vs Latest Period)

Improve		Decline			
2	First Cavite Industrial Estate	82%	1	Baguio City Economic Zone	-3%
2	Laguna Technopark - SEZ	34%	1	Bataan Economic Zone	-53%
2	Luisita Industrial Park	50%	1	Cavite Economic Zone	-9%
2	Toyota Sta. Rosa (Laguna) - SEZ	137%	1	Mactan Economic Zone	-35%
3	Amkor Technology - SEZ	60%	2	Carmelray Industrial Park I	-44%
3	Angeles Industrial Park	244%	2	Gateway Business Park	-41%
3	Calamba Premiere International Park	205%	2	Laguna International Industrial Park	-56%
3	Cocochem Agro-Industrial Park	58%	2	Leyte Industrial Development Estate	-1%
3	Daiichi Industrial Park	331%	2	Light Industry & Science Park I	-55%
3	First Philippine Industrial Park	917%	2	Victoria Wave Special Ecozone	-97%
3	Greenfield Automotive Park - SEZ	74%	3	Carmelray Industrial Park II	-2%
3	Light Industry & Science Park II	8%	3	Jasaan Misamis Oriental	-49%
3	Lima Technology Center	177%	3	Macroasia - SEZ	-29%
3	New Cebu Township	47%	3	Mactan Economic Zone II	-3%
3	West Cebu Industrial Park	325%	3	People's Technology Complex	-6%
3	Eastwood City Cyberpark	216%			
3	E-Square Information Technology Park	355%			
3	Northgate Cyberzone	3141%			
3	RCBC Plaza	29%			
3	Summit One Office Tower	174%			

Source: author's construction based on Philippines Economic Zones Authority (PEZA) statistics.

The analysis of the recent performance of economic zone denotes improvement of the performance of the many economic zones, notably, public economic zones and IT Parks and Centers (Table 7). The performance of public has grown impressively with notable increase from Bataan Economic Zone with 51% and Baguio City Economic Zone with 29%. The reorganization and conversion into a Freeport Area of Bataan in 2009 possibly bolstered the performance of Bataan Economic Zone. Meanwhile, zones under 2nd group have mixed performance with 6 zones having better performance and 5 zones with worsening performance. Most zones from 3rd group experienced improvement of performance. Overall, there are more zones with better performance than worsening performance in recent period. This improvement of performance of many zones coincides with the overall economic growth in the Philippines. In 2010-2017, the Philippines achieved average GDP growth rate 6.4% (Felipe and Estrada, 2018). Alongside with impressive economic growth is significant expansion of IT-BPO industry, whose contribution to GDP has increased from 2.4% in 2005 to 5.4 % in 2014 (Natividad, 2015).

Table 7. Recent Performance (2006-2010 vs 2011-2015)

Improve		Decline			
1	Baguio City Economic Zone	29%	2	Carmelray Industrial Park I	-33%
1	Bataan Economic Zone	51%	2	Gateway Business Park	-51%
1	Cavite Economic Zone	9%	2	Laguna International Industrial Park	-5%
1	Mactan Economic Zone	10%	2	Leyte Industrial Development Estate	-5%
2	First Cavite Industrial Estate	10%	2	Toyota Sta. Rosa (Laguna) - SEZ	-50%
2	Laguna Technopark - SEZ	0%	3	Carmelray Industrial Park II	-32%
2	Light Industry & Science Park I	28%	3	Greenfield Automotive Park - SEZ	-11%
2	Luisita Industrial Park	56%	3	Light Industry & Science Park II	-34%
2	Victoria Wave Special Ecozone	45%	3	Macroasia - SEZ	-36%
2	Amkor Technology - SEZ	18%	3	Mactan Economic Zone II	-12%
3	Angeles Industrial Park	404%	3	RCBC Plaza	-33%
3	Calamba Premiere International Park	25%			
3	Cocochem Agro-Industrial Park	20%			
3	Daiichi Industrial Park	150%			
3	First Philippine Industrial Park	53%			
3	Jasaan Misamis Oriental	38%			
3	Lima Technology Center	203%			
3	New Cebu Township	35%			
3	People's Technology Complex	53%			
3	West Cebu Industrial Park	1%			
3	Eastwood City Cyberpark	85%			
3	E-Square Information Technology Park	17%			
3	Northgate Cyberzone	213%			

3 Summit One Office Tower 62%

Source: author’s construction based on Philippines Economic Zones Authority(PEZA) statistics

The comparison of the performance based on the long-term performance and recent performance denotes consistency of some zones, either consistent improvement or persistent decline (Table 8). None of the public zones had consistent performance. Meanwhile, in the 2nd group, 4 zones are found to have constant better performance and 5 zones with steadily worsening performance. In the 3rd group, 12 zones are identified with consistent good performance and 3 zones are found to have constantly deteriorating performance. Almost all IT Parks/Centers have consistent better performance, and this reflects the continuous growth of IT-BPO industry. On the other hand, zones with constantly deteriorating performance are manufacturing economic zones. Apart from Leyte Industrial Development Estate, zones with constantly deteriorating performance are in provinces with substantial concentration of economic zones which again suggests presence of competition.

Table 8. Analysis of Consistency of Performance

Improve		Decline	
2	First Cavite Industrial Estate	2	Carmelray Industrial Park I
2	Laguna Technopark - SEZ	2	Gateway Business Park
2	Luisita Industrial Park	2	Laguna International Industrial Park
2	Amkor Technology - SEZ	2	Leyte Industrial Development Estate
3	Angeles Industrial Park	3	Carmelray Industrial Park II
3	Calamba Premiere International Park	3	Macroasia - SEZ
3	Cocochem Agro-Industrial Park	3	Mactan Economic Zone II
3	Daiichi Industrial Park		
3	First Philippine Industrial Park		
3	Lima Technology Center		
3	New Cebu Township		
3	West Cebu Industrial Park		
3	Eastwood City Cyberpark		
3	E-Square Information Technology Park		
3	Northgate Cyberzone		
3	Summit One Office Tower		

Source: author’s construction based on Philippines Economic Zones Authority(PEZA) statistics

To further extend the analysis, performance indices of economic zones are also ranked. (Table 9). In the first period (1995-2000), Laguna Technopark-SEZ occupied the top spot, while the first generation of public economic zones, Cavite Economic Zone, Mactan Economic Zone, and Baguio City Economic Zone, ranked 2-4 spot. In the second period (2001-2005), the top 3 economic zones have retained their position, while Gateway Business Park and Light Industry & Science Park I moved to the top 5. In the third period (2006-2010), the top 2 zones have maintained their ranking; Gateway Business Park have moved up one place; and Mactan Economic Zone have reentered the top 5. In the fourth period (2011-2015), the top 2 zones held on their previous spots; First Philippine Industrial Park climbed up to top 3; and public economic zones, Mactan Economic Zone, and Baguio City Economic zone, occupied top 4-5 spot.

Table 9. Top 10 Zones

Rank	1995-2000	2001-2005	2006-2010	2011-2015
1	Laguna Technopark - SEZ	Laguna Technopark - SEZ	Laguna Technopark - SEZ	Laguna Technopark - SEZ
2	Cavite Economic Zone	Cavite Economic Zone	Cavite Economic Zone	Cavite Economic Zone
3	Mactan Economic Zone	Mactan Economic Zone	Gateway Business Park	First Philippine Industrial Park
4	Baguio City Economic Zone	Gateway Business Park	Mactan Economic Zone	Mactan Economic Zone
5	Gateway Business Park	Light Industry & Science Park I	First Philippine Industrial Park	Baguio City Economic Zone
6	Light Industry & Science Park I	Baguio City Economic Zone	Baguio City Economic Zone	Lima Technology Center
7	Carmelray Industrial Park I	Carmelray Industrial Park I	Carmelray Industrial Park I	Newport City CyberTourism Zone
8	Bataan Economic Zone	Carmelray Industrial Park II	Carmelray Industrial Park II	Calamba Premiere International Park
9	Victoria Wave Special Ecozone	Amkor Technology - SEZ	Calamba Premiere International Park	Gateway Business Park
10	Leyte Industrial Development Estate	Bataan Economic Zone	Amkor Technology - SEZ	Amkor Technology - SEZ

Source: author’s construction based on Philippines Economic Zones Authority(PEZA) statistics

In contrast to earlier analysis which shows IT Parks have improving performance, the ranking shows that manufacturing economic zones continue to deliver more significant outcomes. The dominance of manufacturing economic zones is no surprise as it is more capital and labor-intensive than IT Parks and Centers. The ranking confirms that performance of public zones has declined from 1995-2015. Nevertheless, with exception of Bataan Economic Zone, all public economic zones managed to be top 10 in all four periods. Baguio Economic Zone, Cavite Economic Zone and Mactan Economic Zone continue to play a significant role and deliver strong outcomes. The relatively strong performance of these public economic zones signifies resiliency against competition from private economic zones. The relative success of these public

economic zones can serve as useful guide for the government's plan to build more public economic zones. In the case of Cavite Economic Zone, good location and strong support from the local government drive its growth (JICA, 2004). Cavite is in Southern Luzon or Calabarzon region wherein massive infrastructure projects were pursued to accelerate the industrialization. The local government of Cavite has also been active in inviting investors. The case of Mactan Economic Zone highlights the importance of transition of economic activities (Moran, 2011). Mactan Economic Zone began with low-skilled intensive industries such as garment, shoes, and toys but gradually shifted to middle-skill intensive industries such electronics, machinery and medical equipment. The case of Baguio Economic Zone also emphasizes the significance of the transformation of economic activities from low-skilled industry of garment to high-skilled industries of IT and electronics (Moran, 2011). Furthermore, the development of Baguio Economic Zone was steered by an anchor firm, Texas Instrument.

5. SUMMARY AND CONCLUSION

This study presented some key characteristics of economic zones in the Philippines. Economic zones are defined as selected with highly developed or have the potential to be developed into agro-industrial, industrial tourist/recreation, commercial, banking, investment, and financial centers. IT Parks/Centers constitute the largest number of operating and planned economic zones. The development and management of economic zones are dominated by private sector. Majority of economic zones in the Philippines are private economic zones. The geographical distribution of economic zones demonstrates distinct patterns. IT Parks/Centers and Manufacturing SEZ tend to concentrate in few and relatively developed areas of the country. Meanwhile, Agro-industrial SEZ and Tourism SEZ are relatively scattered across the country.

This study analyzed the dynamics of the performance of selected economic zones in the Philippines. The analysis shows the varying performance of the selected economic zones. While the dynamics of the performance is diverse, certain trend can be identified. First, the analysis demonstrates the declining performance of public economic zones which implies the existence of competition. Second, the analysis also denotes that consistent improving performance of IT Parks/Centers which signifies the continuous expansion of IT-BPO industry.

Meanwhile, the analysis based on ranking indicates that while IT Parks/Centers are constantly performing better, the contribution of manufacturing economic zones remains substantial. This finding is predictable as manufacturing economic zones are more capital and labor-intensive. Moreover, while the public economic zones performance has declined over the years, they continue to deliver significant outcomes. The experiences of the relatively successful public economic zones can serve as rich source of guide for the government plan to develop additional public economic zones.

While this study provides useful insight about the dynamics of performance of selected economic zones, some areas needs to be further investigated. First, as the study points out the possible existence of competition among economic zones, it would be meaningful to further examine the mechanism or structure using models of spatial competition. Second, as the study only provides description of the variation of the performance, it would be worthwhile to analyze the determinants of varying performance. Third, as economic zones are probably one of the most popular spatially-focused instruments, it would be valuable to analyzes the importance of host location whether zones in more developed areas perform better than those in less-developed regions.

REFERENCES

- Aggarwal, A (2010), "Economic Impacts of SEZs: Theoretical Approaches and Analysis of Newly Notified SEZs in India," MPRA Paper 20902, University Library of Munich, Munich, 1 March, available at: <https://mpra.ub.uni-muenchen.de/20902/2/> (accessed 10 November 2016).
- Aldaba, R., and F. Aldaba (2010), "Assessing the Spillover Effects of FDI to the Philippines," PIDS Discussion Paper Series No. 2010-27, Philippine Institute for Development Studies (PIDS), Makati City, available at: <https://dirp4.pids.gov.ph/ris/dps/pidsdps1027.pdf> <https://mpra.ub.uni-muenchen.de/20902/2/> (accessed 10 March 2015)
- Aldaba, R. (2015), "The Philippines in the Electronics Global Value Chain: Upgrading Opportunities and Challenges," ERIA Discussion Paper No.2015-62, Economic Research Institute for ASEAN and East Asia (ERIA), Jakarta, September 2015.
- Asian Development Bank (ADB) (2009), *Poverty in the Philippines: Causes, Constraints, and Opportunities*, Asian Development Bank (ADB), Mandaluyong.
- Asian Development Bank (ADB) (2015), *Asian Economic Integration Report 2015(How Can Special Economic Zones Catalyze Economic Development)*, Asian Development Bank (ADB), Mandaluyong.
- Authority of Freeport Area of Bataan(AFAB) (2009), *Republic Act 9728 and its Implementing Rules and Regulations (The Freeport Area of Bataan Act of 2009)*, AFAB, Bataan.
- Baissac, C. (2011), "Brief History of SEZs and Overview of Policy Debates", in Farole, T.(Ed.), *Special Economic Zones in Africa: Comparing Performance and Learning from Global Experience in Africa*, The World Bank, Washington DC, pp. 23-57.
- Balisacan, A.M, Hill H., and Piza.S.F (2009), "Spatial Disparities and Development Policy in the Philippines", in Huang, Y. and Bocchi A.M (Eds.), *Reshaping Economic Geography in East Asia*, The World Bank, Washington DC, pp.169-182, available at: <http://siteresources.worldbank.org/INTPHILIPPINES/Resources/WDR2009PaperBalisacan.pdf> (accessed 10 November 2016).
- Carter, C. and Harding, A. (2011), "SEZ: Policy Incubators or Catalysts for Development?" in Carter, C and Harding, A. (Eds.), *Special Economic Zones in Asian Market Economies*, Routledge, London, pp.1-14.
- Castell, M., (n.d.), "Assessing the Role of Government Institutions Supporting Industrial Adjustment in the Philippines: The Case of PEZA, CITEM and DBP", available at: http://www.dlsu.edu.ph/research/centers/aki/_pdf/_concludedProjects/_volumeII/ Castell.pdf (accessed 5 October 2016).
- Castro, J. (1982), "Philippines: The Bataan Export Processing Zone", *Exporting Processing Zones and Industrial Employment in Asia*, Vol.1, No.1, pp- 157-182.
- Campos, O.(2017), "5 economic zones eyed in Tawi-Tawi", *Manila Standard*, 30 June, available at:

- <http://thestandard.com.ph/business/economy-trade/240704/5-economic-zones-eyed-in-tawi-tawi.html> (accessed 5 October 2017)
- Diokno, B.(2012), "The Lost Decade", *Business World Online*, 19 April, available at: <http://www.bworldonline.com/content.php?section=Opinion&title=the-lostdecade&id=50181> (accessed 21 January 2018).
- Farole, T. (2011), *Special Economic Zones in Africa: Comparing Performance and Learning from Global Experiences*, The World Bank, Washington DC.
- Felipe, J. and Estrada, G. (2018), "Why Has the Philippines' Growth Performance Improved? From Disappointment to Promising Success", ADB Economic Working Paper Series No.542, Asian Development Bank(ADB), Mandaluyong City, April 2018, available at: <https://www.adb.org/sites/default/files/publication/415211/ewp-542-philippines-growth-performance-improved.pdf> (accessed 17 April 2018).
- Farole, T. and Akinci, G.(Eds.). (2011), *Special Economic Zones Progress, Emerging Challenges, and Future Directions*, The World Bank, Washington DC.
- FIAS (2008), *Special Economic Zones: Performance, Lessons Learned, and Implications for Zone Development*, The World Bank, Washington DC.
- Human Development Network (2013), *2012/2013 Philippines Human Development Report*, Human Development Network (HDN), Manila.
- IT & Business Process Association of the Philippines (2016), *Next Wave Cities Report 2016*, IT & Business Process Association of the Philippines(ITBAP), Taguig.
- Japan International Cooperation Agency (JICA) (2004), *Cavite Export Processing Zone Development Project*, JICA, Tokyo.
- Krugman, P. (1995), *Development, Geography, and Economic Theory*, MIT Press, Cambridge.
- Makabenta, M. P. (2002), "FDI Location and Special Economic Zones in the Philippines", *Review of Urban & Regional Development Studies*, Vol.14, No.1, pp. 59-77.
- Manasan, R. (2013), "Export Processing Zones, Special Economic Zones: Do We Really Need to Have More of Them?" PIDS Policy Notes No. 2013-15, Philippine Institute for Development Studies (PIDS), Makati City, November 2013, available at: <https://dirp4.pids.gov.ph/webportal/CDN/PUBLICATIONS/pidspn1315.pdf> (accessed 5 October 2016).
- Mercado, R. G. (2002), "Regional Development in the Philippines: A Review of Experience, State of the Art and Agenda for Research and Action", PIDS Discussion Paper Series No 2002-03, Philippine Institute for Development Studies (PIDS), Makati City, February 2002, available at: <https://dirp3.pids.gov.ph/ris/dps/pidsdps0203.pdf> (accessed 5 October 2016).
- Mercurio, R.(2017), "PEZA to Expand Public Ecozone", *The Philippines Star*, 7 April, available at: <http://www.philstar.com/business/2017/04/07/1688359/peza-expand-public-ecozones> (accessed 15 May 2017).
- Moran, T.H.(2011), "International Experience with Special Economic Zones(SEZs: Using SEZs to Drive Development in Countries Around the World", *Report Commissioned by Center for Development and Enterprise*, available at: http://pmg-assets.s3-website-eu-west-1.amazonaws.com/130522annexure_b1.doc (accessed 18 January 2018).
- Natividad, N.(2015), "A History of the BPO Industry in Numbers", *Rappler*, 31 August, available at: <https://www.rappler.com/brandrap/stories/98207-bpo-philippines-timeline> (accessed 21 January 2018).
- Philippines Economic Zone Authority (PEZA) (1995), *Rules and Regulations to Implement Republic Act No.7916(The Special Economic Zone Act of 1995)*, PEZA, Taguig City.
- Philippines Economic Zone Authority (PEZA) (2016), *List of Economic Zones and Economic Zone Locators*, PEZA, Taguig City.
- Philippines Economic Zone Authority (PEZA) (2016), *Economic Indicators CY 1995-Jan-Sept.2016*, PEZA, Taguig City.
- Philippines Statistical Authority(PSA) (2016), *Foreign Investments (various years)*, PSA, Quezon City.
- Philippines Statistical Authority(PSA) (2016), *Foreign Trade Statistics of the Philippines: various years*, PSA, Quezon City.
- Philippines Statistical Authority(PSA) (2016), *Yearbook of Labor Statistics (various years)*, PSA, Quezon City.
- Raquiza, A. (2015), "The BPO Industry and the Philippine Trade in Services: Boon or Bane?", in Lambregts, B., Beerepoot, N. and Kloosterman(Eds.), *The Local Impact of Globalization in South and Southeast Asia*, Routledge, pp 46-59.
- Remedia, E.M. (1996), "Export Processing in the Philippines: A Review of Employment, Working Conditions and Labor Relations," ILO Working Paper No.77, International Labor Office, Geneva, available at: http://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/---multi/documents/publication/wcms_126169.pdf (accessed 5 October 2016).
- Rodriguez-Pose, A.and Hardy, D. (2014), *Technology and Industrial Parks in Emerging Countries: Panacea or Pipedream*, Springer, Heidelberg.
- Tantri, M. (2011), "Trade Performance of SEZs in India: A Disaggregated-level Analysis", *Margin-The Journal of Applied Economic Research*, Vol.5, No.2, pp. 267-288.
- The Economist(2015), "Special Economic Zones: Not So Special," 3 April, <https://www.economist.com/news/leaders/21647615-world-awash-free-trade-zones-and-their-offshoots-many-are-not-worth-effort-not> (accessed 5 October 2016).
- Warr, P. (1989), "Export Processing Zones: The Economics of Enclave Manufacturing", *World Bank Research Observer*, Vol.4, No.1, pp. 65-87.
- World Bank (2009), *World Development Report 2009: Reshaping Economic Geography*, The World Bank, Washington DC.

1292 PUBLIC SPACE OF KOLKATA: AN EVOLUTIONARY HISTORY**Binay Krishna Pal**Research Fellow (Ph. D.), Dept. of Geography, University of Calcutta, Kolkata, India (Email: binaygeo@gmail.com)**INTRODUCTION**

The Public space has become one of the most important parameters to understand a modern city and its character. As it is the space between peoples' two exclusive territory, it shapes the public lives, their imaginations and actions through becoming a container of public gathering, discussions and participation. Public space is the produced space of peoples' action and integration (Carr, 1992). It is defined as the material and social interactions that characterises the use of that space within the non-exclusive realm of the city (Brown, 2006). It is a space of peoples' mind which although has physical limit but limitless in thinking thus by legitimate activities of the collective over a space. The public space is transformative process of people want, needs and desires. (Slater, J. J. 2004). The defining characteristics of public spaces are- proximity, diversity and accessibility (Goheen, 1998; Zukin, 1995). Public space, being a '*third space*', has played an important role in shaping up urban landscape and rendered a praiseworthy service to nurture human creation. Actually it tries to rationalize the common interest by giving a space to diverse groups to interact, assemble and understand the issues of public interest and policies influencing their lives. There is a tendency towards the decrease of public space for political establishment, whereas increasing focus is on creation of exclusive-premium public space for consumption. Therefore, the democratic-interactive spaces have been transformed to a space of commerce and consumption and too some extent surveillance and police control. Cases of encroachments by real estate developers and commercial entities are found in various parts by changing the natural landscape into a cultural one. The symbolic presentations of the public space have to be taken seriously, as it is approaching towards the sphere of *consumptive hedonism*. In Kolkata, historically the public spaces were framed to cater the leisure and luxury of the Britishers where the native community space was hardly imagined and emphasized. Although people have created and utilized some spaces as common spaces to nurture their wellbeing and interpersonal contact. The practices through urban ecological process have formed distinct neighbourhoods spatially. Post-independence the trend toward the utilization and freedom over public spaces can be called a paradoxical phenomenon where the people were encouraged to maximally enjoy the space limiting to defiant attitude towards authority. In the era of globalization and post globalization, public spaces have been experiencing the same scenario where the previous nature of being considered as the means of leisure and entertainment has been transforming to private clubs, gated multi-complexes, surveillance controlled shopping malls which has not only been barring the people to accomplish a relation with the nature but also disturbing the urban-social fabric. The exclusive public spaces are provided to particular economic groups of people neglecting the role of the state in maintaining traditional urban common space; majority of people has become accustomed with it since a long time. Hence the various public spaces have been emerged as the container of assemblage of various groups of people using common parks, playgrounds, markets etc. Such an attitude of various groups of concerned populations has entitled them as one of the creators of public space. On the other hand, the roles of planners in sculpting public space also deserve a special mention.

Jacobs (1961) was one of the pioneer in urban public space studies. According to him: "Cities have the capability of providing something for everybody, only because, and only when, they are created by everybody." Mitchel (1995) traced police brutality over the conversion of peoples Green Park in California with nexus of UC Berkeley administration and State for a golf club. The values of public space are often celebrated and promoted in the urban studies literature. Public space is represented as a forum that encourages mingling and encounters between people of different classes, races, ages, religions, ideologies, and cultures (Berman, 1986; Harvey, 1992) and as such serves as a breeding ground for mutual respect, political solidarity, tolerance, and civil discourse (Walzer, 1986). The significance of public space to the practice of politics has also been advanced by other political theorists and geographers (Soja, 1989; Young, 1990; Lefebvre, 1991; Ruddick, 1996; Mitchell, 2003; Staeheli and Mitchell, 2004). The existence of spaces and forums to which everyone has access is seen to be critical to the practice of politics: "In such public spaces people encounter other people, meanings, expressions, issues, which they may not understand or with which they do not identify. The force of public demonstrations, for example, often consists in bringing to people who pass through public spaces those issues, demands, and people they might otherwise avoid. As a normative ideal, city life provides public places and forums where anyone can speak and anyone can listen" (Young, 1990). Habermas (1991) explains "public sphere"- a place between private individuals and government authorities in which people could meet and have rational-critical debates about public matters. His work roots in classical antiquity, feudalism and its crisis and emergence bourgeois democracy in Europe. He claims at the initial period of democracy, the societies needed open spaces for the growth of market through political establishment and participation and strengthening capitalism. Now the capitalist crisis of new invention and search for new prime space for market set up for more consumption looking upon the common space once created for bourgeois class's interest. So, here is the need for restricted or reduced public space. The 'privatisation' of public space has been pointed to and criticised in recent literature on American cities (see for example Davis 1990). Argument over expansion of public space emerged from cases of Scandinavian and Chinese cities, where people's expressions are manifested for group's demand and rights as well as daily activism, group-ism Mahadevia (2015). This paper's major objective is to explore the transformation of public space in the city from pre-Colonial period to the present by assessing the evolution of perceptions of public space by planners from different periods. There are underlying agents, shape design the space how it represents itself over a period of time. To analyse and get diverse dimension different time frames have been taken

into account. The city has plenty number of dichotomies over the space and time. This study tries to look into that aspect too.

MATERIALS AND METHODS

This study aims to explore the socio-spatial dynamics of transformation of urban public space, hence take the documentation of archival records which includes publication by the municipality, various authors worked on Kolkata. Newspaper reporting and content analysis is one of the most important dimensions of research. The city space has been represented by various authors of literature through their literary explanations and peoples' narratives. Sometimes literature has modern day social network is also important dimension and tool of research. Now a day many people particularly living in the urban space expressing their likes and dislikes over the social media platform. Takings snaps of their expressions over a period a time on Google Maps and Facebook enrich this study. Spatial analysis tool used in GIS also used to understand the scenario of distribution of parks in different neighbourhoods. The study takes into account experts opinion about their understanding of transformation of public space over the period of time and space. Tracing social transformation is always a nebulous process unlike political and economic change (Sinha, 1978). This study incorporates areas specifically of Kolkata Municipal Corporation (KMC), whenever there are related aspects these has been taken into consideration. New areas have been incorporated into the domain of Municipal Corporation.

INFRASTRUCTURAL PUBLIC SPACE

The traditional public spaces are transforming by the impulse of market expansion. Erstwhile the open market is transforming into surveillance controlled malls, private clubs, exclusive space of assembling and activities (Choudhury, 2017). However, the access, one of the major factor towards the fulfilment of criteria of public space is away to attained. With the unusual and continuous structure of footpaths make inaccessible for the elderly, children and disables, lack of space for pedestrians due to hawking on footpaths people have to take risk to walk on the street. Lack of public toilets and awareness of the people the streets are sometimes unhygienic.

From the infrastructural point of view, public space of any city can be classified into following major types, but not limited to it:

Roads: Roy (1986) has categorised the roads as follows: 1) On the name of Kings and Lords, for e.g. Raja Nabakrishna, Raja Rajballav, Darpanarayan Thakur, Baishnabcharan Seth, Nilmani Mitra, Harighosh, Banamali De etc; 2) On the name of famous people belonged to another province, like- Hujurimal, Rustamji, Umichand etc.; 3) Common people belonged to different populations, like- panchi dhopani, panchu khansama, Akhil Mistri (mechanic), Ramhari Mistri (Carpentar), Chidam Mudi, Ramakanta Mistri (Carpentar), Shyama Bai (women dancer) etc. 4) On the name of various market, like- Boubazar, rajabazar, Shyambazar, Radhabazar, Teritibazar etc. 5) On the name of garden, like- Kalabagan, Peyarabagan, Horitukibagan, Hatibagan etc., 6) On the basis of trees, like- Nebutala, Jhawtala, Nimtala, Taltala etc. 7) On the basis of various caste, ethnic group and their occupation, like- Kolutola, Gowaltuli, Koshaitola, Kumortuli, Uripara, Dhopapara etc. 8) On the names of family or village goddess, like- Chitpur, Gobindapur, Shibtala, Panchanantala etc. and 9) Self Manifested/ Luminous Roads like Serpentine lane, Crooked Lane, Cork Scrue Lane etc. (Roy, 1986). Thus the city has given a space to nomenclature of streets of the people from the different strata of society. It's a very interesting thing that the name of people from sub-altern category was put on street just beside the famous peoples' name. Although the small roads and lanes were named from the lower strata people, the large and famous streets were named on the basis of famous people like, Mahatma Gandhi Road, Chittaranjan Avenue, Acharjya Prafulla Chandra Road, Jagadish Chandra Bose Road (Jwardar, 2003: 26). Now the name of roads and neighbourhoods are influenced by the name of a person, the locality known for its service as well as corporate push to make a known place in the name of their brand. Example can be cited from Exide More (More is a crossing or a nodal point of transport and shops) which has been popularised with the Exide company, a premier heavy battery maker, Ruby More a leading private hospital located near Cosba Etc. Kolkata's roads constitute about 15.2% (9km² out of 62km²) of its total area (UN-HABITAT). The cities of developed nations are characterised by 22%-36% of its street area. Increasing population had required new roads and transport networks.

Footpath: One of the important public space in some of the streets (College Street, Esplanade, Shyambazar, Gariahat etc.) are occupied by the temporary hawkers leads to access barrier of pedestrians. (Pal, 2014). The contest over the utilisation of streets has led to many controversies as several forced displacements from the streets were executed in different periods. Many areas of the city like Gariahat, College Streets have narrow footpaths due to occupancy of the vendors.

Parks: Parks constitute one of the important aspects of public spaces. The parks can be classified according to their size and functions. The concentrations are found mostly in the Central and south-central Kolkata. North & North-central Kolkata really lacks in number and size of parks (Fig-1). People from various parts of the city stated that accessibility, safety are some of the important issue as many parks allow some narrow entry, many places have lack of proper lightening. There are several conflicts over the encroachment on the parks by illegal construction. The morning walker and nearby residents opposed construction of concrete structure in 2017 on Rabindra Sarobar, one of the largest park in south Kolkata.

HISTORICAL TRANSFORMATION OF KOLKATA'S PUBLIC SPACE

Kolkata, has its roots in colonial rule went through various stages of transformation under various authorities. There are many debates whether the city is planned or not. The Formation of Calcutta Improvement Trust in the year 1912 was thought as the benchmark towards managing the urban space and problems (Gupta, 1993). Public space at that time was

not exclusively demarcated and planned. However, the phases of evolution and transformation of public space can be described in the following chronological periods:

- *Colonial (1700-1947)*: a large area of public spaces was designed to cater the need of entertainment and security purposes for the Britishers; e.g.- Maidan was planned to use as a battle ground. Other community spaces were least emphasised, the number of well-maintained parks, square were a few in number. Democratic spaces were hardly imagined and practiced. Although at the later stage, when the educated native emerged to be the new generation of Kolkata and Bengal many places were chosen for street activities, possession, play to display anguish and exploitation by the Britishers (Mitra, 1982). Two parts of Kolkata, British dominated south and native dominated north was uniquely different in terms of representation of space. The British swore by clean, well ventilated and spacious public spaces whereas the Indian dominated was filth, small spaces. There were also differences of designs and motives towards limiting the native space in terms of their utilitarian and maximum use (Choudhury, 2017).
- *Post-Independence (1947-1965)*: Initial period was seen as a vibrant character where people and various political parties used spaces in multiple dimensions like- playground, small markets, dedicated space for democratic gathering and possession. Some of the very popular movements like Food Movement, Land Reform Movement were popularised through varied street activities like street drama, wall art, cultural programmes, stage protests etc.
- *Naxalite Regime (1965-1977)*: This regime is characterised by the perpetuated fear by radicals which started in the northern part of the state, a small village Naxalbari of Darjeeling. (Punwani, 2009; Doner, 2011). Berman (1982) suggested, urban life has been vital in shaping visions of a better world and the attending imagery. Implicit in his and their accounts is the assumption that a bourgeois modernity would be desired and would emerge, as 'traditional' patterns and associations, affective ties and 'backwards' institutions, especially caste and gender discrimination, were left behind. However, in the view of these middle-class men, while the colonial city was on the way up, the post-colonial city for a long time did represent this desire, but fell short in terms of the fulfilment of such modernist visions. In this version of the 'idea of India' (Khilnani 1997), modernity gets unstuck in a narrative within which partition and independence reversed the processes that brought the middle-class within the orbit of utopian urban imageries, and while the post-independence period saw Delhi and Bombay flourish in the new nation, Calcutta lost most of its lustre as cosmopolitan communities left, investment fled and thousands of refugees flocked into the city. The city not only lost investment, but the city public space was full of fear from the police as well as from the extremist radical forces.
- *Leftist Regime (1977s-1990)*: Although the initial phase the public spaces were seen as the urban common property resource. At the later stage the public space has been the means of controls where democratic rights violated for the greater political establishment. Many protesters were accused and sentenced in the name of maintenance of law and order. Public spaces specifically serving cultural, and literary practices happen were emphasised by creating Nandan, Academy of Fine Arts, Madhusudan Mancha, where frequent cultural occasion organises. (Choudhury, 2017).
- *Neo Liberal Regime (1990s onwards)*: Public spaces in Kolkata is still vibrant, while there are some restrictions to use it as an extreme political platform. The Infrastructure has improved a lot, but there are still lags for the different abled and elderly people. The creation of Open Theatre in Alipore and beautifying various spaces like Street Corners, Bus Stands, Parks are happening. There is increasing number of public space which are excluding the diverse peoples' access in terms of their wealth now a day. Emerging shopping malls, entertainment parks, private coffee shops are excluding the erstwhile nature. Although the old tradition is still there, new private or exclusive public space are running parallel.

The traditional public spaces are transforming by the impulse of market expansion. Erstwhile the open market is transforming into surveillance controlled malls, Private clubs etc. With the contemporary trend of expansion of exclusive public space like malls, gated complexes, private clubs barring the essence of public-ness of public space. The colonial legacy of racial bias still persists in Kolkata's public spaces by the segregation of various social groups on the basis of age, community, religion etc. (Kaviraj, 1997).

ANALYSIS AND DISCUSSION OF PRESENT SITUATION

Since the middle of eighteenth century Kolkata started to congregated and become an urban space from erstwhile hamlets. Hawlwel, the then Zamindar of native town, divided different localities for different group or caste of people as the existing social hierarchy did not allowed people to live in same place intermingled. The segregation was done on the basis of occupation or social status of different groups of people as even the people belonged to lower status did not associated themselves with the people of lower caste or status than them. To avoid chaos and disruption of social stability it was created. In that time many higher caste or higher status and economically well off people had come to Kolkata from the surrounding villages to keep themselves safe from *Bargi attack* (Maratha invasions of Bengal). In 1937 a storm destructed almost all the houses, which were mostly non-concrete houses. That incidents led to the construction of new concrete permanent structure houses. In the same time people had come to Calcutta from Satgaon and Hooghly as the ports were destroyed or abandoned. After the construction of Fort Willum, Portugese, Dutch and Armenians also came to live in Calcutta, all these led to population increase and make it a compact city (Joardar, 2003).

The tradition of segregation was not only experienced in the arena of residential or neighbourhood segregation, but in the economic sphere. The first municipal market was established in 1874 as the New Market exclusively for the Britishers in the of the British Town of Kolkata, i.e. Dharmatala. Later many municipal market was set up, but they did not get such importance as the New Market got (Sur, 2014). Chaudhuri (2017) identified public spaces of Kolkata are going through transformation by contest among various stakeholders and participation by the users. As Ahmed Says, "by 1974 there were 186 markets within the Calcutta metropolitan area; most markets are the purview of a religious or ethnic community, and are the business centre of that community. Markets in North Calcutta are run by mostly Hindu communities; the Bara bazaar has historically been home to the traders and money-lenders of the Marwari caste, and the Park circus area has Muslim meat markets. Entering a market is not simply a commercial enterprise, but allowance into the world of a specific community. The city is composed of many quarters, described as "mohulla" or "parah." (Ahmed, 1995).

West Bengal Bangla Academy each year conducts Little Magazine Fair at Nandan, Rabindra Sadan premises. But in 2018 they have announced to shift the fair at the premises of West Bengal Bangla Academy Premise at Salt Lake City Centre. Around 150 little magazines have refused to apply for the fair in the Salt Lake citing cosmopolitan and consumer cultural practices and lack of readers due to problems of transportation. Little Magazine Union Platform (Little Magazine Sommonwoy Mancha). According to the Editor of a Bengali Bi-monthly Journal Ekak Matra and One of the member of that Union has identified it as the attack on the sphere of critical thinking where the artists, authors and readers can directly interact each other.

Public Space as democratic space: The city is considered as a vibrant one in terms of its political culture and practices. Issues which are sometimes cultural, religious and social becomes political as the mobilisation of social groups would led to benefit in the election. Hence the public space of Kolkata in terms of politics is highly competitive. Although the city is seeming to provide a level playing field for political exercise there are some controversies like imposing 144 of Indian Penal Code in the College Street which bans all kinds of gathering to safeguard the academic sphere surrounding (Ekak Matra, 2017). Although critics including eminent human right activist, Sujat Vadra identify this action as the attack on the practices of activism and state control of space to silent the voice of dissent.

Public Space towards safeguarding rights of access of children, women, elderly and disabled: Feminists scholars have questioned the subjectivity of the gender and other social groups of people in the sphere of public space. The existing cultural notions and patriarchal set up creates barrier to the women entering the public sphere. The physical infrastructure most of the time restrict the access to the women particularly pregnant, elderly people, children and the disabled. Beside the physical access, social or economic access of the public space is matter of concern. In the beginning of this year, 2108 the West Bengal Govt. has decided to allow to run autos by women drivers through initiating pink auto on a particular route of Tollygunge. But that move was protested by the men auto drivers citing the effect on their business. They also questioned the need of women in this particular sector. (Banerjee, 2018).

Public Display of Affection: Urbanisation has always been gendered biased in the developing countries as the mode of production depends on the patriarchal system. Until the 1960s the city has seen a conservative tradition of maintaining secret on the affection like love or sexual expression. The situations are changing very fast since the enlightenment period and influx of global modern culture. Still publicly display of affection become issue. In a very recent phenomena of April, 2018 a couple have been harassed and thrashed as they were hugging and kissing in the metro rail compartment publicly (India Today, 2018).

The Debate over accessibility by citizen's vs right to the city of encroachers: The city space is debated over the right of people, as 'whose city' in the arena of 'right to the city' concept. The Bengal Famine in 1943 has produced migration of village poor and occupation on the streets of Kolkata. The food movement also resulted into many violent protest in the city of Kolkata. Post partition and Bangladesh freedom movement in 1971 was marked as the influx of illegal migrants and occupation over the streets and footpaths of Kolkata. Operation Sunshine in 1996 to vacate the illegal vendor or occupants of the footpaths was one of the important incident of conflict over the right of footpaths and public space. (Chatterjee, 2004).

Street and Religious Public space: The streets of Kolkata are full of religious practices includes temporary rock goddess to small temples. Shibram Chakraborty, one of the famous satirist prose writer has identified that the ritual of Shani Puja (Saturn) is the result of fear among the citizen (Chakraborty, 1947). He exposed the then situation of religion and fear over public life, which is reflected on the public space.

CONCLUSION

This research aims to explore in details the critical dynamics of socio-spatial transformation of spaces used by people and controlled by the authority. From the above discussions, it can be attributed that the public space and public sphere of Kolkata was not a simple and linear aspect to conceptualise. Its transformation was carried out by various agencies vis-à-vis public policies, which sometimes helped people to enjoy earnestly and otherwise detrimental to exercise their rights. Economic state of the state guided by the country has determined the inclusivity of the space. The dichotomy of citizens' right to access versus the right to the street dwellers now a day major issue to be sorted. This will indeed be useful for the future planning for a sustainable community life that is increasingly "inclusive" and "participatory".

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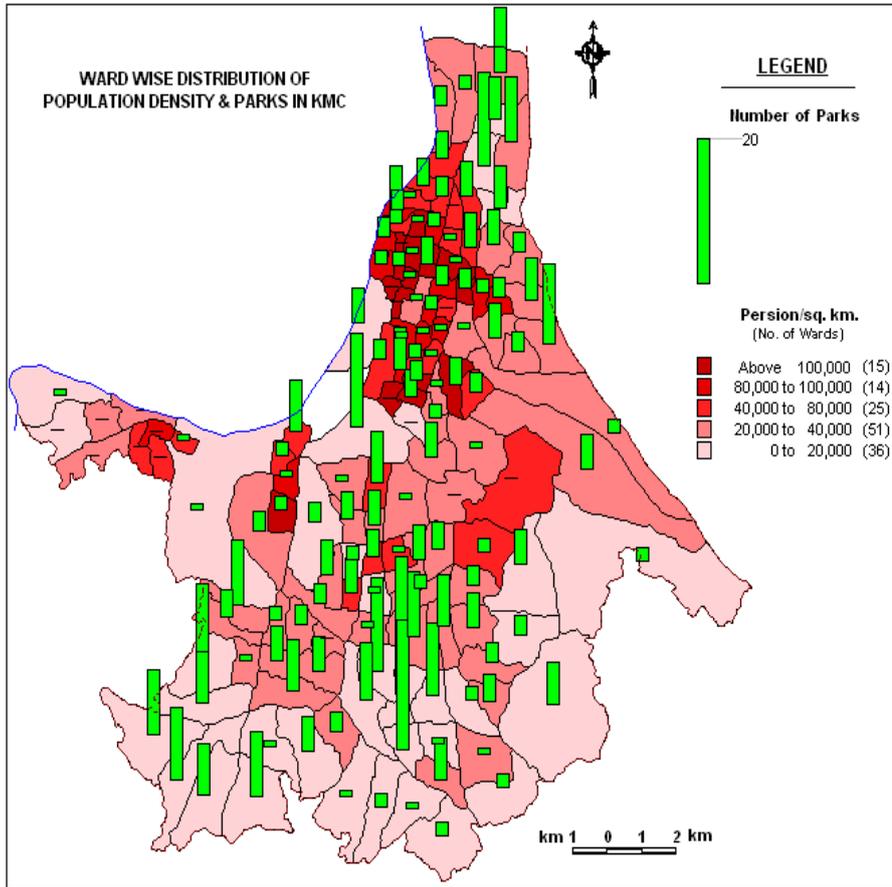
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NOTE

The author possesses supportive photographs if necessary.

REFERENCES

- Banerjee, 2018. En route to breaking glass ceiling, eves at wheels hit male wall. Times of India. Online Available: <https://timesofindia.indiatimes.com/city/kolkata/en-route-to-breaking-glass-ceiling-eves-at-wheels-hit-male-wall/articleshow/62877802.cms> [Accessed 30 April 2018].
- Berman M. 1982. *All that is Solid Melts into Air: The Experience of Modernity*. New York: Simon & Schuster
- Berman, M. 1986. Take it to the streets: Conflict and community in public spaces in *Dissent*, Vol. 33, No. 4, pp. 470–494
- Bhadra, S. 2017. Hok Kolorob Kolej Square in *Ekak Matra*, 18(1): 42
- Brown, 2006. Urban Public Space in the Developing World – a Resource for the Poor. In Alison Brown (ed) *Contested Space* pages 17-34. UK: ITDG Publishing.
- Carr, S. Et all. 1992. *Public Space*. Cambridge University Press.
- Chatterjee P (2004) *The Politics of the Governed: Reflections on Popular Politics in Most of the World*. New York: Columbia University Press.
- Chaudhuri, D. 2017. “Realities and Myths of Public Spaces: Conflicts and Participation in Kolkata”, *International Journal of New Technologies*, Vol-8(1), pp-337-343
- Darshini Mahadevia . 30th November, 2015. Public spaces make cities. [ONLINE] Available at: <http://www.downtoearth.org.in/blog/public-spaces-make-cities-44492>. [Accessed 14 April 2016].
- Goheen, 1998; Public Space and the Geography of the Modern City *Progress in Human Geography* 22,4 (1998) pp. 479–496
- Gupta, S. 1993. Theory and Practices of Town Planning in Calcutta, 1917 to 1912: An appraisal in *The Indian Economic and Social History Review*, 30(1).
- Harvey, D. 1992. Social postmodernism and the city in *International Journal of Urban and Regional Research*, 16(4), pp. 588–601
- Indoia Today, 2018. Online Available: <https://www.indiatoday.in/fyi/story/kolkata-couple-beaten-black-and-blue-for-hugging-in-a-metro-1223929-2018-05-01> [Accessed 1 May, 2018].
- Jacobs, J. 1961. *The Death and Life of Great American Cities*. New York: Vintage Books.
- Joardar, Biswanath. 2003. *Anya Kolkata*, Kolkata, Ananda Publishers)
- Kaviraj, S. 1997. “Filth and the Public Sphere: Concepts and Practice about space in Calcutta,” *Public Culture* 10(1). Pp- 83-113
- Khilnani S. 1997. *The Idea of India*. London: Hamish Hamilton.
- Lefebvre, H. (Translated by D. Nicholson-Smith), 1991, *The Production of Space*. Cambridge, UK: Blackwell.
- Mitchell, D. 1995. “The End of Public Space? People’s Park, Definitions of the Public, and Democracy” in *Annals of the Association of American Geographers*, 85(1). pp. 108-133
- Mitchell, D. (2003) *The Right to the City: Social Justice and the Fight for Public Space*. London, UK: Guilford.
- Mitra, 1982: *Kolkata Darpan*. Subarnarekha, Kolkata
- Nisith ranjan Roy, 1986. The Profile of a City. Calcutta: K P Bagchi and Company, Pp: 60(Original), Jwardar, 2003: 24-26.
- Pal, B. K. 2014. Urban Shanties- Insecure Space, Insecure People (Unpublished M. Phil. Thesis Submitted to IDS Kolkata
- Punwani, 2009. The ‘70s Rebel. The Times of India. Online Available: <https://timesofindia.indiatimes.com/india/The-70s-REBELS/articleshow/5109980.cms> [Accessed 1 May 2018].
- Ruddick, S. 1996. Constructing difference in public spaces in *Urban Geography*, 17(2), pp. 132–151
- Sinha, P. 1978. Calcutta in Urban History. Firma KLM Private Ltd. Calcutta
- Slater, J. J. 2004: The Erosion of the Public Space in Counterpoints, Vol. 263, *Pedagogy of Place: Seeing Space as Cultural Education* (2004), pp. 35-52
- Soja, E. W. 1989. *Postmodern Geographies: The Reassertion of Space in Critical Social Theory*. London, UK: Verso.
- Staeheli, L. A. and Mitchell, D. 2004. Spaces of public and private: Locating politics. In C. Barnett and M. Low, editors, *Spaces of Democracy: Geographical Perspectives on Citizenship, Participation and Representation*. London, UK: Sage, pp. 147–160
- Sur, 2014. *Tinsho Bochorer Kolkata: Potobhumi o Itikotha*, Ujjawal Sahitya Mandir, Kolkata.
- Walzer, M. 1986. Pleasures and costs of urbanity. In P. Kasinitz, editor, *Metropolis: Center and Symbol of Our Times*. New York, NY: New York University Press, pp. 320-330
- Young, I. M. 1990. *Justice and the Politics of Difference*. Princeton, NJ: Princeton University Press.
- Zukin, 1995. *The cultures of cities*. Cambridge, MA: Blackwell



Source: Prepared by M. Haque based on information from CCC (2011), Census 1981, & 2001, Ilair, P.T. (1995)

Fig 1: Ward Wise Population Density and Distribution of Parks, 2011 (Maps Prepared by Sk. Mafizul Haque)

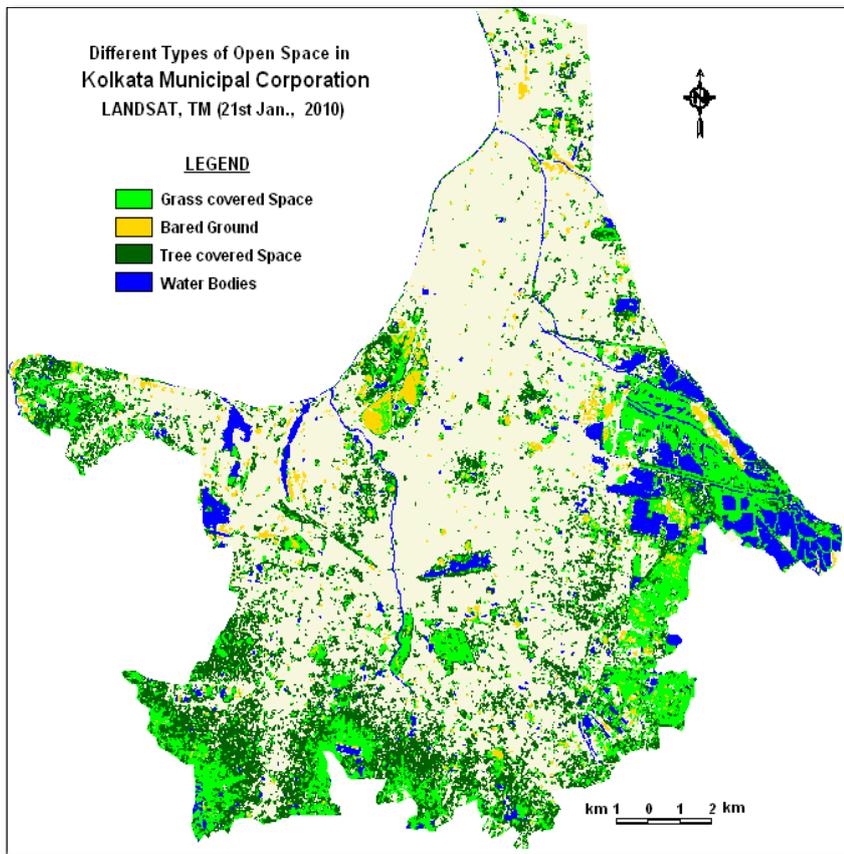


Fig 2: Different Open Space in KMC Area, 2010. (Maps Prepared by Sk. Mafizul haque)

1551 AVAILABILITY OF BASIC AMENITIES IN CENSUS TOWN AND STATUTORY TOWN: A STUDY ON WEST BENGAL, INDIA

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1 INTRODUCTION

The longstanding metrocentric research orientation in the urban and regional research arena heavily incorporated the world cities as a unit of analysis, focused only on the large financial center. The traditional urban research in India also experienced 'academic bias' towards metro cities Gill (2013) (what is academic bias). But the urban experience of India in this early decade attributed by the growth of small and medium town influenced by the tremendous growth of census town shifted the focus from 'metrocentricity' towards small town (Scrase, Rutten, Ganguly-Scrase, & Brown, 2015).

We are living in an "urban age" where for the first time in history, more people are living in cities than the countryside (Mcguirk, 2010). On the perspective of India's urban transition, for the first time, the absolute increase of urban population is more than the rural counterpart (R B Bhagat, 2011). But the dynamics of urbanisation depends on the definition of urban area and the varied narratives about the conception of "urban" which lead to the problems of a universal definition of urban area. The government of India uniquely defined the urban area endowed by the administrative conception which is known as statutory town as well as by functional conception which is known as census town. The statutory town are those which have a municipality, corporation, cantonment board or notified town area committee, etc. These towns are notified under the law by the state/UT governments and have local bodies like municipal, corporations, municipalities, municipal committees etc. without any consideration of their demographic characteristics (RGI, 2011). The census town are those settlement unit which have a minimum population of 5000, a density of population at least 400 persons per sq. km. and at least 75 percent of male main working population engaged in non-agricultural pursuits (RGI, 2011).

In this early decade India as well as West Bengal experienced an unprecedented growth of census town contrary to the stagnating growth of statutory town. The total number of new census town in West Bengal is 537 which is highest in India followed by Kerala. The reclassification of rural areas into census town contributes 66% to the urban growth for West Bengal for 2011. Out of 537 new census town, the number of town having a population less than 20000 are 517 containing 72.4% of the population. This kind of urban transition interested me to take the state as a case study for studying of the quality of service provisions and household quality of living in census town of West Bengal.

As the urban population and income are rising, the demand for major services such as water, sewerage, environment treatment, low-income housing is increasing five to seven-fold in cities of all type and in every size (Planning Commission, 2012). The responsibilities of providing those basic amenities lie to the urban local bodies. The central difference between the census town and statutory town is their governance status where statutory town is governed by its local urban body and the census town by the village panchayat. The village panchayat itself is funded from the rural development ministry and mainly dependent on the scheme of the central and state government. But the panchayat status may not be enough for the census town for providing basic services which is quite different in nature. On the other hand, statutory town can generate tax and non-tax revenue for undertaking planning and development of the municipal area (Kundu, Bagchi, & Kundu, 1999). In this perspective, the major objectives of the study is to know the difference in availability of basic amenities between the census town and statutory town. Whether the administrative status of census town and statutory is a matter of fact for availing basic services is an arena of inquiry in this study.

2 CENSUS TOWN AND CHANGING NARRATIVES ON URBANIZATION IN INDIA

The unprecedented increase in census town challenges the several viewpoint on conventional urbanisation in India. The growth of census town discards various preconceptions about urbanisation which associate urbanisation with migration, municipalities with urban areas, villages with agriculture and cities with manufacturing (Mukhopadhyay, 2012). These census town emerges as the in-situ transformation of village mainly by the agricultural to non-agricultural workforce transformation without having little role of migration mainly governed by the rural panchayat. By challenging the popular conception about stagnating and unproductive smaller town, the census town emerges as an economically vital settlement in India. These dynamics of census town also opposing the traditional concept of urbanisation by urban sprawls through the in-situ transformation of village into an urban area (Jenkins, 2012).

One of the important aspects of the census town is its spatial dynamics. Contrary to the previous experience, a significant proportion of census town emerge beyond the metropolitan influence (Guin & Das, 2015; Pradhan, 2013). One of the interesting thing portrayed by various scholars that spatial transformation or land use of the statutory town is not confined within its administrative boundaries (GSURR, 2015a). Even the probability of becoming census town is not unidirectional where the transformation of village and census town can be of both ways (Sidhwani, 2014). Generally, the village transforms into census town by the shifting of the agricultural worker to the non-agricultural sector. But, on the contrary, the opposite transformation can also happen by the shifting of the workforce from non-agricultural to the agricultural sector.

The growth of census town is a debatable part in the academic arena. Kundu (2011) coined the term "census activism" where the census town is growing due to the discretionary power of the census official. But Guin & Das (2015), argued

that this unprecedented growth of the census town is not due to the census activism, but due to the distress driven sectoral diversification of the rural economy. The agricultural distress in the rural areas forced to the shifting of labour into the non-agricultural sector. But Samanta (2013) put her argument in an opposing manner by arguing that the agricultural surplus and the consequent movement of surplus from farm sector to non-farm sector led the shifting of the workforce to the non-agricultural sector.

3 CONTESTATION FOR ADMINISTRATIVE STATUS IN THE CENSUS TOWN

The scholars in the academia have contesting articulation about the pros and cons of having rural panchayat in census town. The rural panchayat itself have no specific institution for improvement of infrastructural facilities and basic amenities in census town, contrary to the statutory which is better equipped to provide the basic infrastructure and services to the citizens (Samanta, 2013b). Even the haphazard growth of building areas, degradation of local environment due to increased industrial activities, and land acquisition issues will be easy to handle by the statutory body.

On the other hand, the census town can avail various schemes and government funding from the state and census government (Sivaramakrishnan, 2011). Except this, they can lose the attraction of industry, which now a days have more interest to set up in the rural areas (Anuja, 2012). Even it is not always necessary to set up urban local bodies for own resource generation and supply of services where the panchayat can be creative by raising various types of revenues (Anuja, 2012).

At the local level, various types of socio-political interests e.g. tax structure, service provision, access to basic services, land regulations, interests of certain social groups augment the complexities of classification from census town to statutory town (GSURR, 2015b). Usually, the residents of census town go against the urban status because of giving a higher level of tax for the urban service provisions. But this situation is not universal, where sometimes people are ready to pay tax if they get proper services (Jenkins, Anuja & Gadgil, 2012). The various packages for rural areas like MGNREGS, IAY, etc. provoke people to stay under rural governance as the accessibility to this scheme mainly available for those who live under the panchayat body. The class and caste dynamics also played a key role where the low caste and class are against the urban status by which they will lose the rural schemes. On the contrary, the wealthier wards are in support of the municipality by which they want to get affordable access to basic amenities, water, sanitation, solid waste management, etc. (GSURR, 2015b). Sometimes the administrative status is framed in a local elite framework where local politicians and businessmen who have better connections to the higher level governments have a good deed for an urban status.

State machinery also plays an important role in the contestation of providing of urban status. According to the 74th constitutional amendment, local bodies have to prepare their own development plan and generate their own resources (Bhagat, 2005). But the actual classificatory power from rural to urban administration vested on the state machinery (Bhagat, 2005 ; Sivaramakrishnan, 2011). This has created anomalies in the classification from rural to urban, where sometimes state government do not have any will to devolve power to the local bodies for keeping control over the essential facilities like sanitations, water, town planning, etc. (Roche, Mathew, & Yusuf, 2013). Even sometimes, state machinery becomes pro-urban status because of showing the high urbanization scenario in the state. In the case of Tamilnadu, the municipalisation was boosted by the state government with the impressions of becoming of most urbanised state in India (Bhagat, 2005).

4 PERSPECTIVE ON BASIC AMENITIES AND POLICY IMPLEMENTATION IN CENSUS TOWN

There is limited research on the condition of basic amenities in census town due to the academic bias towards metrocentricity. There is no macro level study on the provisions of services to the census town except some case study and report. The recent researches mainly focuses in the small urban local bodies, but the census town and their condition of basic services is beyond the scope of this study. Even, the research on rural studies, conventionally, did not include the census town in their research arena. Most of the research on the basic services highly engaged into showing the systematic decline of basic amenities from metro cities to small town. In case of the distribution of the service like electricity, there have no difference between census town and statutory towns (GSURR, 2015b). In the study on Singur, Samanta (2014) argued that due to the limited financial resources to provide better infrastructure and services, the overall condition of water supply, sanitation and roads is very poor. The level of infrastructure and services in the census town, they are far from the required by an urban area.

There are various types of complexities in implementing government policy in the census town because of its rural governance. The JNNURM scheme cannot be applied to the census town because it is ruled by rural panchayat (Khan, 2014). Though the 74th constitutional amendment has shaped the third tier of governance, the smaller urban local bodies are unable to perform most of the specified functions (Khan, 2014). The small town is hardly better than the rural areas regarding basic amenities e.g. electricity, sanitation and clean drinking water (Bhagat, 2013). Government have declared RURBAN mission which has a huge potentiality for the census town as well as small town (Nair & Sethi, 2014). The issues of the peri-urban areas and census town and disparity among various settlement could be solved by the mission (Nair & Sethi, 2014). Even the PURA scheme cannot be implemented to the census town for boosting the rural administration (Bhagat, 2013).

5 OBJECTIVES OF THE STUDY

From the above background, it can be summarized that the census town is a contesting space in terms of its politics and governance. Multiple stakeholder are contesting each other for or against the statutory status in the census town. Even

some government policy cannot be implemented to the census town because of its rural government. Even most of the research highly concentrated on metrocentric work flowing the persistence neglects towards small town. So, this study tries to contribute to the above research gap by showing the existing condition of basic amenities in census town and statutory town. So, the major objectives of the study is to contribute the above debate by finding out the existing gap in basic amenities between the census town and statutory town

6 DATA AND METHODOLOGY

This study have been done harnessing the houselisting and housing data at the census town and statutory level of the census of India of 2011. The difference in basic amenities between the census town and statutory town have been shown through a unique line diagram. The maximum covergae of household of any amenities in a census town or statutory town is 100 percent. So, the 100 percent have been divided into ten equal interval and for each division, the percentgae of census town and statutory town.

Table 1: Percentage of census town and statutory town in each division of household coverage

Coverage of household of any basic amenities	Percentage of Census town	Percentage of statutory Town
0-10 %	↓	-
10-20% to 90-100%	↓	-

Source: Author’s own

Then the line diagram has been drawn by putting the division of coverage of household in X axis and the percentage of census town and statutory town in the Y axis. Then the up- bars and down-bars have been put into the line diagram where the white coloured up-bars are showing the proportion of census town are better than the statutory town, on the other hand, the black coloured down-bars are showing the proportion of statutory town better than the census town.

Three major amenities have chosen for showing the difference in availability between the census town and statutory town i.e. water, sanitation and electricity. The following indicator have been taken for water, sanitation and electricity-

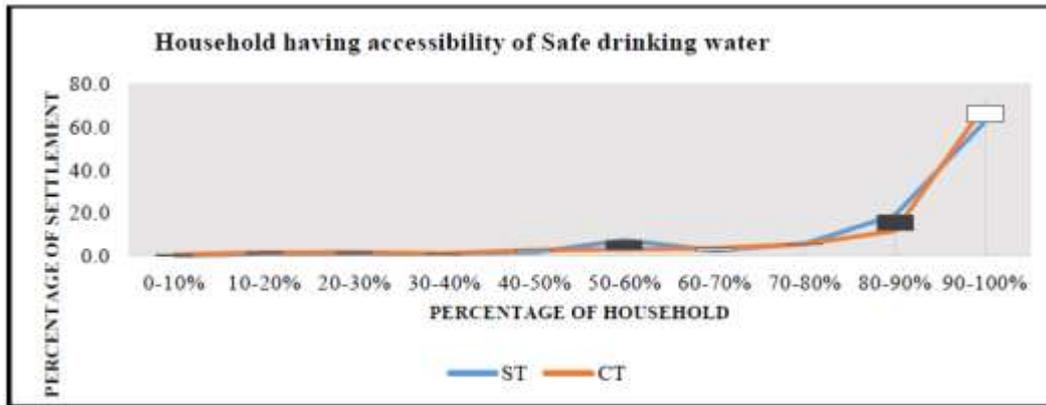
- a) Water: Percentage of household having access to safe water and percentage of household having tap water from treated
- b) Sanitation: Percentage of household having latrine within premises and percentage of household having closed drainage for waste water outlet
- c) Electricity: Percentage of household having accessibility to electricity

The population size of census town and statutory town and their availability of basic amenities also studied. But it is a difficult task to divide the census town and statutory town because Only 14 census town has population more than 30000 population, and only 15 statutory town have a population below 30000 population. So, scatter diagram have used to show the basic amenities and size class division of census town and statutory town

7 DIFFERENCE IN BASIC AMENITIES BETWEEN CENSUS TOWN AND STATUTORY TOWN

The improvement of the governance structure at the local level is a necessity to ensure the provision of basic services to the citizens. One of the critical concern were raised in the ninth five year plan about the ever increasing gap between the demand and supply of basic services (Planning Commission, 1997). Though the challenges of providing civic amenities in the urban area is multifaceted, most of the scholar emphasizes on the three elements e.g. drinking water, sanitation and electricity (Shaw, 2007). Safe drinking water have multidimensional influence in improving quality of living, reducing incidence of disease and deaths, cutting off health expenditure etc. *Safe drinking water here refers to the of sum of the variable of source of drinking water from tap water from treated sources, covered well, hand pump and tube well/borehole.* The percentage of household having accessibility to safe drinking water for the census town and statutory town is 88.05 percent and 86.41 percent respectively (Table C3A1). But There don’t have any significant disparity between the census town and statutory town in terms of household accessibility of safe drinking water as both the line of census town and statutory town overlap each other (figure 3.10).

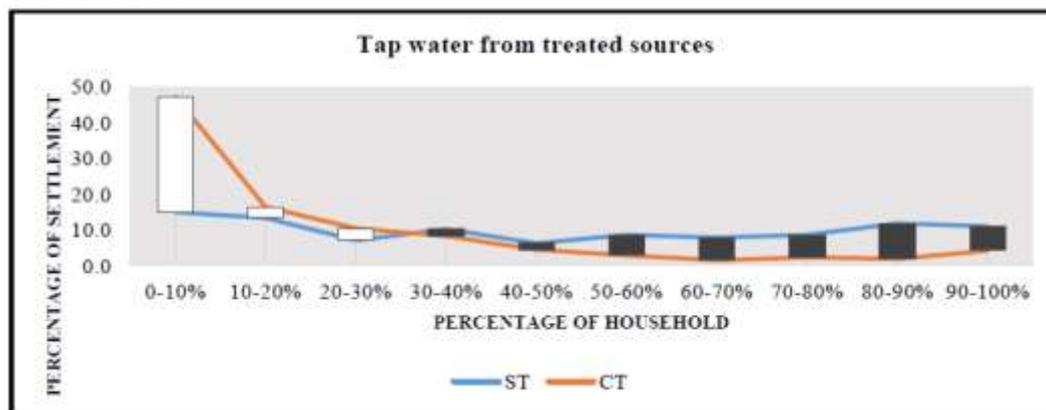
Figure.1: Comparison between census town and statutory town in household having accessibility to safe drinking water



Source: Census of India, 2011.

One of the major source of safe drinking water in the urban area is through tap water system. The coverage of household with tap water system is a reflection of the state intervention directly or through the local government (A. Kundu, 1993). So, the lower participation and capability of the governance influence the coverage of the population through tap water system. The percentage of household covered by tap water from treated source in the census town and statutory town is 21.28 percent and 47.91 percent (Table C3A1). But when it is coming for the individual town unit, it is showing that there is no clear cut division between census town and statutory town. Some proportion of census town is well performed than the statutory town as well as some proportion of statutory town is well performed than the census town (Figure 3.11)

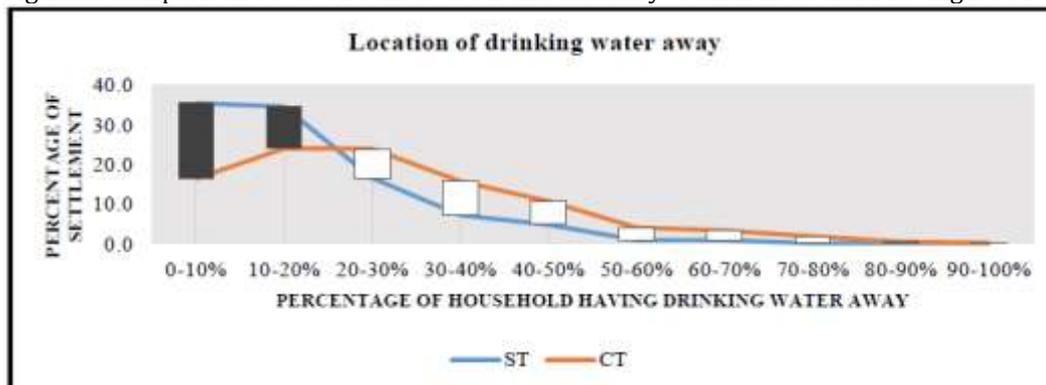
Figure.2: Comparison between census town and statutory town in household having accessibility to tap water from treated sources



Source: Census of India, 2011.

Location of drinking water have important implication from governance perspective and economic status of household. Provision of drinking water within the premises designate the economic status of the household in some extent. On the other hand, the location of drinking water away from the premises indicates the government intervention in providing drinking water to the household. But the availability of drinking water have important implications for more gender empowerment as girls and women are used to fetch water for household and they will get relieve if it became available to the premises (Das & Mistri, 2013). It is showing that the 26.62 percent of household of census town and 16.81 percent for statutory town use to get water from away to premises. From the figure 3.12, the white up-bars indicates that census town have more concentration of household having location of drinking water away from the premises. In that context the laggard economic condition of household in census town leads attract the government attention on the supply of drinking water.

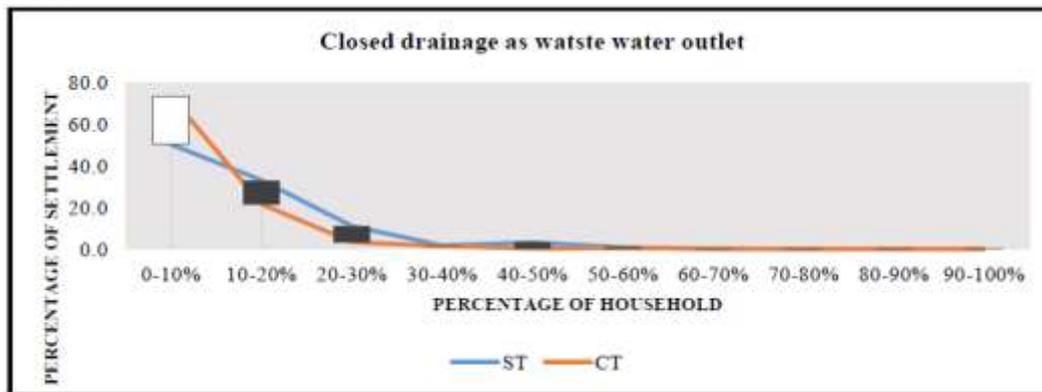
Figure.3: Comparison between census town and statutory town in household having location of drinking water away



Source: Census of India, 2011

Sanitation sector is one of the important sector where government intervention is very much necessary. In India, there is a problem of open defecation. It is revealed in the census of India in 2011 that one in two people in India use to defecate in open space. The latrine facilities within the premises conceals the effort of the peoples at sanitation. The public latrine and the latrine away from the premises indicates the government effort on sanitization (Shaw, 2007). The percentage of household having latrine within the premises for census town is 70.73 percent and for statutory town is 82.73 percent. The percentage of household having flush latrine in statutory town is 60.32 percent and in census town it is 31.73 percent. This indicates that the modern type of sanitation facilities is available in the administratively important towns. But the percentage of public toilet have only 2.94 percent for census town and 3.83 percent for statutory town. This also reveals that there is minimum governance intervention in the sanitation sector.

Figure 4: Comparison between census town and statutory town in household having closed drainage for waste water outlet

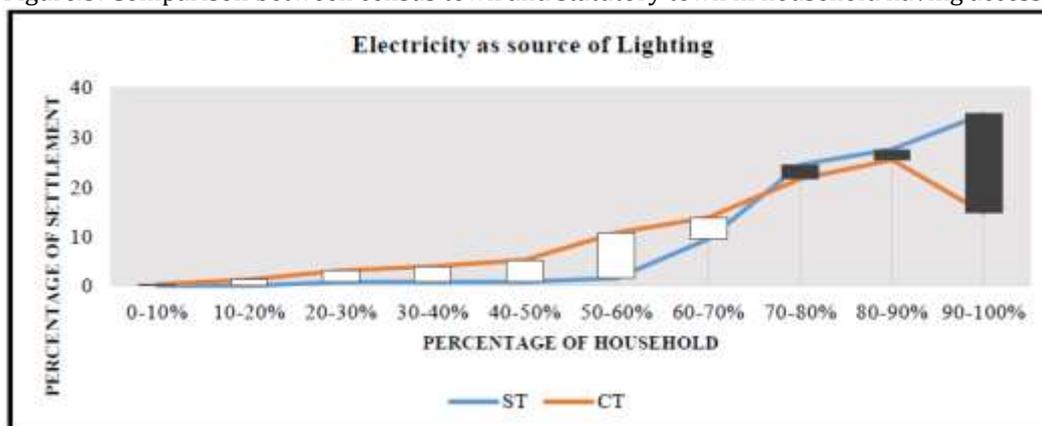


Source: Census of India, 2011.

Closed drainage for waste water is an important effort of the local bodies where the construction and functioning of the drainage lies on the local governance. The micro environment of the local area depends on the sewerage and drainage system which have important health implications. Among the others, closed drainage is hygienic as well as good for health (Haque, 2016). The percentage of household having closed drainage system in census town is 7.57 percent, on the other hand it is 12.46 percent for the statutory town (Table C3A1). When it is coming to individual level settlement unit, it is showing that there don't have much difference between the census town and statutory town in terms of closed drainage as waste water outlet. It is evident that there is minimal state intervention in sewerage system in urban area, albeit the statutory town is well performed than the census town.

The supply of electricity is a function of state government and the magnitude of availability replicates the priorities of the state government. One of the optimization of planners in India is the universal coverage of electricity in India (Planning Commission, 2013). The percentage of household having availability of electricity in census town is 71.38 percent and 82.56 percent in statutory town (Table C3A1). But some census town is well performed than the statutory town which replicating the asymmetrical functioning of the local bodies in providing electricity.

Figure.5: Comparison between census town and statutory town in household having accessibility of electricity



Source: Census of India, 2011.

Is size an important parameter?

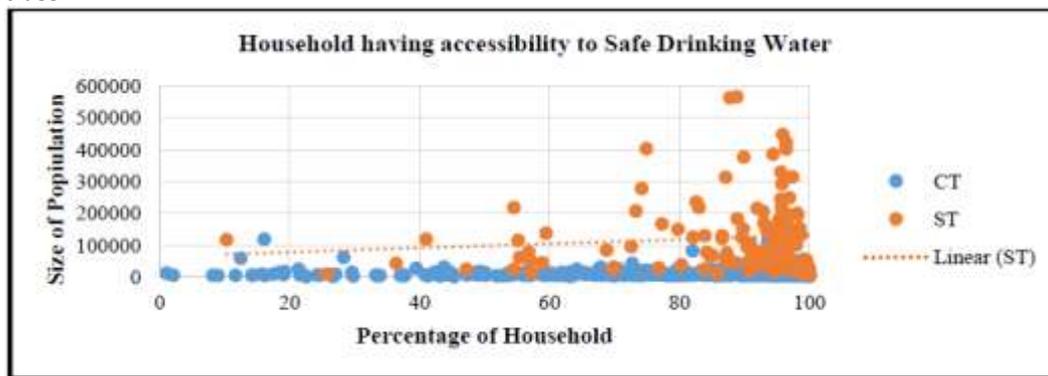
Size class division of town has an important implications for the provision of basic amenities in urban area. The provision of basic amenities in urban area follow a systematic decline according to size class division of town (Kundu et al., 1999; Bhagat, 2011 ; Shaw, 2007; Khan, 2014). The big city is well performed in terms of basic amenities and infrastructural development than the small city. The omnibus project JNNURM taken by the government for urban renewal have been suffused with complexities in resource allocation. Its UIG and BSUP scheme are for the allocation to big city, on the other

hand, UIDSSMT and IHSDP focused on the small town. But it is observed that the big city scheme UIG and BSUP got more resource allocation than the small town scheme UIDSSMT and IHSDP (Khan, 2014). Even in the small town UIDSSMT and IHSDP, the larger town have received more central assistance than the small town and cities. Above all, the JNNURM scheme cannot be apply to the census town because of its governance by the rural panchayat (Khan, 2014).

In this perspective, it is the central task to identify the size class bias in basic amenities in statutory town and census town. The statutory town is enriched with the municipal body for conducting any task relating to provisioning of basic amenities to the citizens. On the other hand, census town is non-statutory in its nature governing by rural panchayat. So, it's totally depend on the schemes of the state government and central government for providing basic amenities to people. Although by being an urban area in terms of its demographic and economic parameter, the JNNURM scheme cannot be applied to this space because of its rural governance.

Unlike the previous study, the role of size class division in census town and statutory town have been shown through the scatter diagram. The outcome is also similar like the previous one where it is showing that the size class division only works for the statutory town. There cannot be found the size class regularity in provision of basic amenities for the census town. It can be found that with the increase of population in the statutory town, there is also increasing provision of safe drinking water (Figure 3.17). On the other hand, there is no regularity with census town with their size in the provision of safe drinking water. Location of drinking water away indicates the inability of the household to install the tap water or tube well in their premises. On the other, most of the drinking water sources outside the premises are due to the government intervention in drinking water supply.

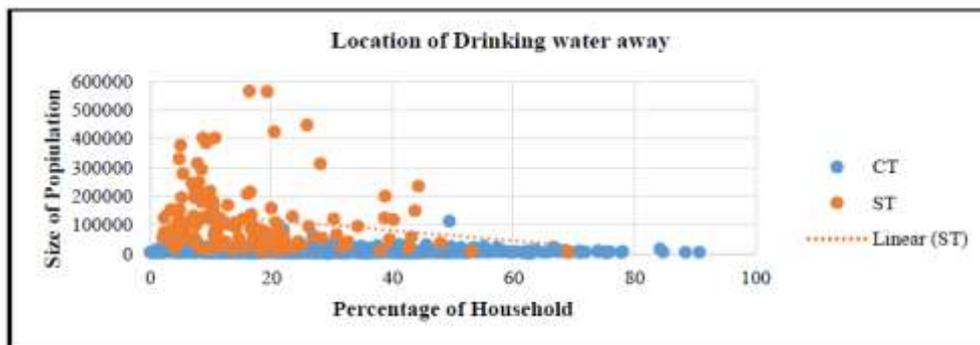
Figure.6: Distribution of household having safe drinking water in census town and statutory town according to their size class



Source: Census of India, 2011

The following figure demonstrate that the decrease of population of the statutory town, the number of household having drinking water away is increasing (figure 3.18). So, the household of small and medium size statutory town are mostly depended on the water sources away from their premises. Thus it can be argued that laggard economic condition of the small and medium statutory town may be responsible for the dependency on the household having location of drinking water away from their premises.

Figure.7: Distribution of household having location of drinking water away in census town and statutory town according to their size class

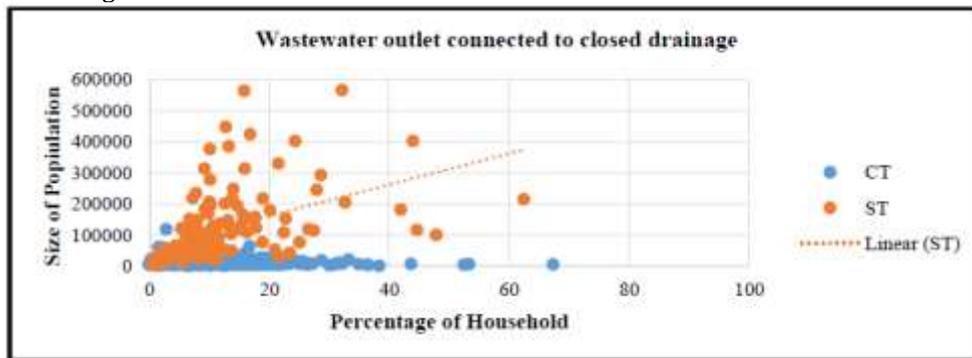


Source: Census of India, 2011

Wastewater outlet connected to the closed drainage have an implication for the microenvironment of the town and cities. The coverage of the household having connection to closed drainage depends on the functionality of the local bodies. From the below graph, it is showing that in the statutory town, with the increasing of the population size of the statutory town, the household having closed drainage increased (Figure 3.19). So, it can be argued that local bodies of the higher order cities have more capability than the lower order cities in managing the micro environment of the cities. Almost the similar findings can be found in case of electricity coverage of household (Figure 3.20). As the demand of electricity for household consumption more in higher order statutory towns, the government is also more engaged in supply the electricity to the citizens. But the local bodies of the lower order cities have less capability to provide the electricity connection. The higher order cities have more electricity connection than the lower order statutory town. The lower

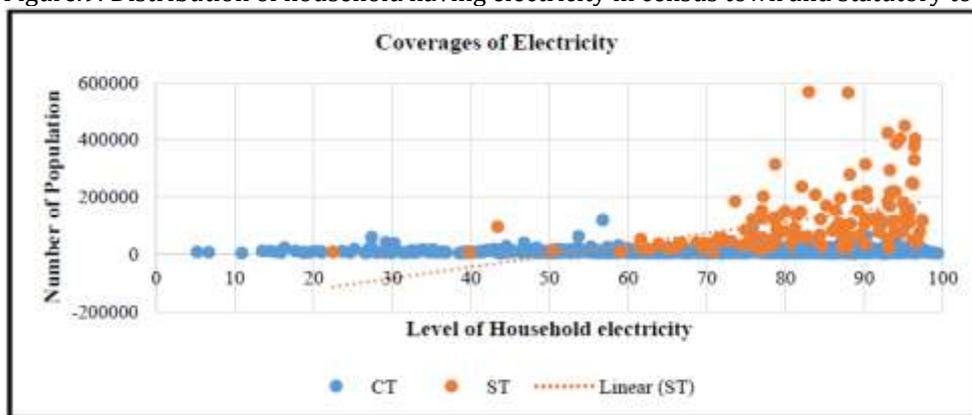
order statutory town fulfilled their demand by using fuel wood, coal etc. in place of LPG. So in a nutshell it can be concluded that the local bodies of the higher order statutory town have more capability than the lower order statutory town in providing the basic services to the citizens.

Figure.8: Distribution of household having closed drainage as wastewater outlet in census town and statutory town according to their size class



Source: Census of India, 2011.

Figure.9: Distribution of household having electricity in census town and statutory town according to their size class



Source: Census of India, 2011.

8 CONCLUSION AND POLICY IMPLICATIONS

The major objectives of the current chapter are the summarization of the empirical analysis, the policy implication by the empirical analysis, and suggestion for the further work. The complex urbanity of census town motivates to study the basic amenities and household quality of living of those settlement unit.

A quite different and insightful scenario can be found when the individual settlement put on a line graph. The various parameter of the housing shows that there is a blurred distinction between census town and statutory town. Regarding the household having good census house, it is noted that some proportion of census town better facility in getting basic amenities compared to the statutory town. Even a significant proportion of census town and statutory town is overlapped regarding their housing parameter, indicating the similar status between them. This scenario is true for the others variable like household having concrete roof, dwelling room four and above, ownership status as owned, census house as permanent, etc. The pattern of basic amenities and household quality of living in census town and statutory is showing almost the same pattern as like the housing pattern.

The pattern of disparity between census town and statutory town has been tried to analyse across size class division. As the range of population distribution between census town and statutory town is very high, scatter diagram have been used for showing the relation between size of population and housing parameter. The pattern is showing that there is no size class bias for the census town regarding housing. But the size class regularity is only maintained for the statutory town where the trend line is showing that there is a positive relation between the size of the statutory town and household having good census town. On the other hand, it is showing that with the increase in the population size of the statutory town, the household having dilapidate house is decreasing. Unlike the previous study, the roles of size class division in basic amenities and household quality of living in census town and statutory town have been shown in the scatter diagram. The outcome is also similar like the previous one where it is showing that the size class division only works for the statutory town. The size class regularity cannot be found in provision of basic amenities for the census town. Actually most of the census town are small in their nature, which in turn, does not create any class division in terms of housing. On the other hand, they are run by the rural panchayat which does not have any institution for improving the housing in census town. For that reason, the fate of the all census town remains same regarding housing and basic amenities.

A comparison has also been done with the census town and village regarding their housing, basic amenities and household quality of living. Unlike the census town and statutory town, regarding census house, basic amenities and

household quality of living, it shows that some proportion of village receives better amenities compared to the census town. On the other hand, some proportion of census town is well performed than the village. Even, a significant proportion of village has similar good census house as like census town.

The size class divisions of the village and census town and the distribution of basic amenities, housing and household quality of living have been shown in the study. In the previous study, it is already established that there is no pattern of availability of basic amenities with the population size of census town. But according to size class division of village showing that some housing and basic amenities parameter are actually decreasing with increasing size of the village. In the case of housing, the household having good census house and material of roof as concrete are decreasing with increasing size of the village. Even the household having accessibility to tap water from treated source, safe drinking water, the location of drinking water away from premises also decreases with village size. So, it can be asserted that the panchayat is unable to provide the service to the village when the population of the village tends to increase. So, at the policy level there need to empower the panchayat so that they can perform well in providing the service to the citizens.

The insightful findings of the above study leads to the recommendation of some argumentative proposition. First of all, it is the gradation of distribution rather than the crude division among census town, statutory town and large village. The hierarchical classification of Indian settlement system does not acquaint with the hierarchical distribution of housing and basic amenities. Though the statutory town has statutory body for improving the quality of living of the residents, still some proportion of census town is more progressive than the statutory town. Even some proportion of the statutory town has equal quality of living as like census town. This is questioning the functionality of the urban governmental institution in statutory town. In India, the urban local body is suffering from multiple shortcomings ranging from the poor revenue generation to limited people’s participation in decision-making. This is, however, not leading to any difference in the quality of living between census town and statutory town. So, there needs a radical reformation for improving the capability of the urban local body to provide quality services to the residents of cities.

A question about the nature of urbanity in urban space can be raised from the above study. One of the important attributes of India’s present urbanisation process is the “morphing of place” where in-situ village area is transforming into urban one by changing its demographic and economic characteristics. But the new census town is not acquainted with the statutory body for providing urban services to the citizens. So, there doesn't have much difference in housing, basic amenities index in census town and large village. As a consequence, the household quality of living in census town and village has only minimal difference. Sometimes, some villages receives better basic amenities compared to the census town in household quality of living.

Some policy level change is a necessary step towards solving the problems raised by the study. The micro level study at the individual settlement unit is showing that there is a gradation except for the clear-cut divide between the census town, statutory town and large village. But the broader policy perspective in India does not consider the complex settlement character regarding the provision of housing, basic amenities and household quality of living. The current policy experience in India is discretely binary regarding rural and urban. The findings of the study shows that some large village is well performed than the census town, as well as some census town are well performed than the statutory town. So, it is necessary to think about the level of development at the village, census town and statutory town and to implement a policy about them rather than rural-urban binary. So, the micro level study suggests that it is a time in the policy arena to shift from the approach of “one for all”.

The second strand of complexity found in the relative performance of urban local bodies and the utility of decentralisation. As some census town is well performed than the statutory town, the performance of urban local body as well as the rising academic judgment towards establishing urban governance in census town needs interrogation.. As some census town is prosperous even under rural governance, and some statutory town lagged behind census town even after urban local body, it is necessary to think beyond the establishing urban local bodies in census town.

Table C3A 1: Descriptive statistics of basic amenities of census town and statutory town

	N		Mean		Variance	
	CT	ST	CT	ST	CT	ST
Tap water from treated sources	783	127	21.28	47.91	650.81	966.47
Safe drinking water	783	127	88.05	86.91	369.92	259.57
Location of drinking water within premises	783	127	37.04	53.2	697.87	571.55
Location of drinking water away	783	127	26.62	16.81	297.44	145.56
Source of light as electricity	783	127	71.38	82.56	361.31	160.89
Latrine facility within premises	783	127	70.73	82.7	452.7	225.16
Flush Latrine	783	127	31.73	60.32	371.14	405.46
Pit latrine	783	127	37.71	21.61	487.27	270.08
Public Latrine	783	127	2.94	3.83	17.72	20.09
Having bathroom	783	127	44.9	67.13	526.97	390.11
Waste water outlet connected to closed drainage	783	127	7.57	12.46	54.09	104.26
Waste water outlet having No drainage	783	127	65.82	36.44	477.11	594.92
LPG/PNG	783	127	21.88	46.53	315.38	416.01

Source: Census of India, 2011

1612 SOCIO-SPATIAL UNDERSTANDING OF INTER-RELATIONSHIPS BETWEEN CRIME SPACE AND GENDER: AN ANALYSIS OF MURDERS IN KOLKATA

Ratrita Pal

ABSTRACT

Space governs the occurrence, frequency and nature of crime. In fact whatever one does and how, varies with circumstances and settings. Thus nature of crime doesn't just exhibit spatial variation but also genetic variability in terms of causal, co-relational and co-happenstance explanation. The objective of this study was to find the locational variability of occurrence of murders in Kolkata using hot-spot analysis, the gender-based difference in victim-perpetrator/accused relationship and to find the different causes behind these crimes. According to NCRB, murder is the most prominent of all cognizable crimes in India with a growth percent of 7.39% (1953-2006). As a social menace it is of utmost concern as it affects human resource doubly, first it curbs a life and second it cages at least another per incident. Data was collected from Crime Records Section of the Detective Department of Kolkata Police for a period 2012-2015. Inferential statistics and different techniques from GIS platform were used to derive outcome and map it. While Tiljala, Jadavpur, Patuli, Burtolla and Entally police stations recorded maximum number of murders, male murders by male outnumber the other gendered victim-accused relationships. Female murders committed were more in the other categories than the 498-A cases. The reasons behind the murders also varied across the city. Of the various causes, previous grudge was found to be dominant in cases of both male and female murders. Blunt wounds, burns, hanging and sharp wounds were the major causes of death of the victims.

Keywords: Violent crimes, crime-space, gender-space, victim-perpetrator/accused relationship, hot-spot analysis

INTRODUCTION

'Crime' more often becomes an Abstract noun that generates fear, which often has greater impact than the actual events of crime (Evans & Fletcher 2000). Similarly, crime can simply be a complex as well as an organised event occurring in a particular spatio-temporal setting (Shaban 2008). On the other hand it is a social construction, where criminals are found as imminently social creations and are conditioned by a spectrum of social dynamics (P. L. Brantingham et al. 2008). It occurs when an offender, a victim and a law intersect in time and space (fig. 1); therefore a criminal activity is non-random in time and space consideration; rather it raises questions about the location and reasons for its location (Andersen 2006) along with a particular pattern.

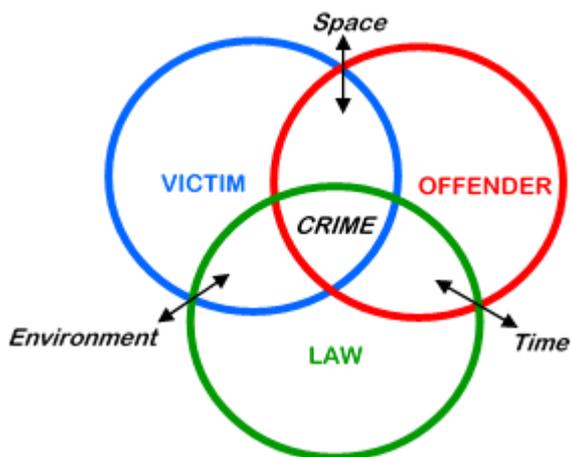


Fig. 1: Conceptual framework of Crime with a close location of space-time-environment setting

Theory of 'Crime pattern' maintains that criminal events occur in persistent, identifiable patterns with time and space dimensions (Brantingham & Brantingham 2013). The spatiality of these patterns are often less than and the fear they generate, thereby affecting significant aspects of daily life, which have been studied closely by human geographers who have examined the interactions between crime, space and society. There is a strong geographical tradition that has focused on mapping crime and explaining its spatial variation (Yarwood 2015). These patterns are temporally structured by routine humane social and economic activities; and are spatially structured by physical and social nodes, paths, and edges that constrain physical activity. They are shaped more deeply by the cultural, social, economic and physical backcloth that underlies any place of human habitation (Brantingham & Brantingham 1993, 2008).

The fact that people are not equally fearful of all places suggests that they understand that crime is not evenly distributed. Hence, the question regarding the 'where' is also an important element in an event of crime. Fear for a space largely depends on one's subjective evaluation of the neighbourhood and the quality of life offered by surrounding environment (Schafer et al. 2006). The perceptual component of crime affects how a landscape is perceived and eventually affects the way of life of the residents of the area, thereby forcing them to negotiate with their quality of life (Foster et al., 2013). The presumption of men's fearlessness coupled with aggressiveness and criminality often overshadows the fact that it the men who are more susceptible to violent crimes, in almost every part of the world. Masculine demand of public space

participation and performance put young men at greater risks of violent victimisation. Fear of violence in both men and women, however, is a function of economic marginalisation and racism (Brownlow 2005).

Crime mapping can be very conveniently considered as an indispensable aid to law enforcement, and has contributed in a significant paradigm shift in policing (Sharon 2006). For these reasons, its strategic implications are also worth considering, particularly the targeted policing of so-called 'hot spots' (Kydnis 2014). GIS plays a crucial role by facilitating the development of the timely and accurate visualization of crime for the combined use of police and concerned civilians (Getis, A. et al. 2000). It helps not only in targeted policing but also reduces socially negative reputation of a place by mitigating the fear of the residents and the commuters. GIS fuses geography with location-based information thereby allowing police personnel to plan effectively for emergency response, determine mitigation priorities, analyse historical events, and predict future events (Johnson 2002). Social Scientists have a responsibility not just to interpret the world, but to try and change it; cartography offers us a powerful tool for action research and a vehicle for promoting social justice (Kydnis 2014). Identifying the problematic zones might act as a feeder to find probable solutions. Since, most of crime mapping being retrospective (Groff & La Vigne 2002), planning for future requires efficient and accurate modelling based on assumptions. However, crime mapping of real time and place through linkages with GPS and Automated Vehicle Location systems can reduce the gap between crime events and crime analysis (Weisburd & McEwen 1997).

UNODC (United Nations Office on Drugs and Crime) reported a global average intentional homicides rate of 6.2 per 100,000 population for 2012 (in their report titled "Global Study on Homicide 2013") The study extensively reports on intentional homicides across the world. It reports on individual countries along with their region and sub region along with the year. The report suggests that homicidal rates are higher in the developed parts of the world. Among the south Asian countries, India ranks 4th with a homicidal rate of 3.21%

National Crime Records Bureau, India publishes an annual report Crime in India. A comparative analysis from 2011-2016 reveals that 'Crime against Body' has been steadily increasing in West Bengal, from 22nd rank in 2011 to 12th rank in 2016. However its crime-rate has always remained below the National Rate.

Table 1: Crime affecting body rate and incidence in India 2011-2016

YEAR	2016		2015		2014		2013		2012		2011	
STATES	Rate	Rank	Rate	Rank	Rate	Rank	Rate	Rank	Rate	Rank	Rate	Rank
West Bengal	69.6	12	60.5	12	56.8	15	36.1	17	34.3	16	27.9	22
States(S) Total	69.3		67.6		64.8		47.4		46.3		43.4	
India Total	70.4		68.1		65.4		47.5		46.2		43.4	

(Source: Compiled by author from Crime in India, 2011- 2016)

The paper begins with stating the research problem and then setting out the objectives. It then attempts to give an account of the data sets and methodologies used. What follows is an examination of the overall scenario of the extreme crime i.e. *murders* in Kolkata Municipal Corporation, including its spatiality and temporality, followed by an elaborate discussions on the particular findings and there-after drawing a conclusion.

STATEMENTS OF PROBLEM:

Crime’s influence on daily life is way beyond than just the impact of an event of crime. Research suggests that crime is affected by multiple locational factors and hence it should be studied from sociological, psychological and even geographical approaches, since crime changes its nature from time to time, space to space and even person to person. Location and situation of the victims and accused along with their genders play the most crucial roles in a criminal incident, which adversely affect the quality of life. Here the query is whether there is a geographicality of the crimes committed and the gendered variation amongst them.

OBJECTIVES:

The objectives of this study are

- ✓ To measure the spatio-temporal variation of murders in Kolkata urban unit,
- ✓ To analyse the gender dimension of murders and factors associated with it.
- ✓ To examine the different motives behind these murders and the causes of death in these cases.

DATA AND METHODOLOGY

Data was collected from Crime Records Section, Detective Department, Kolkata Police, West Bengal from their monthly journal 'Crime Review' for the time period of January 2012 to December 2015. The rationale for selecting the time period is that the police jurisdiction areas have changed since 2011 and 2015 was the latest data available. Thereafter the data was sorted, tabulated, mapped and analysed according to their location, victim-accused relationship, causes of death, weapons used and motives behind these murders. Finally the hotspots of murders in Kolkata were identified based on the location of the crime cites.

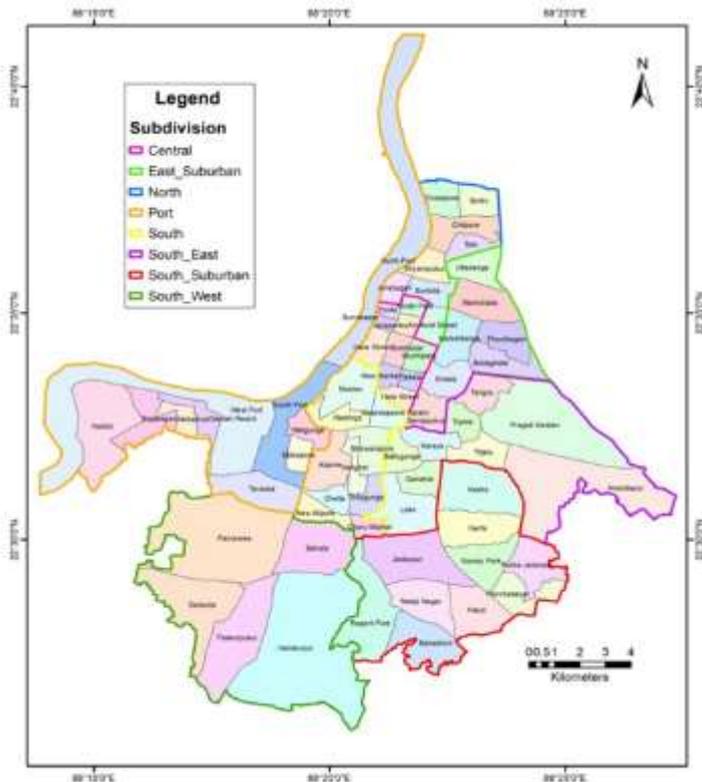


Fig. 2: Police Stations and Subdivisions under Kolkata Police Area, 2015

Criminology groups crime into three broad classifications: violent crime, property crime and nuisance/other crime (Ellis & Walsh 2000). Violent crime includes assault, fighting, hold-ups, homicide, robbery, sexual assault and stabbing. For this paper only murder cases were considered since the data is available only for reported crimes, where final investigation and judgement is yet pending. Geo-coding the point locations of these crimes can be potentially erroneous. Aside from the accuracy of geo-coding algorithms (Ratcliffe 2001) geo-coding can also result in not finding the addresses of point locations. In this case addresses were geo-coded using a website (<https://www.latlong.net>) which provided almost 98% accurate latitude longitude coordinates. These were verified using Google Earth and also field visits. However there were problems of no address records, no street names, or cites being very far away from the study area. Few cases have been left where only the decomposed dead bodies were recovered with ambiguity about the actual cite of murder. The geo-coded data was mapped using ArcGIS software (version 10.2.1). The data was mapped to identify the spots of murders along with gendered victim and accused relationship and incentives behind these incidents. A temporal analysis was also done using the 4 years data.

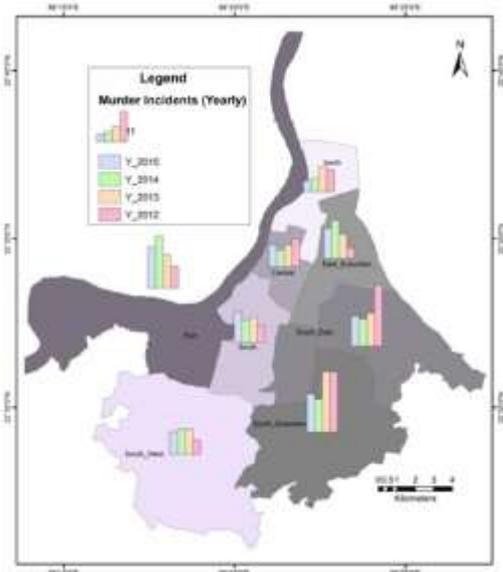


Fig. 3: Murders in Subdivisions under Kolkata Police, 2012-2015

RESULT & DISCUSSION:

The paper looks into the 69 Police Stations and 8 subdivisions of the Kolkata Police Jurisdiction. Data is recorded police station wise, in a chronological manner. IPC Sections, victim’s and accused’s age and gender, cite of crime, cause of death, weapons used and motive behind these incidents were data mined out of the cases’ brief fact. This data served as the

meta-data for the descriptive statistics where spatiality and associated attributes of these cases were mapped and analysed. Further geo-coding the addresses of the sites paved way for the hotspots identification.

Table 2: Police station wise murders reported in Kolkata 2012-2015

YEAR	2015	2014	2013	2012
Alipore	2	2	0	1
Amherst Street	0	0	2	0
Anandapur	2	0	0	0
Ballygunge	0	2	1	1
Bansdroni	0	0	1	1
Behala	1	3	2	0
Beliaghata	0	1	2	0
Beniapukur	0	2	1	0
Bhawanipore	0	1	0	2
Bowbazar	0	2	1	0
Burrabazar	2	1	1	3
Burtolla	1	0	6	5
Charu Market	0	0	1	0
Chetla	1	1	1	0
Chitpore	2	3	0	1
Cossipore	0	1	1	1
Ekbalpore	3	2	0	1
Entally	2	5	1	3
Garden Reach	4	4	1	0
Garfa	2	0	2	2
Gariahat	1	1	0	2
Girish Park	1	1	0	1
Hare Street	0	0	3	1
Haridevpur	4	2	2	2
Hastings	1	2	2	0
Jadavpur	2	4	5	5
Jorabagan	1	0	0	0
Jorasanko	0	1	0	0
Kalighat	0	0	1	0
Karaya	2	0	1	3
Kasba	4	3	2	0
Lake	0	1	2	3
Maidan	1	0	1	0
Manicktala	0	0	1	1
Metiabruz	0	2	3	1

YEAR	2015	2014	2013	2012
Muchipara	1	0	1	0
Nadial	1	1	0	1
Narkeldanga	4	1	2	0
Netaji Nagar	2	0	0	0
New Alipore	0	0	0	0
New Market	0	0	1	2
North Port	2	7	1	1
Panchasayar	0	1	0	0
Park Street	3	1	0	2
Parnasree	1	1	3	2
Patuli	0	1	7	5
Phoolbagan	3	2	0	0
Posta	2	0	0	3
Pragati Maidan	0	0	2	2
Purba Jadavpur	0	0	2	1
Rajabagan	2	0	1	2
Regent Park	2	0	3	4
Sarsuna	0	1	0	0
Shakespeare Sarani	0	0	1	1
Shyampukur	0	0	0	0
Sinthi	0	0	0	1
South Port	0	2	0	2
Survey Park	2	3	0	4
Tala	0	1	0	0
Taltala	2	1	1	0
Tangra	0	3	1	2
Taratala	0	1	0	0
Thakurpukur	2	1	2	1
Tiljala	6	2	5	8
Tollygunge	3	1	2	0
Topsia	0	1	0	1
Ultadanga	2	3	2	0
Watgunge	2	0	2	0
West Port	1	1	4	0
TOTAL	82	83	90	85

(Source: Compiled by author from Crime Review of Kolkata Police, January 2012- December 2015)

SCENARIO OF EXTREME CRIME (MURDER) IN KOLKATA:

The study revealed that maximum murders happened in the police stations of Tiljala (21), Jadavpur (16), Patuli (13), Burtolla (12) and Entally (11). These fall under South East (1), South Suburban (2), North (1), East Suburban (1) subdivisions. The yearly occurrence of murders also reveals that the maximum reported murders occur in the South-East and South Suburban sub-divisions. These areas are the newer residential areas which has heterogeneous population along with high slum population. Moreover these are zones of heterogeneous land use, hence it can be deduced that these factor do have an impact on the occurrence of crime.

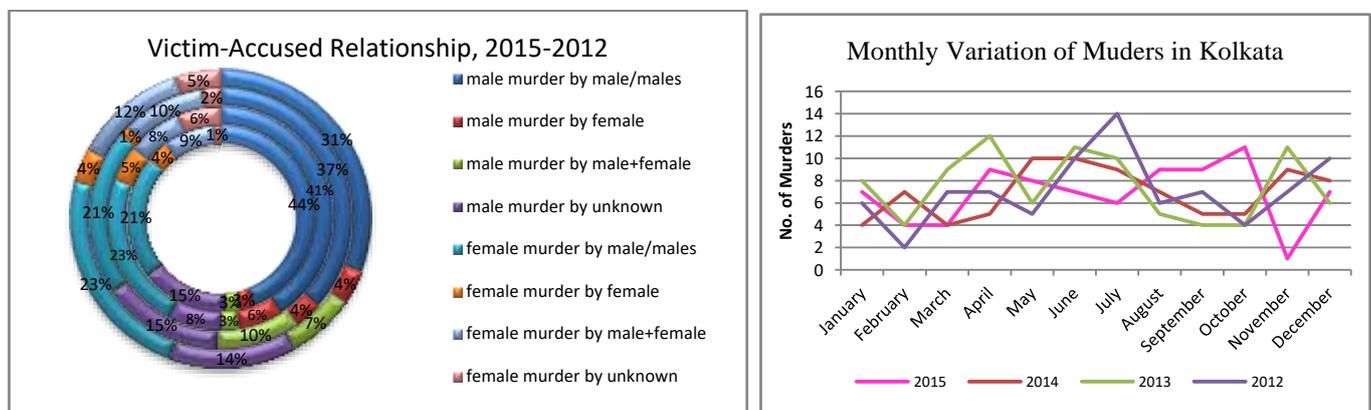


Fig. 4(a): Gendered Victim-Accused Relationship & (b) Monthly Variation of Murders in Kolkata 2012-2015

The gendered victim-accused relationship reveals that male murders by males dominate the crime scene of the Kolkata, which is understandable owing to the fact that males not only spend significantly higher time outside their homes and

also are more socially active in their localities. The next largest number of cases was under male murders by unknown, which comprised cases of death by drowning, hanging and in carnal rape. The number is followed by female murders by males, and though dowry and domestic violence cases come under this category, previous grudge was the major cause behind these murders. In fact the number of cases of female murders registered under Dowry Prohibition Act and Domestic Violence (27.55%) were outnumbered by other cases (72.45%) significantly. The monthly variation of the reported murders reveal that though the lines do not establish a very distinctive pattern, if we overlook 2015, the other three years show a fall in the murders in the months of February, May and September. They rise in April (Bengali New Year), July (rainy reason) and October-November (Durga Puja and other festivities). A superficial study suggests that extreme natural or social climate can have a relationship with incidents of crime.

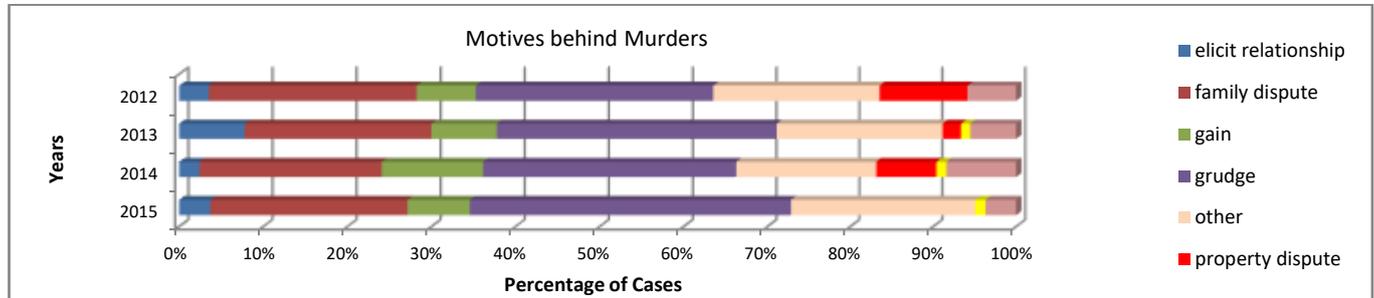


Fig. 5: Motives behind Murders in Kolkata 2012-2015

A study into the motives behind the murders showed that grudge is the most dominant reason followed by family and financial disputes. The murders due to elicited relationship had both male murders by female and female murders by male. It is interesting to see that whereas female murders by males had husbands killing their wives and their paramours, male murder by females had women killing their paramours. The murders under family dispute also include dowry and domestic violence cases, since these are cases that are still under investigation it has been clubbed under family dispute cases. Murders for gain are cases where murders are accompanied with theft (*dacoity* in local language). Geriatric crimes dominate this section. These cases were mostly from North Subdivision with a few from South Subdivision.

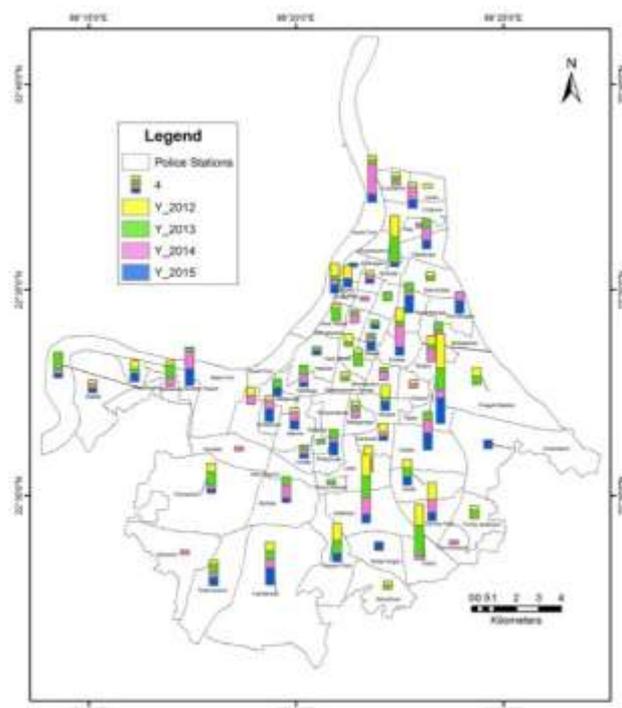


Fig.6: Yearly Variation of Murders in Kolkata 2012-2015

Murders are not just higher in certain subdivisions but also in particular police stations under these subdivisions. The bar charts (fig. 7) give a clearer picture of the inter-zonal and intra-zonal variations in the occurrence of murder incidents. The graphs reveal that though Burtolla recorded 4th highest number of murders during the study period it is the only police station of its subdivision to record such high values, hence murders are quite localised. It is almost a similar situation in the South-East Subdivision which has Tiljala Police Station. However, the East Suburban and the South Suburban subdivisions show that along with Entally and Jadavpur Police Stations respectively, they also have other police stations like Narkeldanga, Ultadanga and Patuli, Regent Park and Survey Park police stations, of the respective subdivisions, recording a moderate to high number of murders. A map (fig 6) helps to identify more clearly the spatiality of these murders.

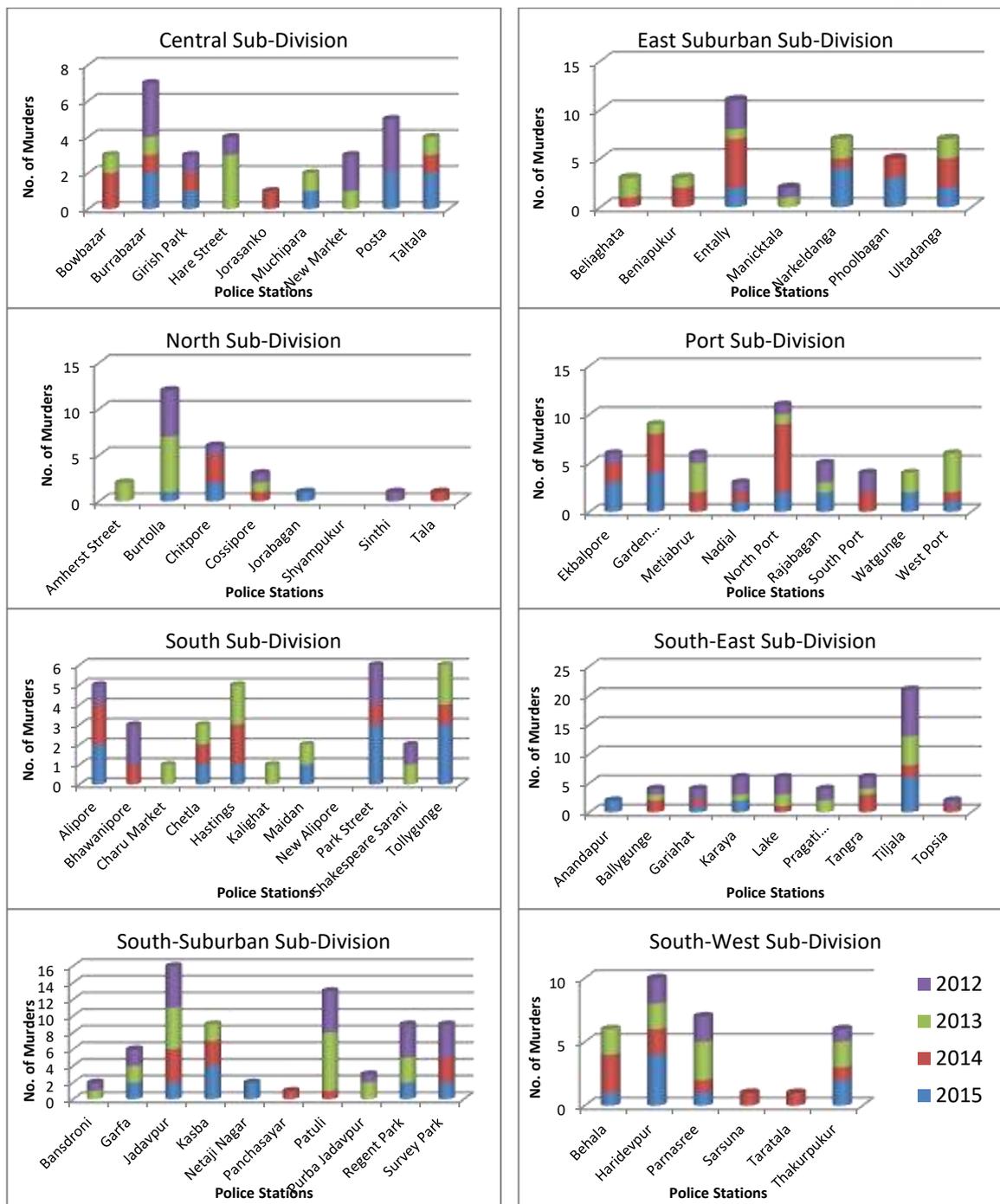


Fig. 7(a)(b)(c)(d)(e)(f)(g)(h): Subdivision-wise Yearly Variation of Murders in Kolkata 2012-2015

SCENARIO OF HOTSPOTS OF EXTREME CRIME:

Hotspots intervention not just supports reallocating existing resources into the treatment areas without incurring any additional costs, but generates both crime control gains and monetary savings relative to traditional policing methods. (Braga et al 2014). Hotspot analysis can be done at three levels:

- ✚ Place theories explain why crime events occur at specific locations. They deal with crimes that occur at the lowest level of analysis—specific places. Crime phenomena at this level occur as points, so the appropriate units of analysis are addresses, street corners, and other very small places, which are typically represented on maps as dots.
- ✚ Street theories deal with crimes that occur at a slightly higher level than specific places; that is, over small, stretched areas such as streets or blocks,
- ✚ At a higher level than place or street, neighbourhood theories deal with large areas. Two-dimensional shapes such as ellipses, rectangles, and other polygons are used on maps to represent crime phenomena at this level.

The most common method of "forecasting" crime in police departments is simply to assume that the hot spots of yesterday are the hot spots of tomorrow. The research on repeat victimization suggests that much more could be learned from further examination of the composition of hot spots and the extent to which repeat victimizations could be used to predict not just future victimizations, but future hot-spot areas (Groff & Vigne 2002).

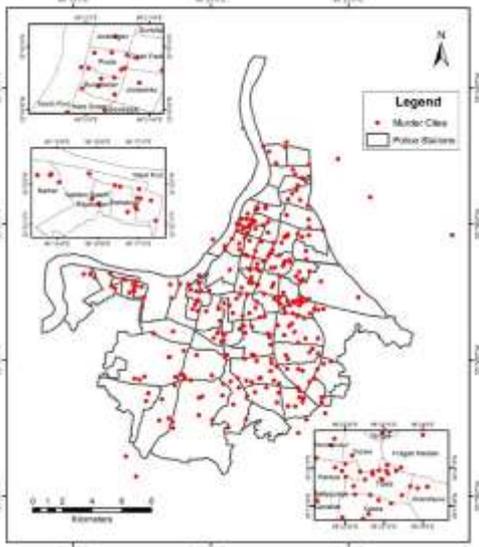


Fig. 8: Hotspots of Murders in Kolkata 2012-2015

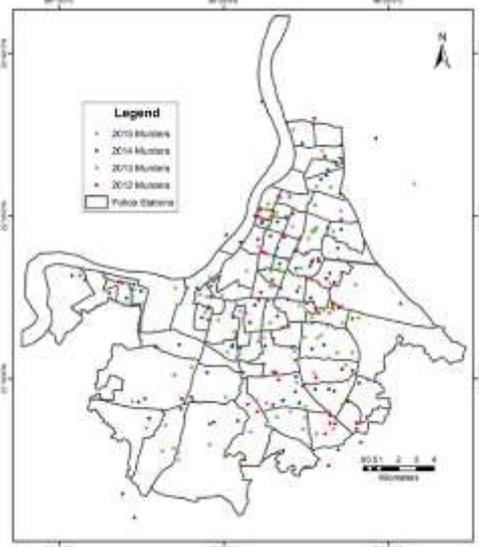


Fig. 9: Locations of Murders in Kolkata 2012-2015

The greatest advantage of Hotspot analysis in Criminological studies is that it identifies very particular spaces where a particular crime dominates. It is particularly a significant tool for Human and Social Geographers to identify the problematic spots in a neighbourhood and look redressal measures to improve the quality of daily life of people of the area and also who commute through the areas. This paper tries to identify the hotspots and describe their attributes only. Extensive field surveys, in-depth interviews and perception studies are required for identifying the locational factors influencing the event of crimes and for suggesting redressal measures.

Murders reported in the four study years (315 out of 340) were geo-coded on a map to find the clusters, and three were identified_ first in the Burtolla area, second in the Metiabruz area and the third in the Tiljala area. These areas were further zoomed and it was found that the murders are being committed towards the periphery of the police jurisdiction areas. Burtolla and Tiljala were identified as concentrated zones of murders in the general analysis sections, however geo-coding the murder-cites pointed another hotspot zone. Most of the incidents of the entire study area showed a higher occurrence towards the periphery of the police jurisdiction areas. Zones of higher incidence rate reports murders in all the four years; inconspicuous reporting is seen in areas of low incidence rates. A temporal analysis of even larger duration might depict starker change of spatiality with time.

To find the spatiality of murder victims and accused (fig 10(a) (b)) the variables have been clubbed into three categories, female (adult/juvenile/single/multiple), male (adult/ juvenile/ single/ multiple) and male + female (adult/ juvenile/ single/ multiple); however, an unknown category had to be kept for the accused. The maps revealed that city core or the Central subdivision is dominated by male victims and by male accused. The outskirts of the city or the suburbs also show a similar trend except for the north section where female victims outnumber males. The number of female victims is higher in the female category of victims, whereas it is higher in female + male category in the accused

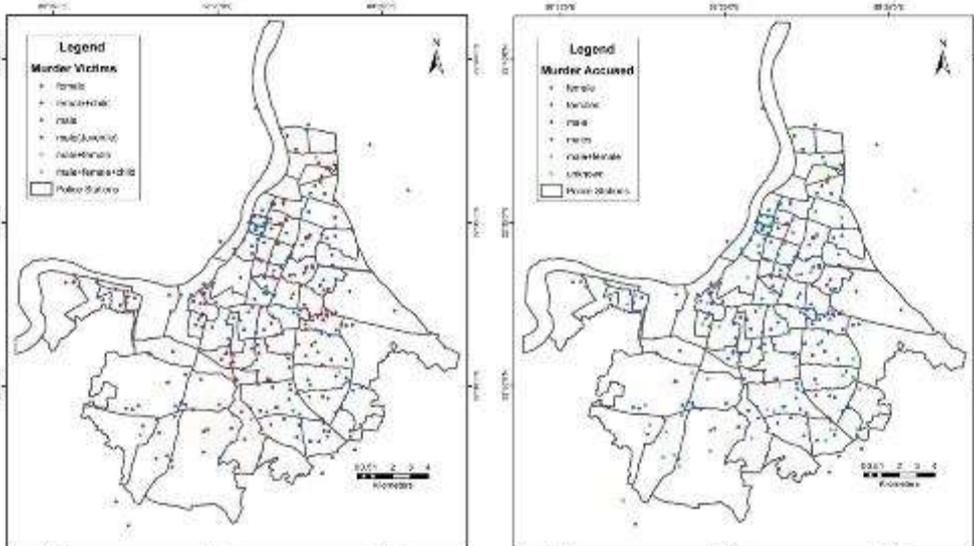


Fig. 10: Location of Murders in Kolkata 2012-2015 based on (a) gender of Victims; (b) gender of Accused

While geo-coding the murders with the motives (fig 11) behind them grudge though quiet dispersed yet was concentrated in the central part of the city including the East-Suburban, Central and South Subdivisions, whereas family dispute cases were spread all over the study area. Murders for gain were in the Eastern part of the city starting from South and South-Suburban to North and East Suburban. These are areas of old residential area with geriatric population and newer posh

areas. Murders due to elicit relationship is restricted to south Suburban and East Suburban subdivisions, with the only exception being Burtolla police station of North Subdivision.

To get a clearer picture of the gendered susceptibility to murder, data had been graphed at Sub-division level. It was seen that except in North and South East Subdivision male murders significantly outnumber female murders. Thus in Kolkata, men are at greater risks to being victims of violent crimes. Of the female murders in the North Subdivision the dominant motive is gain, and the victims are either single ladies or old women. Some property disputes had also led to female murders in this region. The reasons in the South-East Subdivision were quiet diverse however murders due family dispute (including Dowry Prohibition Act and Domestic Violence had a higher frequency.

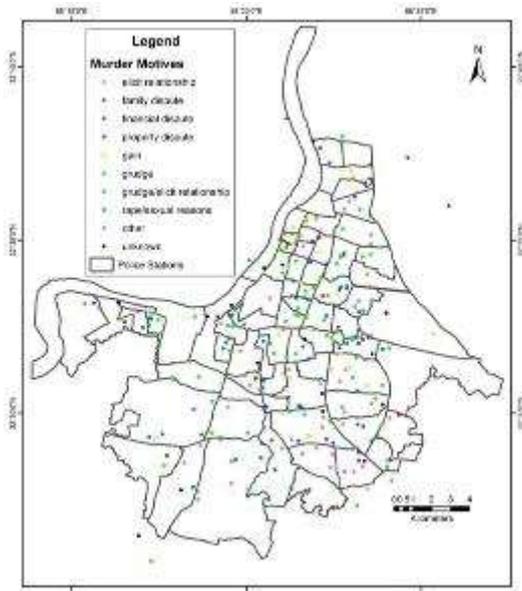


Fig. 11: Spatial Variations in Motives of Murders in Kolkata 2012-2015

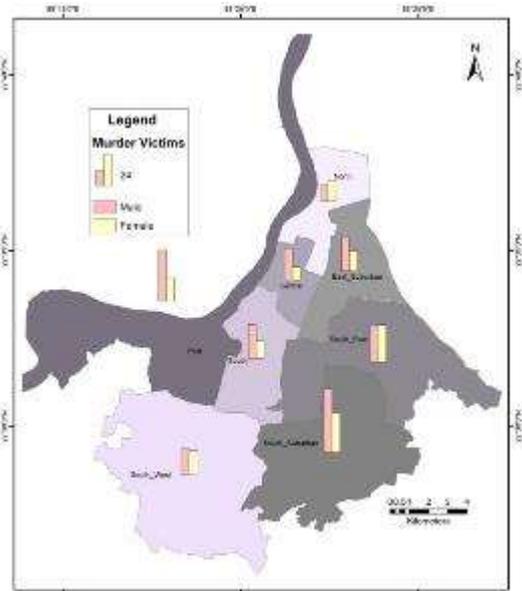


Fig. 12: Subdivision-wise gender of Murder Victims in Kolkata 2012-2015

MAJOR FINDINGS:

This paper looked into the murder-scenario of Kolkata during 2012-2015 and it was found that murder has both spatiality and temporality (monthly) variability. The heterogeneous diasporas of the various regions had an influence on the incidents. The causes behind cases varied from region to region, along with the gendered difference of victims and accused of the incidents in the study area. The gendered analysis revealed that male victims and male offenders outnumber the female victims and female offenders respectively and that female murders were less under 498-A category than other sections. As a matter of figures, 72.45% of female murders were cases without 498A, 304b or DPA (cases of dowry demand and domestic violence). Male murder by males was the dominant victim-accused relationship while grudge and family dispute were the major motives. Though causes of death and weapons used were not studied elaborately, blunt wounds, burns and hanging were the more frequent causes of death of the victims. An analysis into the various causes of death showed that most deaths were caused by blunt wounds (73), followed by burning (54), hanging (47), sharp wounds (44) strangulation (26) and drowning (20) out of the total 340 cases reported in Kolkata urban area. Hotspot Analysis based on 315 cases out of total 340 (cases left out due missing and incomplete addresses) was done on the study area, which resulted in the identification of three clusters, mainly at the Burtolla, Metiabruz and Tiljala areas. It also revealed that murders took place more on the periphery regions of the police jurisdiction areas. Extensive surveys, in-depth interviews are required to understand the importance of the socio-economic factors of the areas to completely understand the total geographicality of murders in the identified clusters.

REFERENCES

Alkimim, A., Clarke, K. C., & Oliveira, F. S. (2013). Fear, crime, and space: The case of Vicoso, Brazil. *Applied Geography*, 42, 124-132.

Andersen, M. A. (2006). Crime Measures and the Spatial Analysis of Criminal Activity. *British Journal of Criminology*, 46, 258-285

Baldwin, J. & Bottoms, A. E. (1976). *The urban criminal*. Tavistock. London

Braga, A. A., Papachristos, A.V., & Hureau, D. M. (2014). The effects of hot spots policing on crime: An updated Systematic Review and meta-analysis. *Justice Quarterly*, 31:4, 633-663.

Brantingham, P. L., & Brantingham, P. J. (1993). Nodes, paths and edges: Considerations on the complexity of crime and the physical environment. *Journal of Environmental Psychology*, 13(1), 3-28.

Brantingham, P. L., & Brantingham, P. J. (1997). Mapping crime for analytic purposes: location quotients, counts, and rates. Brownlow, A. (2005). A geography of men's fear. *Geoforum*, 36, 581-592.

Brantingham, P., & Brantingham, P. (2013). Crime pattern theory. *Environmental criminology and crime analysis*. 100-116 Willan.

Brownlow, A. (2005). A geography of men's fear. *Geoforum*, 36, 581-592.

Brunsdon, C., Corcoran, J., & Higgs, G. (2007). Visualising space and time in crime patterns: A comparison of methods. *Computer, Environment and Urban Systems*, 31, 52-75.

Chainey, S. & Ratcliffe, J. (2013) *GIS and Crime Mapping*, Wiley Publishers

Clarke, R. V. G. (1980). "Situational" crime prevention: theory and practice. *British Journal of Criminology*, 20, 136-147

- Cope, N. (2004). Intelligence led policing or policing led intelligence? Integrating volume crime analysis into policing. *British Journal of Criminology*, 44, 188-203
- Kolkata Police Headquarters Lalbazar (2012, 2013, 2014, 2015) *Crime Review*. Department of Police, Government of West Bengal, Kolkata
- Day, K., Stump, C., & Carreon, D. (2003). Confrontation and loss of control: Masculinity and men's fear in public space. *Journal of Environmental Psychology*, 23, 311-322
- Ellis, L. & Walsh, A. (2000), *Criminology: A Global Perspective*. Boston, MA: Allyn and Bacon
- Evans, D. J., & Fletcher, M. (2000). Fear of crime: testing alternating hypotheses. *Applied Geography*, 20(4), 395-411
- Foster, S., Knuiman, M., Wood, L., & Giles-Corti, B. (2013) Suburban neighbourhood design: Associations with fear of crime versus perceived crime risk. *Journal of Environmental Psychology*, 36, 112-117.
- Getis, A. et al. (2000) Geographic Information Science and Crime Analysis. *Journal of the Urban and Regional Information Systems Association*, 12, 6-14.
- Groff, E. R., & La Vigne, N. G. (2002). Forecasting the future of predictive crime mapping. *Crime Prevention Studies*, 13, 29-58.
- Herbert, D. (1982) *The Geography of Urban Crime*, Longman Group, Essex, U.K.
- Johnson, C.P. (2002). Crime Mapping and Analysis Using GIS Geomatics 2000: *Conference on Geomatics in Electronic Governance, January 2000, Pune*
- Johnstone, J. W. C. (1978) Social class, Social areas and delinquency, *Sociology and Social Research*, 63, 49-72.
- Kindynis, T. (2014). Ripping up the map: criminology and cartography reconsidered. *British Journal of Criminology*, 54, 222-243.
- Klien, D., & Kress, J. (2002). Any Woman's Blues: A Critical Overview of Women, Crime, and the Criminal Justice System. *Social Justice*, Vol. 40, No. 1/2 (131-132), 40th Anniversary Issue: *Legacies of Radical Criminology in the United States (2014)*, pp. 162-191
- Manning, C. J. (2001). Technology's ways: Information technology, crime analysis and the rationalization of policing. *Criminal Justice*, 1, 83-103.
- National Crime Records Bureau (2011, 2012, 2013, 2014, 2015, 2016) *Crime in India Statistics*, Ministry of Home Affairs, New Delhi
- Ratcliffe, J. H. (2001). On the Accuracy of TIGER Type Geocoded Address Data in Relation to Cadastral and Census Areal Units, *International Journal of Geographical Information Science*, 15: 473-85
- Schafer, J. A., Huebner, B. M., & Bynum, T. S. (2006). Fear of crime and criminal victimization: Gender-based contrasts. *Journal of Criminal Justice*, 34, 285-301.
- Shaban, A. (2008). Ghettoisation, Crime and Punishment in Mumbai, *Economic and Political Weekly*, Vol. 43, No. 33 (Aug. 16-22, 2008), 68-73
- Sharon, C. (2006). The History of Crime Mapping and Its Use by American Police Departments, *Alaska Justice Forum*, 23: 1, 4-8.
- Stanko, E. A. (1995). Women, Crime, and Fear. *The Annals of the American Academy of Political and Social Science, Reactions to Crime and Violence*, 539, 46-58
- United Nations Office of Drugs and Crime (2013, 2015, 2017) *World crime trends and emerging issues and responses in the field of crime prevention and criminal justice*. Vienna
- Weisburd, D., Bernasco, W., & Bruinsma, G. J. M. (2009), *Putting Crime in its place*, Springer
- Weisburd, D., & Lum, C. (2005). The diffusion of computerized crime mapping in policing: Linking research and practice, *Police Practice and Research*, 6:5, 419-434.
- Weisburd, D., & McEwen, T. (1997). Crime mapping and crime prevention. *Criminal Justice Press*.
- Yarwood, R. B. (2015). Geography of crime. In *Oxford Bibliographies in Geography*. Oxford University Press.

PY.4. RSAI Young Researchers Prize

1595 LOW REPAYMENT CAPACITY AND HIGH INDEBTEDNESS AMONG AGRICULTURAL HOUSEHOLDS IN INDIA: SUSTAINABILITY OF THE SECTOR AS A SOURCE OF LIVELIHOOD

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INTRODUCTION

Sustainable development of agriculture does not denote a particular way of production process, rather it compels the producers to think regarding the adaption of sophisticated approach that can maintain high yields and farm profits without undermining the resources on which agriculture depends (Pretty, 1997; Diao and Prett, 2010). Sustainability of the agriculture sector depends on the responsiveness of the large section of farmers towards the technological change of the production system and the ability to adapt them. Since, the Green Revolution, Indian agriculture has come a long way. However, the new production system, characterized by the usage of bio-chemical inputs, and mechanisation, is still facing challenges both in terms of accessibility and affordability of inputs by a large section of farm households. "The economic well-being of farm households depends on its resources, production and employment levels, and the ability of income to meet consumption, savings, and other household needs" (Mishra, 2007, p. 5). Marginal farm households with small investment stock are in a critical position due to the variability of income, and they are prone to detrimental effects of weather risk as well as market volatility. They occupy the lower-most strata regarding accessibility to resources, affordability of input expenses, less realization of the price of the commodity as well as the risk of agricultural production. The lack of institutional accessibility and property rights on land destitute this section and make it the most vulnerable segment of the production organisation (NCEUS Report, 2008).

Green revolution led advances in the sector could not bring inclusive and sustainable development due to inadequate policies and failure of institutional reforms in the country. Growth in output bypassed the economic wellbeing of the large section of farm households which overlooked the viability of the sector from the perspective of farmers' income. Primary focus on modern input usage to augment the productivity level undermines the response of local agro climate of the region as well as the resource base of the agricultural households regarding land, non-land resource and base of knowledge to adapt to changes. Lack of diffusion of information concerning judicious input usage brought changes in cropping pattern without focusing on the affordability of the farm households and resource availability. While at the aggregate level, the state may perform well, the situation of small and marginal farmers in agricultural developed regions needs targeted analysis to increase their capability to meet the expenses of increasing inputs and to earn a decent remuneration from the production process.

The trajectory of development path of Indian agriculture from a food shortage economy to a self-sufficient and surplus food production country has attracted much attention. But malnutrition, distress sale, uncertainty in production, bankruptcy, crop loss, and rural poverty are realities in the countryside which indicates the plight of the farmers. Increased news of farmer suicides further questions the viability of this sector as a source of livelihood. The economic situation of the farm households appears to be deteriorating and the viability of the sector as a source of income is under question mark. Poor remuneration from agricultural production process and absence of adequate alternative sources of income illustrate the growing agrarian crisis of Indian agriculture (Mishra 2008, Reddy et al., 2009). Hence it is immensely important to analyse the economic situation of the agricultural households across farm-size groups in a regional framework in accordance with the sustainability of the sector as a source of livelihood for them.

Keywords: Indebtedness, Repayment Capacity, Sustainability, Viability.

SCOPE OF THE STUDY

Agrarian distress is not a short-term event, rather it is a drawn-out process often symptomized by a situation in which farmers get trapped into indebtedness due to unviable expenditures and low repayment capacity. In this paper, we focus on the three major dimensions of economic situation, repayment capacity, extent of indebtedness and economic viability on the basis of Situation Assessment Survey of India 2012-13. Firstly, economic situation of agricultural households in terms of income, consumption and incidence and extent of indebtedness have been described across farm-size groups and regions. At the next level, k-means cluster analysis has been performed to delineate homogeneous economic regions by the repayment capacity and extent of indebtedness across farm size groups. Further determinants of economic viability⁸⁴ which depends on the repayment capacity status of the household, have been traced by Linear Discriminant Analysis across farm-size groups.

DATABASE

⁸⁴ Literature mainly focus on the economic viability of agricultural holdings (Adelaja, 2005), however there is dearth of study on economic viability at household level. India, as well as in other developing countries, the share of agricultural income is reducing especially for marginal and small agricultural households.

Hence, the question arises regarding the ability of total income which includes agricultural income and alternative income sources to generate surplus over consumption expenditure level.

The present study uses the dataset of 'Agricultural Situation Assessment Survey'⁸⁵ (hereafter SASAH) of the 70th round of NSSO unit level data for the year 2012-13 (Jan- Dec) to understand the dynamics of current production organisation of agriculture as the principal database. In this survey⁸⁶, detailed information has been covered on the receipts and expenses in farm and non-farm sectors at household level.

METHODOLOGY

Delineation of economic region on the basis of repayment capacity and extent of indebtedness has been done by k-means cluster analysis across farm-size groups. The basic premise of cluster analysis is to categorize N data points, each of D-dimensional, into groups of K clusters. The method assigns data points to a particular cluster in a way that minimizes the distance between intra-cluster data points while maximizing the distance between inter-cluster data points (for mathematical detail refer to section 9.1, Bishop,2007) This method has been used to target agricultural households on the basis of specific attributes to get an idea about their spatial distribution as well as class specific concentration.

$$J = \sum_{n=1}^N \sum_{k=1}^K r_{nk} \|x_n - \mu_k\|^2 \quad (i)$$

This objective function J is minimized in an iterative fashion performing the following two steps:

$$r_{nk} = \begin{cases} 1 & \text{if } k = \arg \min_j \|x_n - \mu_j\|^2 \\ 0 & \text{otherwise} \end{cases} \quad (ii)$$

$$\mu_k = \frac{\sum_n r_{nk} x_n}{\sum_n r_{nk}}$$

The above two steps are repeated until there is no change in the assignments.

Variables are fitted in the equation (i) and (ii) in both the cluster analysis for allotment of D dimensional data points into specific clusters. In the cluster analysis, N=79 and D=2.

At the next level, linear discriminant analysis⁸⁷ has been used to explain the gap between viable and non-viable agricultural households on the basis variables portraying the socio- economic attributes of the household and the production process across farm-size groups. The analysis has been carried across farm size groups with the assumption that the relative strength of discriminant coefficients significantly varies for the explanation of the distance between these two groups.

SECTION I

Economic Status of the Agricultural Households across Farm Size Groups and Regions

Economic status of the agricultural households considers the consumption expenditure pattern, repayment capacity and indebtedness⁸⁸ of the household. Lack of remuneration from farm income, the pressure of indebtedness, lack of opportunities outside agriculture and inability of policies to tackle the interest of the large section of farmers lead to deterioration of the situation of farmers. But the extent and intensity of distress varies across regions. Most of the incidence of agrarian distress concentrates in the states of Andhra Pradesh, Karnataka, Punjab, and Maharashtra in last decade due to volatility in income, lack of remuneration of income from cultivation, crop failure, huge indebtedness at the household level (Vyas, 2004; Suri, 2006). According to Shah's writing on agrarian distress, it is an artificial creation of the scarce situation where the trauma of pauperization pushed the farmer to the extreme position (Shah, 2012). The level of agrarian distress across regions is hereby discussed focusing on income, consumption, and indebtedness of agriculture households across regions and farm size groups.

⁸⁵ The survey used the interview method of data collection from a sample of randomly selected households and members of the household by stratified multi-stage design method. The survey used for the present analysis, has been covered the rural areas only. The information has been collected by NSSO in two visits to the same set of sample households. Datasets are merged to get the annual estimation of any continuous variable, wherever needed. Otherwise datasets are individually used for the analysis, mentioned in the specific section. For the binary variables, either visit 1 has been used or two visits have been dealt separately.

⁸⁶ This round did not keep 'land possession' as a compulsory criterion to be labeled as the agriculture household, but it puts a benchmark of generating a value of ₹3000 from agriculture with at least one person in the family self-employed in the agricultural sector as a principal or subsidiary status during last 365 days. Hence it includes landless agricultural households (regarding both owned land and operated land) who are dependent on agriculture other than crop husbandry as it takes into account all other agriculture allied activities, termed as agricultural production (SASAH, 2013).

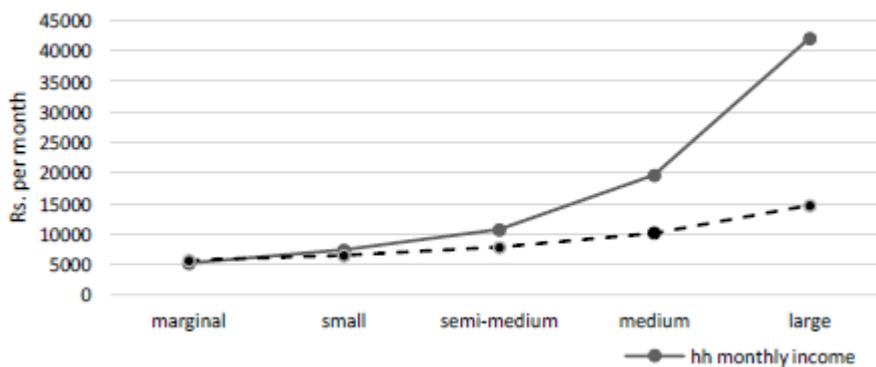
⁸⁷ It is a method of classification proposed by R.A Fisher in 1936. It has been conceptualized to differentiate between two target groups through the explanatory variables.

⁸⁸ Loans included borrowing in cash and/or kind (including hire purchases/credit purchase). Borrowings in kind are evaluated at current retail price prevalent in the local market in this survey. An advance payment received for forward delivery of goods also considered as loan. Cash loans taken for short period without any security are excluded.

At all India level average monthly income is estimated as ₹ 6426 per annum among agricultural households. Across all farm-size groups, Haryana (₹ 12,683 p.m.) ranks top, regarding total income⁸⁹ followed by Jammu & Kashmir (₹12,683 p.m.) and Kerala (₹ 11,888 p.m.). In contrast to that the lowest income per household is earned in Bihar (₹ 3,558 p.m.) followed by West Bengal (₹ 3,980 p.m.). Regarding consumption expenditure⁹⁰ per agricultural household, Punjab (₹ 13,311 p.m.) ranks first followed by Kerala (₹ 11,008 p.m.) and Haryana (₹ 10,637 p.m.) respectively. Whereas, consumption expenditure in rural agricultural households is the minimum in Odisha (₹ 4,307 p.m.) followed by Chhattisgarh (₹ 4,489 p.m.) and Jharkhand (₹ 4,721 p.m.) respectively.

The gap between income and consumption expenditure gets wider across farm-size groups at all India level. Marginal farms generate a negative economic surplus and are not able to earn sustenance level of income from the current production process. Whereas the situation is not so better for small farmers as well; both the curves are almost overlapping for this farm size group which further reveals their incapability of repaying the loan from the current level of income. The graph exhibits that difference between consumption and expenditure shows drastic difference between medium and large farms which elaborates the investment capacity of the large farms and dispossession of marginal and small farmers from the production process due to its inability to generate sustenance level of income.

Figure1. Net Income or Net Surplus across farm-size groups



Source: Calculated by unit level data from NSS quinquennial survey on SAS of Farmers in India 2012-13 Note: Monthly Net Income from all sources and consumption-expenditure data have been plotted at household (hh) level

Eastern states mostly generate a negative economic surplus over consumption expenditure. In West Bengal, the average spending per household is 1.28 times higher than the total income for the marginal farmers along with 51 percent incidence of indebtedness. Bottom 10 percent of agricultural households earn virtually nothing with negative net income; next 10 percent of agriculture households earn only ₹ 13,344 p.a. which is on an average ₹ 1,112 per month per household. Although in these states consumption expenditure is almost half of Haryana and Punjab; even that little amount cannot be afforded by these farmers resulting negative economic surplus with low-income level. But the extent and incidence of indebtedness are comparatively lower in eastern states resulting relatively less pressure of indebtedness among these households. Compared to other states, Punjab performs better regarding the level of income and consumption; but inequality concerning income-consumption is vast across farm size groups. 78 percent of income is spent on consumption expenditure for marginal farmers whereas only 27 percent of the income of large farmers' get used for consumption-expenditure due to the drastic gap in income level across farm-size groups [See T.1.]. Bottom 10 percent of income quantile earn ₹43,655 per annum with consumption expenditure level of ₹1,05,971 per annum as well as an extent of indebtedness of ₹ 45,022 per household. Similar to the situation of marginal farmers, large farmers have spent ₹2,58,662 p.a. on consumption-expenditure with ₹ 11,55,575 p.a. household income on an average. Haryana ranks first regarding total income level, but the distribution is highly skewed towards the upper end of the farm households. Total income of marginal farm households is ₹11,974 p.a. whereas the income of large farmers goes up to 1.4 lakhs per month [see T.1.].

The other highlighted states with agrarian distress are Andhra Pradesh; a closer view of the economic situation of the state reveals the depth of vicissitudes prevails in the state. Bottom 10 percent of agricultural households are running in the deficit from net income from all sources, in addition to that on an average ₹1,06,894 loan amount outstanding per household as on the date of survey. Marginal farmers of Andhra Pradesh and West Bengal belong to the similar position in terms of income, consumption expenditure level, however, the incidence of indebtedness is excessive among marginal farmers of Andhra Pradesh. 93 percent of marginal farm households are indebted with a mean value of ₹ 88,100 loan

89 Total income means Net receipt from all sources, calculated by deducting total expenses from total receipts for each source of income. Expenses included only the actual expenses incurred (out of the pocket expenses) for farm and non-farm business. Imputed expenses in respect of inputs out of home stock or out of free collection as well as receipt in exchange or borrowed were not considered for reporting expenses for the purpose of the survey. Income of the agricultural households from various other non-economic activities such as pension, remittances, etc. are not collected in the survey and not included in the average monthly income presented here.

90 The value of consumption out of purchase, value/imputed value of home produced stock, receipts in exchange of goods and services, gifts and loans and free collection are considered for working out the average monthly consumption expenditure in this survey

outstanding per household whereas the incidence of indebtedness among marginal farmers of Bihar and West Bengal are 38 percent and 51 percent respectively with much lower level of the extent of debt [T.2].

Micro level analysis of Vidarbha region in Maharashtra unearthed that the extent of debt is 3.5 times greater in households with agrarian suicide incidents compared to the non- suicide households (Mohanty et. al, 2004; Mishra, 2006; Mishra & Shroff, 2007). The less repayment capacity is due to shallow total income level along with higher dependence on income from the farm. Eastern part of Vidarbha region are in the 'advance stage of the agrarian crisis' (Mishra, 2006). Marginal farmer households of this region have a total earning of only ₹ 3,344 per month with 28 percent incidence of indebtedness compared to net income of ₹8,900 per month in the inland western region of Maharashtra. The incidence of indebtedness of Vidarbha region rises to 71 percent for the large farm households of the region. While, in Karnataka, due to the skewed distribution of irrigation facilities, inequality is distinct regarding farm income. Bottom 10 percent of the household earns ₹ 5,000 p.a. compared to ₹ 5,10,800 p.a. for the top decile of agricultural household. The state wise income, consumption-expenditure and indebtedness across deciles have been plotted to show the distribution across income deciles of agricultural.

T.1. State table on Income and Consumption Pattern across Farm Size Groups

States	Marginal			small			Semi-medium			medium			large		
	I	C	I/C	I	C	I/C	I	C	I/C	I	C	I/C	I	C	I/C
J&k	14.13	10.33	0.73	13.68	11.94	0.87	61.48	21.53	0.35	22.83	14.19	0.62	0.00	0.00	
Himachal	9.94	8.05	0.81	13.51	12.27	0.91	28.65	11.43	0.40	26.17	20.85	0.80	51.33	18.06	0.35
Punjab	18.64	14.51	0.78	28.19	16.55	0.59	42.42	22.10	0.52	60.63	25.23	0.42	124.51	33.40	0.27
Uttarakhand	3.83	6.41	1.67	11.22	9.39	0.84	27.76	14.78	0.53	47.85	11.52	0.24	84.68	21.78	0.26
Haryana	14.37	12.09	0.84	20.00	13.88	0.69	25.12	14.75	0.59	59.24	20.92	0.35	167.16	28.83	0.17
Rajasthan	6.97	7.57	1.09	11.18	9.02	0.81	14.21	10.65	0.75	21.87	12.16	0.56	35.47	24.31	0.69
UP	5.11	6.79	1.33	11.32	9.30	0.82	20.19	12.71	0.63	28.91	14.63	0.51	82.62	20.78	0.25
Bihar	3.84	6.36	1.66	12.41	7.72	0.62	14.49	9.57	0.66	37.14	15.65	0.42	44.57	11.41	0.26
WB	5.28	6.79	1.28	9.73	9.86	1.01	11.57	10.62	0.92	44.04	17.50	0.40	13.99	14.25	1.02
Jharkhand	4.27	5.59	1.31	6.32	6.02	0.95	7.84	6.29	0.80	13.46	10.11	0.75	6.80	5.63	0.83
Odisha	4.24	4.99	1.18	5.98	5.63	0.94	10.92	6.44	0.59	21.58	10.33	0.48	173.88	9.74	0.06
Chhattisgarh	4.82	4.84	1.00	7.43	5.64	0.76	10.19	6.26	0.61	15.24	8.49	0.56	36.25	10.98	0.30
MP	4.59	5.16	1.12	7.34	5.80	0.79	11.25	7.72	0.69	24.54	9.88	0.40	48.43	18.10	0.37
Gujarat	9.32	8.50	0.91	10.85	8.77	0.81	15.41	10.56	0.69	21.91	14.76	0.67	45.83	14.26	0.31
Maharashtra	9.35	6.47	0.69	10.38	6.82	0.66	12.53	7.49	0.60	20.43	9.43	0.46	64.98	14.31	0.22
Andhra Pradesh	5.16	6.79	1.32	7.11	6.77	0.95	7.69	6.80	0.88	20.95	8.90	0.42	23.15	8.49	0.37
Karnataka	9.19	6.55	0.71	10.46	7.16	0.69	17.41	8.36	0.48	27.24	8.76	0.32	42.16	11.84	0.28
Kerala	14.56	12.64	0.87	26.15	15.59	0.60	18.73	20.02	1.07	83.39	21.05	0.25	307.30	20.94	0.07
Tamil Nadu	8.03	6.82	0.85	9.29	7.67	0.83	15.80	9.37	0.59	26.17	12.20	0.47	27.20	15.65	0.58
Telangana	6.44	5.74	0.89	7.66	5.96	0.78	10.26	6.86	0.67	18.01	8.18	0.45	12.22	10.28	0.84

Source: Calculated by unit level data from NSS quinquennial survey on SAS of Farmers in India 2012-13.

Note: Annual Net Income from all sources at household level; I=Income, C=Consumption-Expenditure. Values of I and C are in '0000 (ten thousands); I/C=ratio in unit

T.2. State table on Incidence of Indebtedness and Extent of Indebtedness across Farm Size Groups

States	Marginal		small		Semi-medium		Medium		Large	
	II	EI	II	EI	II	EI	II	EI	II	EI
J&k	31%	0.84	29%	0.99	21%	2.54	34%	2.72		0.00
Himachal	26%	2.39	48%	5.21	42%	6.77	30%	8.27	0%	0.00
Punjab	41%	3.42	72%	16.41	73%	23.87	81%	32.61	92%	92.74
Uttarakhand	50%	2.01	53%	13.91	71%	16.77	100%	31.49	100%	25.00
Haryana	46%	6.72	42%	9.60	51%	16.01	40%	11.87	74%	46.81
Rajasthan	58%	4.11	63%	6.78	73%	11.41	80%	15.87	59%	15.92
UP	41%	1.81	50%	4.57	66%	10.74	71%	12.45	86%	21.70
Bihar	38%	1.38	40%	3.47	33%	2.76	44%	4.25	50%	14.94
WB	51%	1.65	57%	3.30	43%	3.29	30%	4.34		27.60
Jharkhand	30%	0.52	27%	0.85	29%	0.92	53%	3.10	0%	0.00
Odisha	56%	2.76	65%	1.86	67%	3.27	90%	13.06	100%	222.81
Chhattisgarh	31%	0.79	45%	0.80	46%	2.03	42%	2.39	0%	0.00
MP	37%	1.34	48%	2.70	62%	6.46	66%	11.37	80%	21.93
Gujarat	40%	2.13	45%	3.44	63%	8.25	84%	16.36	77%	11.48
Maharashtra	46%	2.95	58%	4.60	72%	6.29	84%	20.94	90%	35.38
Andhra Pradesh	93%	8.81	92%	10.40	95%	16.16	97%	34.87	93%	24.94
Karnataka	76%	6.66	78%	9.99	83%	12.49	86%	23.21	79%	36.73
Kerala	78%	17.55	77%	35.51	80%	62.93	70%	80.88	88%	157.26
Tamil Nadu	85%	10.19	84%	13.57	85%	22.70	87%	33.08	93%	45.12
Telangana	90%	7.61	84%	10.32	92%	10.98	86%	13.65	100%	26.90

Source: Calculated by unit level data from NSS quinquennial survey on SAS of Farmers in India 2012-13

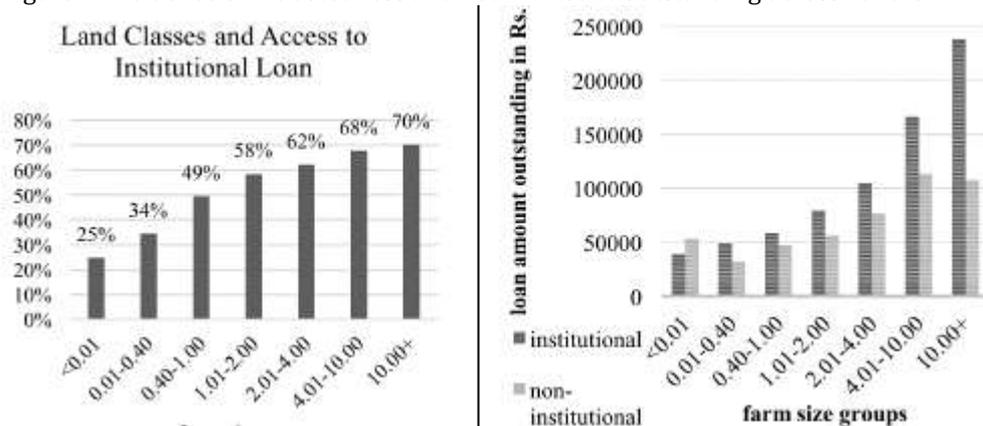
Note: II=Incidence of Indebtedness (Percentage of indebted households), EI=Extent of Indebtedness (Average loan outstanding in ₹

'0000)

Source and Extent of Indebtedness

Concerning the credit supply, 70 percent agricultural household avails institutional loan whereas for small and marginal farmers it is 30 Percent on an average. Since 2005-06 institutional credit flow in agriculture has been increased at a high pace, still it is not able to reach to the small and medium farmers to reduce their vulnerability of indebtedness and dependence on money lenders. They are trapped in hereditary loans and gets forced to sell their land to repay. At all India level, 60 percent of farm households have access to institutional credit including bank, cooperative and Government whereas, 26 percent of agricultural households are still relying on professional money lenders. The dependence on the bank is distinct for large farmers, while small farmers are primarily dependent on informal sources of loan. Due to increased expenses on input, they are forced to lend, and the less accessibility to institutional loan is making them trapped with money lenders. The role of the bank as a lender is increasing, still, it is unable to capture the entire lending market. Regarding the source of indebtedness, the share increases from 25 percent for the landless agricultural households to 58 percent for small farms and it goes up to 70 percent for large farms. Concerning the amount outstanding, marginal farmers have a higher share of non-institutional loan whereas it gets reverse for small farmers and the the share of institutional loan increases across land owning classes.

Figure 2. Incidence of Indebtedness and Loan Amount Outstanding across Land Owning Classes



Source: Calculated by unit level data from NSS quinquennial survey on SAS of Farmers in India 2012-13

Note: Marginal land owners have been further divided into groups due to distinct difference regarding accessibility. Ownership of land is used to compare the asset and liability among agricultural households

SECTION II

Repayment Capacity of Agricultural Households across Farm Size Groups

Now, the analysis is forwarded to examine the repayment capacity of the household. Single- minded focus on indebtedness is not enough to describe the economic status of the household. While, repayment capacity is conceived as the amount of current net income over consumption expenditure of the farm household which examines the capability of the farm family to reimburse the loan amount from the current level of production (Barnard et. Al,2013). 'Repayment Capacity Sensitive analysis' has been used in Barnard's study to measure the degree of repayment capacity calculating by the given formula.

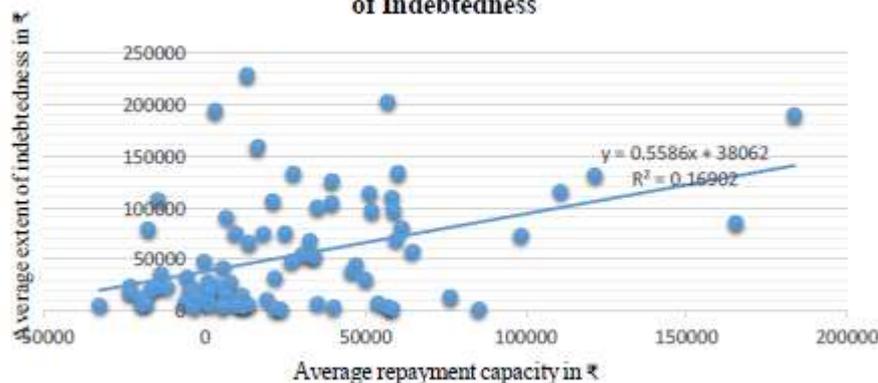
Repayment Capacity of the household=Net Farm Income from Operation + Non-farm income- Family Expenses

The present analysis deducts the family expenses from income from farm and non-farm to get an estimate of the repayment capacity of the household.

Thereby it is important to boost the repayment capacity to make the farm families capable of using loan to increase the production level rather than getting trapped in the vicious cycle of indebtedness. The region with a higher income level of large farmers can sustain greater extent of debt, but the situation is extreme for the areas with low-income level and high indebtedness. Thereby NSS-regions have been delineated by k-means cluster analysis for each farm size groups as well as across all farm-size groups to get broad pattern depicting economic situation of the agricultural households

- High Repayment Capacity with high indebtedness
- High Repayment Capacity with low indebtedness
- Low Repayment Capacity with high indebtedness
- Very low Repayment Capacity with low indebtedness

Figure 3. Relation between Repayment Capacity and Extent of Indebtedness



Source: Calculated by unit level data from NSS quinquennial survey on SAS of Farmers in India 2012-13

The scatter diagram reveals that there is no systematic relationship between net income of the household and the extent of the debt. Rather at NSS-region level, it forms some groups by these two variables. Thereby, cluster analysis has been performed to understand the economic status of the agricultural households regarding the repayment capacity and the extent of indebtedness. Centroid values of clusters [Table 6.7] exhibit that in regions of w1 cluster, net income and extent of indebtedness both are the maximum across all farm size groups. Entire Punjab, Western Haryana belong to cluster (w1) with high repayment capacity and low indebtedness whereas western parts of the country are mostly distressed under lower income and massive indebtedness (w3). Eastern regions have mean income in negative at NSS-region level with comparatively lower debt than western regions. This is the situation across all farm size groups; however, the situation varies across farm size groups. Cluster analysis on small farmers reveals that developed states (Punjab, Haryana) also belong to w3 cluster which is characterized by low repayment capacity and huge indebtedness. Hence, the economic affluence of agricultural household is not only region specific phenomenon; it concentrates in few hands of medium and large farmers of well-off regions. Regarding the cluster analysis only regions of Kerala comprises the high repayment capacity and low indebtedness cluster, whereas some pockets of regions of Western Maharashtra, Western UP are parts of cluster w2 (high repayment capacity and high indebtedness). Eastern and central regions have very poor repayment capacity along with lower indebtedness, while the North western regions and remaining southern regions have huge indebtedness with low repayment capacity.

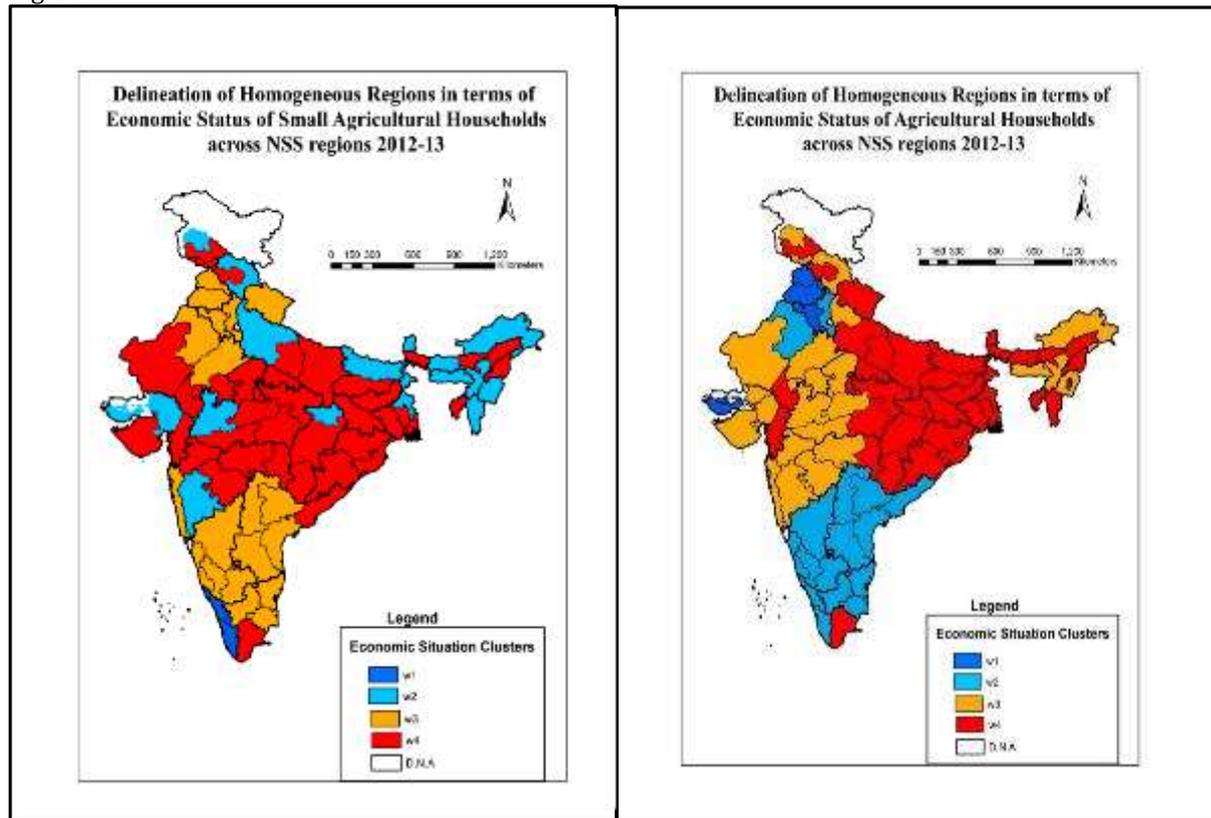
T.3. Result of Cluster Analysis :Centroid values (μ_k) of k-means clustering

Economic Status	High Repayment Capacity and Low Indebtedness (w1)	High Repayment Capacity and High Indebtedness (w2)	Low Repayment Capacity and High Indebtedness (w3)	Low Repayment Capacity and Low Indebtedness (w4)
Repayment Capacity in ₹	145388	45122	32931	-1962
Extent of Indebtedness in ₹	130015	42180	130960	16715
Ratio(RI/EI)	1.12	1.07	0.25	-0.12
Marginal Farm Households				
Repayment Capacity in ₹	87208	12019	11876	-2642
Extent of Indebtedness in ₹	12232	64940	134443	12738
Ratio(RI/EI)	7.13	0.19	0.09	-0.21
Small Farm Households				
Repayment Capacity in ₹	85939	112407	21545	5765
Extent of Indebtedness in ₹	54521	344233	115843	20984
Ratio(RI/EI)	1.58	0.33	0.19	0.27
Semi-Medium Farm Households				
Repayment Capacity in ₹	41844	125627	165051	-132672
Extent of Indebtedness in ₹	50438	185040	905554	435597
Ratio(RI/EI)	0.83	0.68	0.18	-0.30
Medium Farm Households				
Repayment Capacity in ₹	96463	471479	153045	153528
Extent of Indebtedness in ₹	56134	337772	956820	242881
Ratio(RI/EI)	1.72	1.4	0.16	0.63
Large Farm Households				
Repayment Capacity in ₹	1696047	4730231	1846296	277079
Extent of Indebtedness in ₹	410151	2585007	2038684	226405
Ratio(RI/EI)	4.14	1.83	0.91	1.22

Source: Calculated by unit level data from NSS quinquennial survey on SAS of Farmers in India 2012-13 Note: Categories of economic status are divided relatively for the specific farm size group and to show the variation within the farm size group. The ratio values are not comparable across farm size groups because the levels of repayment capacity and indebtedness are different. High and low terms are used relatively within the farm size group and in a combination of both the indicators estimated by the ratio value. RI=Repayment

Capacity, EI= Extent of Indebtedness

Figure 4.



Source: Calculated by unit level data from NSS quinquennial survey on SAS of Farmers in India 2012-13

Economic Status	High Repayment Capacity and Low Indebtedness (w1)	High Repayment Capacity and High Indebtedness (w2)	Low Repayment Capacity and High Indebtedness (w3)	Low Repayment Capacity and Low Indebtedness (w4)
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SECTION III

Sustainability of Agriculture as a Source of Livelihood

The analysis demonstrates that farm income is not enough for the sustainability of the household in most of the states; thereby economic viability on the basis of agricultural income as well as of total income of the household is going to be considered in this section. The farm households are categorized into two separate groups by economic viability of the household. Net income from the household is calculated by net income from farm, livestock and off-farm wage income. The household is labeled as viable if the household generates a positive surplus from the current level of income⁹¹ over consumption expenditure (sustenance level); otherwise, the household falls into the group of the non-viable zone. Firstly, descriptive analysis has been carried out across states and farm size groups to understand the role of alternative sources of income as well as the capacity of farm business income to generate a positive surplus for the household.

The ability of farms to produce a positive surplus for the household increases across farm-size groups. In Punjab, 10 percent of marginal farm households have positive economic surplus depending only on farm income whereas it goes up to 77 percent of large farms. Adding up of livestock income increases the percentage share to 27 percent and 85 percent for marginal farms and large farms respectively, which reveals the importance of livestock income to generate positive surplus especially for the small and marginal farms. While in Haryana the percentage of viable households only by farm income is close to zero for marginal farms and 20 percent for small farms; the share goes up to 52 percent and 76 percent for semi-medium farm households and medium farm households respectively. Including income from livestock, the percentage of viable farm households rises to 19 percent for marginal farmers in the state. In the same way, the gap between the contribution of farm income and agricultural income is even higher than Punjab portraying the importance of the share of contribution of the livestock sector.

Due to high wage rate in both the states, the addition of wage share leads to the viability of 50 percent farmer households among marginal farms. The pattern also shows that marginal farmers are more reliant on wage income to become sustainable farm households whereas small farm households are more dependent on livestock share to earn surplus over consumption and medium and large farmers earn a surplus by farm income only. Rajasthan also portrays at similar

⁹¹ Annual income includes nonfarm business, livestock income and wage. These are measured by deducting the expenses from the value of output. The survey does not include data on remittances

pattern, but the capacity of farm income to obtain economic viability is substantially lesser in comparison to large farms of Punjab and Haryana; only 51 percent of farm household generate positive economic surplus and absence of alternative income sources the situation persists similar even after inclusion of the income from livestock and wage income. In Eastern states the situation is worse regarding the economic viability of the marginal and small agricultural households; West Bengal has only 3 percent of marginal farm households with a positive economic surplus from agricultural income whereas the share goes up to 19 percent only for the marginal farm families after inclusion of wage income. In contrast to that Kerala has 15 percent share of marginal farm households producing a positive economic surplus from agricultural income and it rises to 39 percent including the wage income due to the high wage rate.

The data on income composition shows a higher share of wage income for marginal farm households in Eastern states especially in West Bengal and Odisha; it is evident from the present analysis that the higher percentage of wage is not capable enough to produce a viable level of surplus over-consumption. In Jharkhand and Odisha, the situation is slightly better than West Bengal, with one-fourth of economically viable marginal farm households. The role of livestock income as alternative income source contributes a paltry amount in Eastern states resulting low economic viability for marginal and small farmers in these states.

In Andhra Pradesh out of estimated 33,097 large farm households only 21 percent are economically viable, and due to higher dependence on farm income, the level of viability is same after incorporation of wage earnings. 50 percent of farm households belong to the marginal farm-size group and out of that only 5 percent are economically viable by agricultural income, and it rises to 29 percent including wage income. Small farmers of Kerala perform better concerning both agricultural income viability and overall economic viability compared to other Southern states.

Table1. Percentage of Viable Agricultural Households across Farm Size Groups

States	Marginal			Small			Semi-Medium			Medium			Large		
	FBI	AI	AI+Wg	FBI	AI	AI+Wg	FBI	AI	AI+Wg	FBI	AI	AI+Wg	FBI	AI	AI+Wg
J&k	6.2	8.3	43.4	7.2	20.2	41.3	30.4	44.2	47.1	20.3	41.4	71.1	--	--	
Himachal Pradesh	6.1	8.9	36.7	13.8	27.6	48.5	30.2	36.3	54.1	10.9	24.2	49.8	--		--
Punjab	10.3	26.8	45.2	32.2	63.1	67.3	58.4	80.9	87.2	79.4	95.9	96.2	77.2	85.4	85.8
Uttarakhand	6.4	11.2	18.6	30.3	33.4	33.5	46.4	63.3	71.5	90.9	91.9	92.3	99.8	99.9	100.0
Haryana	0.5	18.9	54.2	20.8	66.4	73.3	52.2	84.3	85.2	76.5	98.4	98.3	98.7	99.9	100.0
Rajasthan	2.2	10.2	34.2	18.3	35.2	51.5	25.1	43.4	60.4	29.6	50.5	64.4	50.9	55.8	56.8
UP	5.3	12.8	21.3	29.3	40.6	43.6	46.3	60.2	63.4	54.3	78.3	79.3	77.2	77.5	77.5
Bihar	2.1	9.8	17.4	15.4	32.5	35.7	38.4	47.3	52.7	59.8	65.5	67.2	--	--	--
WB	0.8	2.9	19.1	16.3	24.3	34.5	7.5	14.2	22.5	29.6	37.2	93.3	--	--	--
Jharkhand	5.2	7.2	24.2	21.5	24.5	46.3	29.6	30.1	64.4	33.5	52.5	79.1	--	--	--
Odisha	2.8	3.8	25.1	14.3	17.7	44.5	38.6	41.7	61.5	58.4	67.2	71.5	--	--	--
Chhattisgarh	5.2	10.9	44.3	34.5	37.5	60.4	53.6	53.8	74.4	78.3	78.6	80.2	--	--	--
MP	8.3	12.8	32.8	30.1	38.5	55.5	41.5	52.5	61.8	78.2	86.7	88.3	90.9	95.4	96.2
Gujarat	2.2	18.7	40.9	19.3	46.4	60.5	24.2	50.4	65.5	56.3	61.6	65.4	76.2	88.5	89.4
Maharashtra	6.4	14.6	39.1	19.8	36.3	54.4	36.1	47.3	57.4	49.5	59.5	62.1	68.2	73.8	74.2
Andhra Pradesh	0.9	4.9	28.7	17.3	29.8	38.6	22.2	29.3	50.6	43.6	47.4	79.1	21.4	24.5	24.8
Karnataka	12.2	26.9	53.1	21.5	30.2	48.7	44.4	53.2	61.7	54.5	67.3	72.3	39.8	58.5	58.8
Kerala	5.3	15.2	38.9	26.2	39.3	58.4	26.5	39.7	43.8	61.8	63.5	72.4	56.2	87.8	88.3
Tamil Nadu	8.9	20.8	44.6	15.1	29.2	41.3	35.3	46.4	60.5	41.6	54.6	62.4	16.6	61.4	64.5
Telangana	19.6	26.6	48.1	38.6	43.1	50.2	43.2	54.2	61.3	60.5	70.8	75.9	22.2	22.4	22.4

Source: Calculated by unit level data from NSS quinquennial survey on SAS of Farmers in India 2012-13

Note: Percentage of viable agricultural households has been calculated in these three selected category: farm income (FBI), farm income and livestock income (Agricultural income=AI), Agricultural Income and Wage Income (AI+Wg).

Linear Discriminant Function Analysis (hereafter LDA) has been performed to differentiate the economically non-viable and viable agricultural households by a set of variables and to measure the relative strength of these variables on the viability of the household. At the aggregate level, the explanatory variables provide a crude picture; hence regression has been focused on marginal and small farm size groups as well as across all agricultural households, dividing into viable and non-viable farm households to trace the variables which decide the viability status of the agricultural households.

$$Z = \sum_{i=1}^n L_i X_i \tag{i}$$

where,

$$Z = \bar{Z}_0 + \bar{Z}_1$$

Xi = Variables chosen to explain the causes of variation between two groups X1 = Land Owned in hectare (as an indicator of land asset)

X2 = Family Size (as in indicator of economic burden)

X3= Loan Outstanding per hectare (as an indicator of liability)

X4 = Share of livestock income (reliance on non-crop agriculture) X5 = Share of wage income (dependence on off-farm income)

X6 = Cost of cultivation per hectare (as an indicator of the intensity of input use) X7 = Per capital consumption expense (an indicator of standard of living)

X8 = Productivity (GVO per hectare)

X9 = Percentage of secondary above education (knowledge of farmer)

X10 = Percentage of area under HVC to GCA (as an indicator of cropping pattern) Li= L1, L2....., L10 (Coefficients or weights of discriminating variables)

Z-score (critical discriminant score) has been calculated by summing up the score of a mean of estimated Z0 (non-viable farms) and Z1 (viable farms).

Z0 and Z1 are obtained by multiplying the mean value of Xi with the specific coefficient and are added to get the individual score. If the individual has score fitting the equation (i) greater than Z the individual falls into economically viable farm household otherwise it belongs to non-viable farm household zone.

Table 2. Regression Results of Linear Discriminant Analysis

Variables	Non- Viable	Viable	Mean difference	Discriminant Coefficient	Discriminating distance
Marginal Agricultural Households					
Land owned in ha.	0.39	0.47	0.08	0.259**	0.020
Family size	4.95	4.90	-0.05	0.011	-0.001
Share of livestock income	20%	20%	0.00	-0.042	0.000
Share of wage income	30%	41%	0.11	0.593*	0.066
Cost in farm per ha.	21248.71	23025.93	1777.22	0.090**	160.245
Per capita expense on consumption (₹ p.a.)	15261.44	14797.60	-463.84	-0.099***	45.713
Productivity (GVO per ha. In ₹)	46650.38	71360.38	24710.00	0.219*	5403.294
Percentage of secondary above education	15%	19%	0.04	0.339**	0.013
Percentage of HVC to GCA	12%	20%	0.07	0.569*	0.043
F-values					60.105*
MD					0.214
Small Agricultural Households					
Land owned in ha.	1.24	1.30	0.06	0.219*	0.013
Family size	5.54	5.09	-0.45	-0.299	0.135
Share of livestock income	23%	19%	0.04	0.231*	0.024
Share of wage income	20%	20%	0.00	0.422*	-0.001
Cost of farm per ha.	18054.58	19034.79	980.21	-0.486**	-476.372
Per capita expenditure on consumption (₹ p.a.)	16396.71	16007.39	-389.32	-0.379***	147.375
Productivity (GVO per ha. In ₹)	32034.69	58429.95	26395.26	0.997*	26324.568
Percentage of secondary above education	21%	22%	0.01	0.175***	0.002
Percentage of HVC to GCA	14%	20%	0.06	0.161**	0.010
F-values					123.430*
MD					0.515
All Agricultural Households					
Land owned in ha.	0.72	1.36	0.64	0.803*	0.516
Family size	5.12	5.14	0.02	-0.068	-0.001
Share of livestock income	21%	20%	-0.02	-0.163	0.003
Share of wage income	28%	29%	0.02	0.203**	0.003
Cost in farm per ha.	20456.79	20931.37	474.58	-0.048***	-22.599
Per capita expense on consumption (₹ p.a.)	15712.21	16235.94	523.73	-0.137***	-71.898
Productivity (GVO per ha. In ₹)	43004.31	64072.53	21068.22	0.169*	3566.190
Percentage of secondary above education	16%	21%	0.05	0.310**	0.015
Percentage of HVC to GCA	13%	21%	0.08	0.412*	0.033
F-values					227.39
MD					0.291

Source: Calculated by unit level data from NSS quinquennial survey on SAS of Farmers in India 2012-13

*' 1 percent, '**' 5 percent and '***' 10 percent significant level respectively

Table 2. shows the result of LDA analysis; the p-value for all the models is less than 0.05 depicting that the function is capable of discriminating between viable and non-viable farm households. Canonical Correlation results of the models illustrate that the set of variables are correlated with the set of discriminating groups at a significant level.

Table 3. Validation Results of Model

	Marginal	Small	All farm
Canonical Correlation	0.215	0.33	0.26
Likelihood ratio	0.953 (0.000)	0.886 (0.000)	0.932 (0.002)

Source: Calculated by unit level data from NSS quinquennial survey on SAS of Farmers in India 2012-13 (figures in parentheses are p values)

Model 1 examines the impact of discriminatory variables on viable and non-viable farmers among marginal farm households. It is observed from the discriminant coefficient that the share of wage income followed by ownership of land and area under high value cropped explain the maximum share of discriminating coefficient of viable and non-viable farm households.

A one standard deviation increase in the share of wage income leads to 0.593 standard deviation increase in the predicted value of viable farm households at statistically significant level. A one-unit increase in productivity level leads to 0.22 standard deviation increase in the predicted value of becoming viable farm households; it has the maximum share in discriminating distance among other variables. The mean productivity of viable farmers is ₹71360 per hectare whereas the productivity level is substantially low in non-viable farm household with a value of ₹ 46650 per hectare. In line with the positive relation between productivity and viability of farm household; it is also observed that cost of cultivation is inversely related to the viability of farm among marginal farm households.

Among all the farm size groups marginal farm households has the maximum relative strength of percentage of HVC to GCA to explain the higher predicted value of viable farm household. The mean percentage of area under HVC to GCA is 20 percent for viable farm household whereas it is 12 percent for the non-viable farm households. The mean difference in productivity between viable and non-viable farm household persist to be the same for the small farms; the mean difference is of ₹ 26395 per hectare. Regarding the demographic composition of the household family size is inversely related to the viability of farm households across all farm- size groups; individual models depict that family size has inverse relation till semi-medium farm size households whereas medium and large farms show the positive relationship with the viability of the household.

Mean value of the cost of cultivation per hectare is higher for viable farm household compare to non-viable farm household across all farm-size group, but according to discriminant function cost per hectare impacts the viability of household positively for marginal farms but it has an inverse relation to other farm size groups. A one-unit increase in standard deviation of cost per hectare brings down the predicted value of becoming viable agricultural household by 0.48 times and 0.39 times for small farms and semi-medium farm size group respectively. The relative strength of discriminant coefficient increases for large farms and a one-unit increase in standard deviation of cost per hectare reduces the predicted value of becoming viable agricultural household by 0.67 times.

At all farm size, level of education above secondary positively influences farm viability with discrimination coefficient value of 0.31; which depicts that one-unit increase in the standard deviation of above secondary education leads to 0.31 unit up-rise in the predicted probability of viable farm household. Per capita increase in consumption expenditure is inversely related to the viability of farm households excluding large farm size group. That means large farm households can afford a higher level of consumption expenditure per capita whereas higher expense per capita is an economic burden for other farm size groups and influences the probability of non-viable household.

CONCLUSION

The paper has examined the economic situation of agricultural households in India across farm size groups and regions. Indebtedness, itself is not disadvantageous for farming households. However, repayment capacity reveals the ability of the household to reimburse the loan taken. The economic situation of Andhra Pradesh reveals that Bottom 10 percent of the agricultural households are running in a deficit from net income aggregating all income sources with intense extent of indebtedness. Marginal farmers of Andhra Pradesh and West Bengal belong to a similar position in terms of income, consumption expenditure level but the incidence of indebtedness is acute among marginal farmers of Andhra Pradesh. Less repayment capacity in Vidarbha region is due to very low total income level along with higher dependence on income from the farm. Marginal farmer households have total earning of only ₹ 3,344 per month with 28 percent incidence of indebtedness compared to ₹ 8900 per month in the inland western region of Maharashtra. The study further investigated the determinants of the economic viability of agricultural households across farm-size groups at all India level. Regarding the viability of agricultural households, the share of wage income followed by ownership of land scores the maximum to differentiate viable and nonviable agricultural households for the marginal and small farmers. The analysis finds out that the share of alternative sources of income, income from livestock and the income share of wage, are distinct for bottom 40 percent of agriculture households across the states. In the Eastern states and Kerala, the bottom 30 percent of farm families have a higher share of wage income than income from the farm which indicates the moving out of farm families for other sources of earnings. However, in Eastern states, even including the wage income, marginal agricultural households are not able to meet their expenditure from the farm and nonfarm income. Alternative sources of income have an immense role in the betterment of the economic situation of the agricultural households. A frontal strategy to

raise wage income needs to be taken to ensure the economic viability of marginal and small agricultural households. The situation of marginal farmers even in agriculturally developed states is under crisis; however, livestock sector significantly supports these households to meet their consumption. Expansion of livestock sector, especially in Eastern states needs to be taken as an alternative strategy for the economic well-being of land-poor agricultural households.

REFERENCES

- Chand, Ramesh (et.al) (2015). Estimates and Analysis of Farm Income in India,1983-84 to 2011-14 *Economic and Political weekly* Vol 1 No.22
- Diao, X., Taffesse, A. S., Yu, B., & Pratt, A. N. (2010, November). Economic importance of agriculture for sustainable development and poverty reduction: The case study of Ethiopia. In *Global forum on agriculture* (pp. 29-30).
- Deshpande, R. S. (2002). Suicide by farmers in Karnataka: agrarian distress and possible alleviatory steps. *Economic and Political Weekly*, 2601-2610.
- Khusro, A. M. (1964). Returns to scale in Indian agriculture. *Indian Journal of Agricultural Economics*, 19(3), 51.
- Mahendra Dev, S. (2014). Small farmers in India: Challenges and opportunities. Indira Gandhi Institute of Development Research, Mumbai June 2012. <http://oii.igidr.ac.in:8080/xmlui/handle/2275/262>
- Mishra, S. (2008). Risks, farmers' suicides and agrarian crisis in India: Is there a way out? *Indian Journal of Agricultural Economics*, 63(1).
- Narayanamoorthy, A., Alli, P., & Suresh, R. (2014). How Profitable is Cultivation of Rainfed Crops? Some Insights from Cost of Cultivation Studies. *Agricultural Economics Research Review*, 27(2), 233-241.
- Pretty, J. N. (1997, November). The sustainable intensification of agriculture. In *Natural resources forum* (Vol. 21, No. 4, pp. 247-256). Blackwell Publishing Ltd.
- Pretty, J. N., Morison, J. I., & Hine, R. E. (2003). Reducing food poverty by increasing agricultural sustainability in developing countries. *Agriculture, ecosystems & environment*, 95(1), 217-234.
- Schultz, T. (1979). The Economics of Being Poor. *The Journal of Political Economy*, Vol. 88, No. 4, pp. 639- 651.
- Sen, A. (1976). Poverty: an ordinal approach to measurement. *Econometrica: Journal of the Econometric Society*, 219-231.
- Sen, A., Sen, A., & Bhatia, M. S. (2004). *State of the Indian Farmer: A Millenium Study: Cost of Cultivation and Farm Income*. State of Indian Farmer", Ministry of Agriculture, GOI
- Singh, S., & Bhogal, S. (2014). Depeasantization in Punjab: status of farmers who left farming. *Curr Sci*, 106(10), 1364-8.
- Government of India (2004), "Annual Report 20012-13". Ministry of Chemical & Fertilizers, New Delhi.

1602 MIGRATION AND LABOUR MARKET: A CONTINUED CASE OF OCCUPATIONAL SEGREGATION AND CASTE DOMINANCE

Dipsita Dhar

INTRODUCTION:

The traditional theories of migration (Todaro, Haris, Stark) had introduced migration into a broadly rational framework where in reality it is an outcome of various social, cultural and economic construct. It is rather community or the identity, one individual immediately identifies with during making such decision that influences the mobility. This paper thus borrows the theoretical framework from Turton, Richmond and Van Hear and tries to place migration behaviour in recent Indian context where the migrants are considered as “purposive actors” in particular social, political and historical situations. Caste being one of the most crucial social order that controls the means of production and labour division, this paper will look how caste as a category influences migration. Caste is here not constrained as an identity only but apprehended as a “cultural capital” that enables some people to access skill in form of education and restrict rest from doing the same. At the same time it seeks to testify the claims of migration being an agency of social mobility through change in occupation.

The migration optimists from academia has often mentioned migration to be a window of opportunity which people from marginalised community use to escape from the traditional exploitative economic and social structure. Settling in a new place thus can be empowering in some sense as it gives a chance to rearrange the social relation and overcome the marginalisation. But in reality it is more likely it is the ‘marginalisation’ that gets rearranged in different form keeping the fundamental alienation and deprivation as it was. The study shows even after the migration the labour force remains highly segregated in terms of caste and gender, certain kind of occupation show the dominance of people from certain communities and though the occupation changes but the social strata or the class position remains unchanged. For example an agricultural labour from the rural area becomes informal labour with no assurance of future after migrating to urban area, there can be partial increase in purchasing power but the vulnerability remains constant. Those who could actually get mobility through migration are predominantly those who have some kind of privilege either in form of class or caste and sometimes both. So the people from lower caste who are also from lower class even after migration continue being as what Marxist say “reserved labour pull” and get further exploited. This paper thus tries to bring in the essence of vicious nature of labour exploitation and the social immobility of marginalised migrant labours in the present Indian context.

1. ENCOMPASSING CASTE CLASS AND MIGRATION:

“The distribution of economic and political power is central to the decision-making process at the individual and collective level. ‘Rational choice’ within a means-end schema, in which individuals maximize net advantage, is a special case rarely found in isolation from decisions which are influenced by direct coercion, manipulated opinion and value systems, the non-rational pursuit of transcendental goals and normatively oriented voluntaristic action.”⁹²

The idea that Richmond propagated had taken into account the complexity and the multicausal nature of the decision making. It essentially included the non economic factors which played significant role in determining the degree of autonomy an individual or a community can actually exercise even regarding the access to the strictly economic factors. The movement of people is no longer seen in a binary but in a continuum of different social processes. A step ahead the theory of **Van Hear** in the same line also had tried giving a holistic answer on why people migrate? Interestingly he took the effort of redefining the class as a universal category with inclusion of social and cultural factors embedding into it. He argued “class in itself and class for itself”.

“While once a mainstay of social science, class has lately been eclipsed in much of migration studies by consideration of other forms of social difference, affinity, and allegiance such as ethnicity, gender, generation, and lately religion. This article puts the case for renewing attention on the part class plays in shaping migration – particularly who is able to move and to where. It argues that the form of migration and ultimately its outcomes are shaped by the resources that would-be migrants can muster and that in turn the capacity to mobilize such resources is largely determined by socio-economic background or class. Drawing on Bourdieu, class can be conceived in terms of the disposal of different forms of capital – economic, social, and cultural. Having access to combinations of such capital shapes the routes and channels migrants can follow, the destinations they can reach, and their life chances after migration.”⁹³

Borrowing the conceptual framework from this above two, this paper will attempt to see the Indian migration trajectories putting the major on caste and how it actually shapes up the endowment of other capital forming distinguish class category which further controls the occupation choices and social mobility of individual or community.

In India Caste is one of the major social realities which cuts across different religion, due to the long history caste based society this further acts as a controlling factor in all most all aspect of life. It results in presence of endogamous social groups in which social position is hierarchically arranged and ascribed. The patterns of landownership and the distribution of occupational and educational opportunities remain very closely linked with caste in India. As a result, it

⁹² Richmond Anthony H.; Sociological Theories of International Migration: The Case of Refugees; 1988.

⁹³ Hear Van Nicholas; Reconsidering Migration and Class; International Migration Review; IMR Volume 48 Number S1 (Fall 2014):S100-S121

becomes a determining factor in determining access to economic, social and cultural resources. The caste system with its normative order differentiates the various segments within and between the castes. Although hierarchical and localized nature of caste system, its rigid rules, the strict adherence and the attachment to caste system along with its close knit boundaries tend to hamper spatial mobility. At the same time the caste system also pushes the process of migration by becoming the basis of social inequality and conflict. Caste system is the root cause of innumerable problems like differential values being attached to different castes, discrimination and tensions between the castes, differential resource distribution based on caste, exploitative economic categories along caste axis along with the exploitative social forms of relationship. All these are very closely linked with caste based migration. There are some studies that have shown the impact of caste on migration. They reveal that caste has a different effect on migration because different caste groups perceive migration differently and take decisions to move out accordingly. Their perceptions and motives of migration are regulated by the caste based socio-economic inequalities. For example if the caste position varies the perceptions and motives of migration also vary accordingly. Since social caste and economic class inequalities co-exist there is both the caste and class selectivity in migration. The study of Rajasthan villages by Kothari shows that the propensity to migrate is high in upper and lower caste groups.

This is confirmed by Yadav's study done in 1989 on the rural-urban migration in India. The upper caste migrants move to gain from migration while the lower caste migrants move for almost no gain. For instance after the partition of India the second wave of refugee influx and the social composition of that population had created a strong movement in Bengal named "Namasudra" movement under the leadership of Matua Sangh which precisely raised the discrimination the dalit refugees were facing by the state. It has been argued by historian Sekhar Bandyopadhyay that 64 in 'post-colonial West Bengal, the violence caused by partition and refugee influx led to a re phrasal on the idioms associated with victimhood, with less emphasis on caste and focusing more on the causes of migration and the struggles faced by the refugees' and hence, in spite of perpetuation of caste based discrimination, "caste" as an idiom of protest disappeared from public space.⁹⁴

Pradip Kumar Bose specifically hitting on the casteist nature of the state mentioned that the Namasudras had been the prey of calculative discriminatory responses of the Indian state which quite overtly followed a caste line vis-à-vis its rehabilitation policy. Unlike the upper caste Hindu refugees who were settled in and around the city of Calcutta, the Namasudra migrants were either resettled in the uninhabitable camps in districts of 24 Parganas, Nadia, Burdwan, Midnapur or Cooch Behar or deported mostly to inhospitable areas of Dandakaranya and Andaman Islands. Being utterly confused and disillusioned by the factionalism in its leadership on the eve of partition, and largely lacking the family/caste connections and other means to survive on their own, most of the Namasudra refugees had to depend on government relief schemes and hence were meticulously scattered in small pockets in different parts of India. In other words, the earlier organized dalit movement was effectively broken and the dalit refugees were strategically not allowed to unite.⁹⁵

In a study by **Danen Benbabaali** where she looked in to the specific mobility of Kammas from the Andhra Pradesh she showed, how the dominance over land has given the Kammas the opportunity to move from their native lands and take important jobs specially in the Southern Peninsular Cities and with active participation in politics and entertainment media helped them gaining power not only in undivided Andhra Pradesh in the leadership of Telegu Desham Party but also able to influence a decent number of mobilisation in Tamil Nadu, she described this whole assertion in social hierarchy with an important note on their physical mobility and coined this dominance as not merely "material hegemony" but as ideological too. ⁹⁶ **Deshingkar and Start** had argued in the line that the lower castes, due to the inaccessibility to land tend to migrate more than the other landowning castes.⁹⁷ The same argument was given by the scholars like Breman(1994) too. Tsujita and Oda while analysing the migration trend just like Danen had established the link between the landholding, caste hierarchy and the influence on migration decision, but quite contradictory to previous scholar had mentioned of a non linear relationship between these three. In earlier literature also Oberoy and Singh (1983), Van wey (2005) had found an "u" shaped relation between these. A study on the migration between US-Mexico found out an inverted "u" curve.

There had been ample number of studies on the relations of caste and migration, with contradictory claims. Where scholars like Khan, Mahapatra, Rajan and Mishra argued that the probability to migrate among the SC and ST is more than the rest, Shukla (2006), Kara (2006) and Bhagat (2010) argued the case reversely. Berman (1985) too argued in the later line and said there is over representation from the lower caste in the circular migration. Skeldon (2013) on the other hand brought in the class angle and stated that out of poverty people usually migrate but there can be situation where due to acute poverty people might be unable to move as well. Thorat (2005) inter linked exclusion, initial inequality and low economic growth as the cause of "chronic poverty" and migration as a tool to escape that. Ellis (2003) in the same line of thought referred migration as a "central livelihood strategy". Interestingly a study by Korra (2010) on the migration pattern in Andhra Pradesh didn't put migration into a simplistic caste binary but tried to focus on the intersctionality and variation where states "each upper caste house has one person migrating at urban areas, where rural to rural migration is common in Madigas and the other landless marginal agricultural labour".

⁹⁴ Bandyopadhyay Sekhar, Caste, Protest and Identity in Colonial India: The Namasudras of Bengal 1872-1947. Oxford University Press, Delhi, 2011.

⁹⁵ Byapari Manoranjan, Mukherjee Meenakshi; 'Is There Dalit Writing in Bangla?' Economic and Political Weekly 42(41), 2007.

⁹⁶ Benbabaal Daneni; Dominant Caste and Territory in South India: Migration and Upward Social Mobility of the Kammas from Coastal Andhra, 2014.

⁹⁷ Deshingkar Priya, Start Daniel; Seasonal Migration for Livelihoods in India: Coping, Accumulation and Exclusion, Overseas Development Institute, 2003

As the caste hierarchy is traditionally directly related to the access to means of production specially the land, which too is an important factor while discussing the migration as land can be a source of livelihood which if is labour intensive tend to keep people grounded around the land, where as the income that land generates can also be an incentive for providing the capital to move. In an agrarian society landlessness too can result into the either of the condition where a person chose between staying back and moving out. Scholars like Belwal (2007) Khan (1986) Mahapatra (1998) and Lipton (1976) found out a negative relation between the land holding and outmigration, whereas a study by Yadav (1996) found showed land to be a potential supplier for initial capital to migrate.

There had been ample number of studies on the relations of caste and migration, with contradictory claims. Where scholars like Khan, Mahapatra, Rajan and Mishra argued that the probability to migrate among the SC and ST is more than the rest, Shukla (2006), Kara (2006) and Bhagat (2010) argued the case reversely. Berman (1985) too argued in the later line and said there is over representation from the lower caste in the circular migration. Skeldon (2013) on the other hand brought in the class angle and stated that out of poverty people usually migrate but there can be situation where due to acute poverty people might be unable to move as well. Thorat (2005) inter linked exclusion, initial inequality and low economic growth as the cause of “chronic poverty” and migration as a tool to escape that. Ellis (2003) in the same line of thought referred migration as a “central livelihood strategy”. Interestingly a study by Korra (2010) on the migration pattern in Andhra Pradesh didn’t put migration into a simplistic caste binary but tried to focus on the intersctionality and variation where states “each upper caste house has one person migrating at urban areas, where rural to rural migration is common in Madigas and the other landless marginal agricultural labour”.

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RESEARCH DESIGN, DATABASE AND METHODOLOGY:

In order to get an empirical result the India Human Development Survey-II (IHDS-II), 2011-12 is used as a database which is nationally representative, multi-topic survey and includes 42,152 households in 1,503 villages and 971 urban neighbourhoods across India. Statistical tools such as regression model, co relation co efficient and cross tabulation and thorough analysis of literature available is used for better understanding of the subject.

Variables like Caste (ID13), Seasonal Migration (MG1), Education (ID18), Access to land(Landowned1) is used in the exact form that is given while surveying. The variable “Class” is defined as the quartile of total income to have a easier classification.

While defining the different type of occupation, some of them are clubbed together on the basis of nature of the occupation (formal-informal and according to the NATIONAL CLASSIFICATION OF OCCUPATIONS-1968) and classified to understand the social and economic mobility through occupational change.

Salaried: Architects, Engineers, Technologists and Surveyors, Engineering Technicians, Aircraft and Ships Officers, Life Scientists, Life Science Technicians, Medical and Technical Persons, Journalists Creative Artists, Composers and Performing Artists, Professional Workers, Elected and Legislative Officials, Administrative and Executive Officials, Financial Institutions, Working Proprietors, Working Proprietors, Directors, Managers and Related Executives etc.

Business and Service related: Merchants and Shopkeepers, Wholesale and Retail Trade, Manufacturers, Agents, Technical Salesmen and Commercial Travellers, Salesmen, Shop Assistants and Related Workers, Insurance, Real Estate, Securities and Business Service, Salesmen and Auctioneers, Money Lenders and Pawn Brokers

Domestic help and Petty service Provider: Hotel and Restaurant Keepers, House Keepers, Matron and Stewards (Domestic and Institutional), Cooks, Waiters, Bartenders and Related Worker (Domestic and Institutional), Maids and Other House Keeping Service Workers, Building Caretakers, Sweepers, Cleaners and Related Workers, Launderers, Dry-cleaners and Pressers, Hair Dressers, Barbers, Beauticians and Related Workers, Protective Service Workers, Service Workers. **Agricultural:** Farm Plantation, Dairy and Other Managers and Supervisors, Cultivators, Farmers other than Cultivators, Agricultural Labourers, Plantation Labourers and Related Workers, Other Farm Workers, Forestry Workers, Hunters and Related Workers, Fishermen and Related Workers. **Non agricultural:** Metal Processors, Wood Preparation Workers and Paper Makers, Chemical Processors and Related Workers, Spinners, Weavers, Knitters, Dyers and Related Workers, Tanners, Fellmongers and Pelt Dressers, Food and Beverage Processors, Tobacco Preparers and Tobacco Product Makers.

A thorough statistical analysis of secondary data, literature available and **Richmond Migration axis** is used for narrowing down the conclusion of the study. To see the change in the occupation the simple % calculation and to understand the factor affecting them cross tabulation is used. All the graphs and tables are calculated from IHDS data (2011-12) independently by the author.

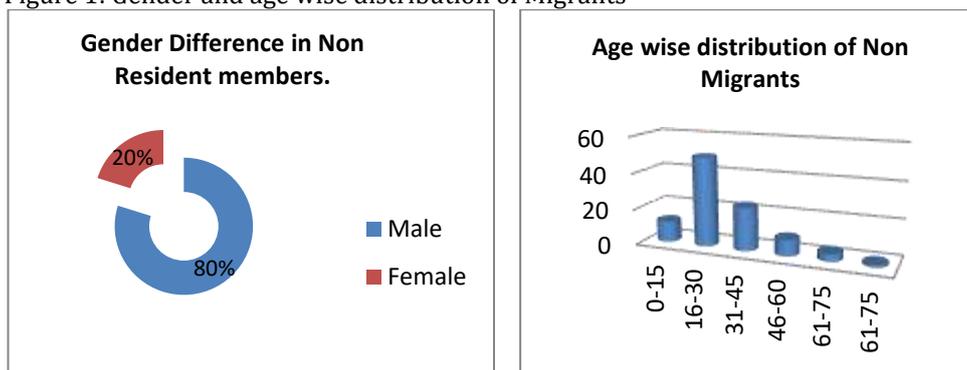
2. SOCIO CULTURAL FACTORS, POLITICAL ECONOMY AND MIGRATION IN INDIAN CONTEXT:

According to P. Sainath, the collapse of livelihood in the primary sector especially agriculture has been the major cause for the increase in migration. More than 240,000 farmers have committed suicides between 1995 and 2009 because of failure of our agricultural policies and has been a major reason for out migrations which he referred as ‘distress

migration'. The collapse of the agricultural sector in these regions thereby increasing unemployment, indebtedness, low wage rates etc become the push factors for seasonal migration in search of employment. In these conditions food twice a day, and the job availability throughout the year though at very low wage rates become the pull factors in migration in search of a better life (Srivastava and Ali, 1981; Rao, 1994; Rogali et al, 2002; Deshingkar and Start, 2003; Deshingkar and Grimm, 2005; and Deshingkar and Akter, 2009).⁹⁸

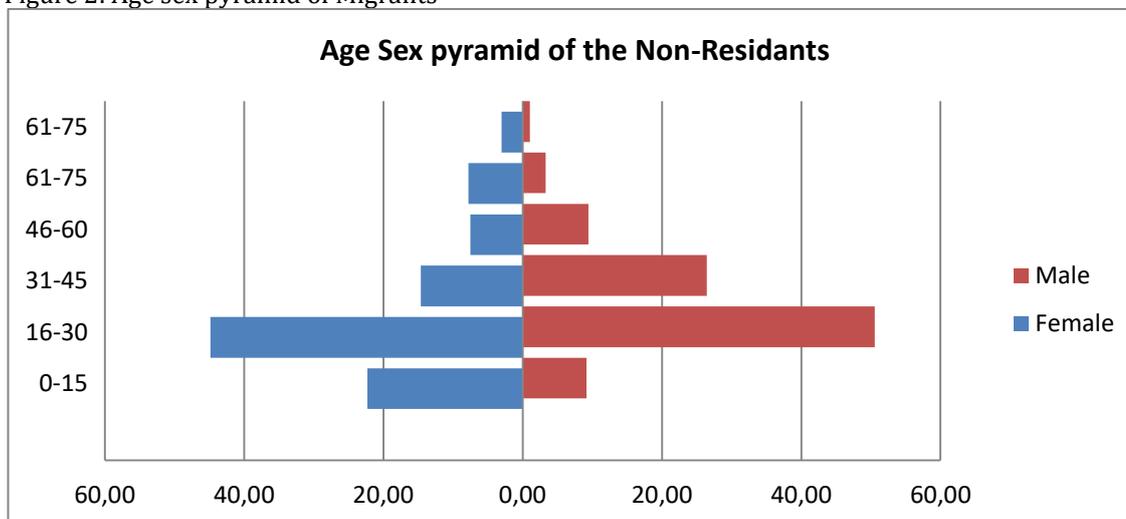
In IHDS survey, residents who are either born to the surveyed household or married to any individual of the household who no more stay with the current household are considered as the non-residents which includes husband/wife of any of the member who stay outside, the children of any of the member of the household who stay outside and parents of any children in the household who stay outside. These people can also be considered as out migrants to the respective households. The basic demography of them shows that there has been a gender bias in migration, where majority of reported migrants are male, which means the migration was mainly due to economic reasons (the mobility of women due to economic reason is still to be less likely in a country of Classical Patriarchy like India, Rao 2014)⁹⁹, it also mean that women of the family, who were married off are underreported. This reflects the gendered notion of how women are no more considered as a member of the family once married, also while “male moving out in search of job” are considered as an event worth mentioning the removal of women looks more naturalised thus not worth reporting.

Figure 1: Gender and age wise distribution of Migrants



Source: Computed from the IHDS data (2011-12)

Figure 2: Age sex pyramid of Migrants



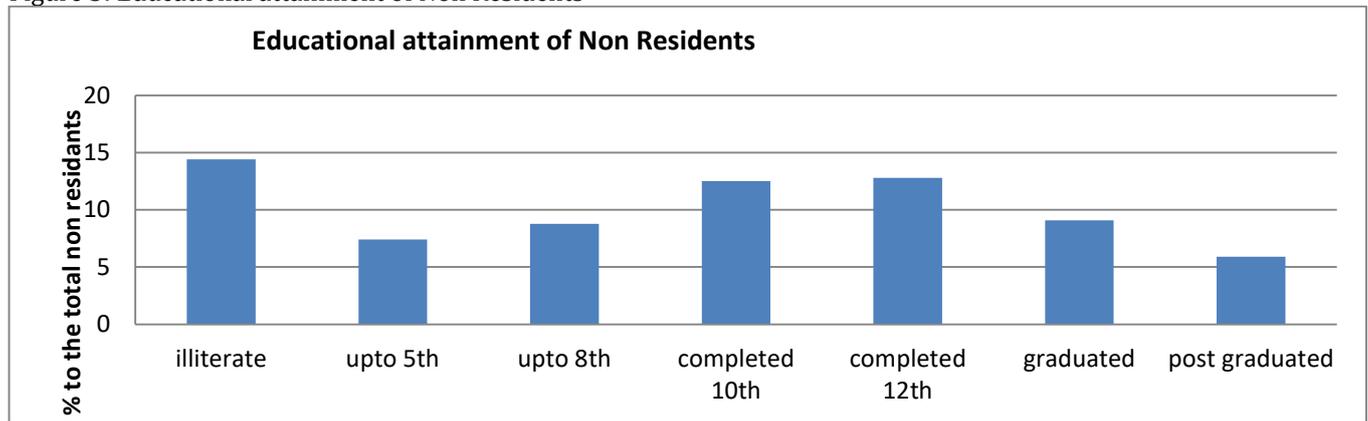
Source: Computed from the IHDS data (2011-12)

As expected among the migrants most of them are between the age group of 16 to 30 years, followed by people up to the age of 45, all most 70% of the NRs belong to the working age group and the rest in the dependent one. It is interesting to see that number of people under the age of 15, are largely men. Female migrants are mainly between the age group of 16 to 45 and collectively more than the men of the same age group. This trend follows up till the age of 60 and take reverse direction afterward. The woman moving after marriage can be reason for the bulge in middle part, also very few women are allowed to move alone in Indian society at younger age, but the same may not be applicable for the men of the same age. The urge for earning money and men as an agency to do that is widely common in India. Unlike the neighbouring Bangladesh India really didn't face what Elson and Pearson (1981) coined as the “nimble fingers” phenomenon, where there is deliberate effort from the state and the capital to “culturally legitimate the migration of young, single women from rural to urban areas” which indeed allowed them to be treated as a “docile, reliable, and low-paid reserve army” (Bagchi 2011, Ghosh 2002, Standing 1999).

⁹⁸ Parida Jajati Keshari, Madheswaran S ;HIGHER WAGES, COST OF SEPARATION AND SEASONAL MIGRATION IN INDIA.

⁹⁹ Rao Smriti ;Women and the Economy in India: Insights from the Data on Migration; December, 2014.

Figure 3: Educational attainment of Non Residents

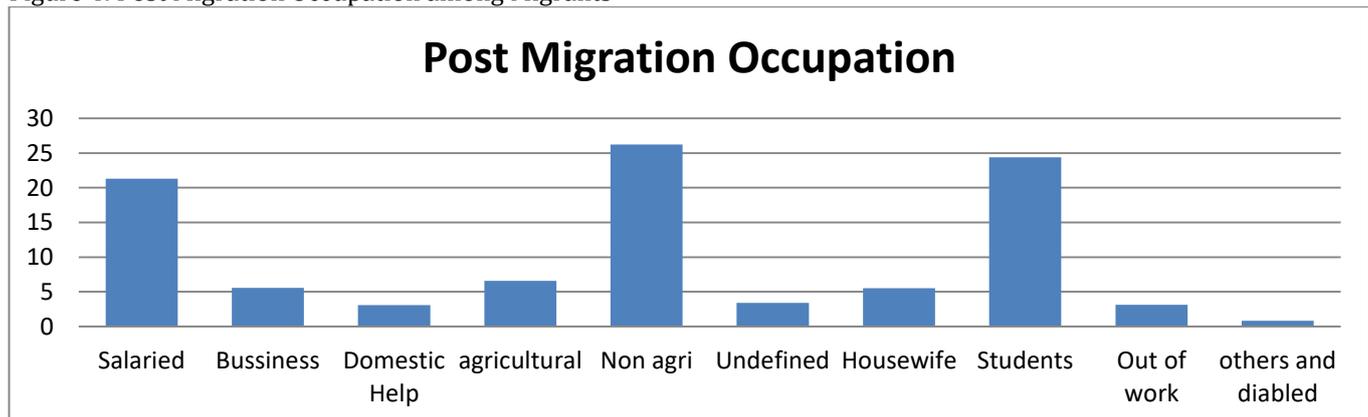


The data shows people on the move are majorly illiterate, but it dips down afterward. The migration stream picks up again after they pass class 5th and reaches a saturation point at people passing class 12th. There is a strong decline after this point which continues up till their post graduation. This is an indicator that generally people with higher education move less for long term than the rest, at the same time the rise in migrants educated up to secondary shows, some sort of educational acquirement empowers or provide basic skills to move as well. The people with higher educational attainment might get a job in place of their origin and thus take less part in migration.

3. CHANGE IN OCCUPATION AND FACTORS CONTROLLING MOBILITY

As this paper primarily look into the generational occupation change taking into account the caste dynamics, a statistical review of change in occupation is required. The followings are the particular caste wise break up of pre migration traditional occupation and the one they taken reportedly after migration.

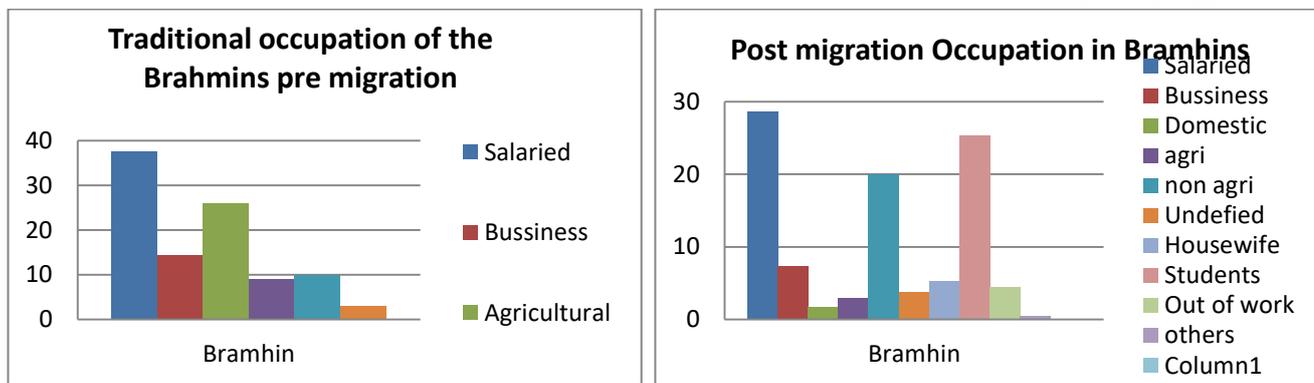
Figure 4: Post Migration Occupation among Migrants



Source: Computed from the IHDS data (2011-12)

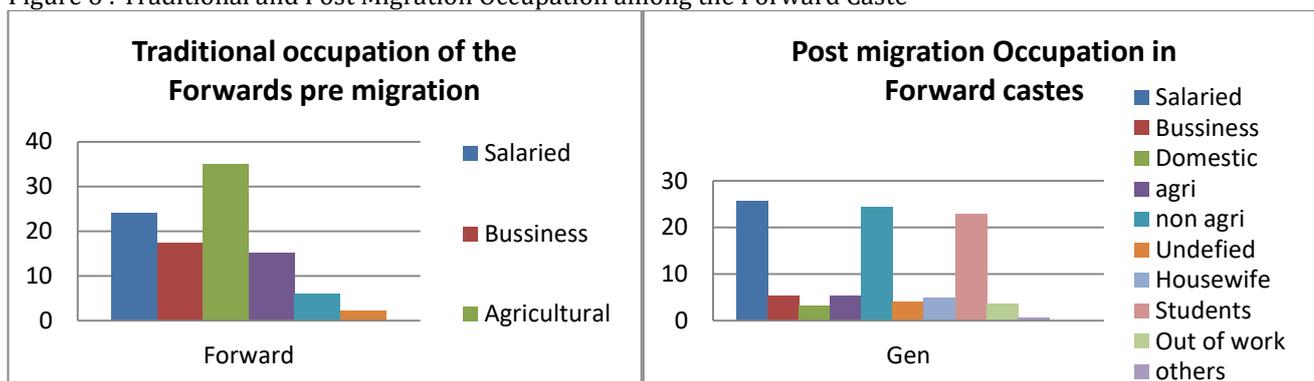
The graph above depicts majority of people after migration deploy themselves into three major activities; Non agricultural wage labourer, students and salaried services. The decrease in agricultural activities marks the rural-urban, intergenerational migration and shift in overall economic activity. The women who are married off or moving as their family move, come under the housewife category, and it is important to keep it in the occupational classification as in a patriarchal society domestic work done by the women of the family goes unnoticed as a labour input. Domestic help includes people who work as cook, cleaner, laundry owner etc, though in economic activities they might fall as service provider but in reality operate in a complete informal manner with unregulated low pay. Now if looked into the traditional occupation of the migrant family and current one in many cases there will be difference, and there will be many instance with no change in their occupation. But why some tend to get into a new job while others remain in same. In a country like India no socio-economic study can be done without taking into consideration the caste factors. If individual caste and its effect in occupation is measured, a theorisation can be formulated.

Figure 5 : Traditional and Post Migration Occupation among the Bramhins



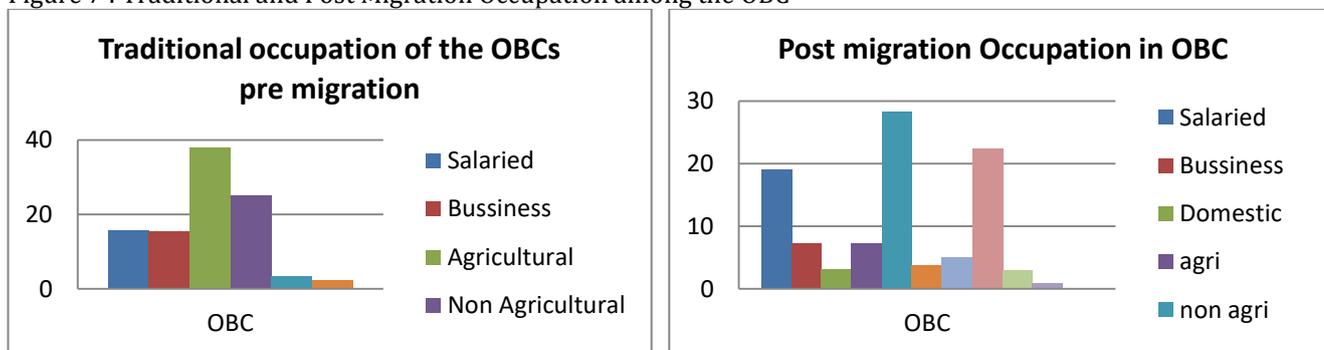
In case of Brahmins a significant chunk of people who are moving outside their houses are moving as students (25.41%), interestingly the primary dependency on salaried job remain unaltered. There has been an increase in the non agricultural labour force and a usual decline in the people involved in agricultural activity.

Figure 6 : Traditional and Post Migration Occupation among the Forward Caste



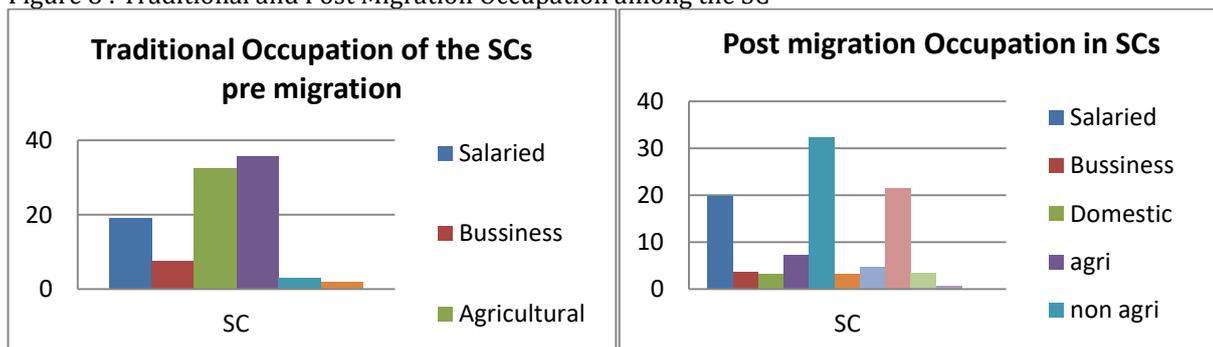
Among forward castes there is a clear shift from agricultural activity to salaried job after the migration, this is interesting and significant as unlike Brahmins, forward castes are traditionally feudal landlords or land owning class. The sweep in occupational choices after the migration shows the growing dependency on non-land activity which is induced by the agrarian distress and salaried job as a symbol of status upgradation.

Figure 7 : Traditional and Post Migration Occupation among the OBC



The occupational shift among OBCs happened majorly from agricultural to non-agricultural activities followed by salaried jobs. And over this point the caste groups can be differentiated. Where in upper caste the thrust remains on salaried job, in OBCs it gets consolidated in non-agricultural wage labour.

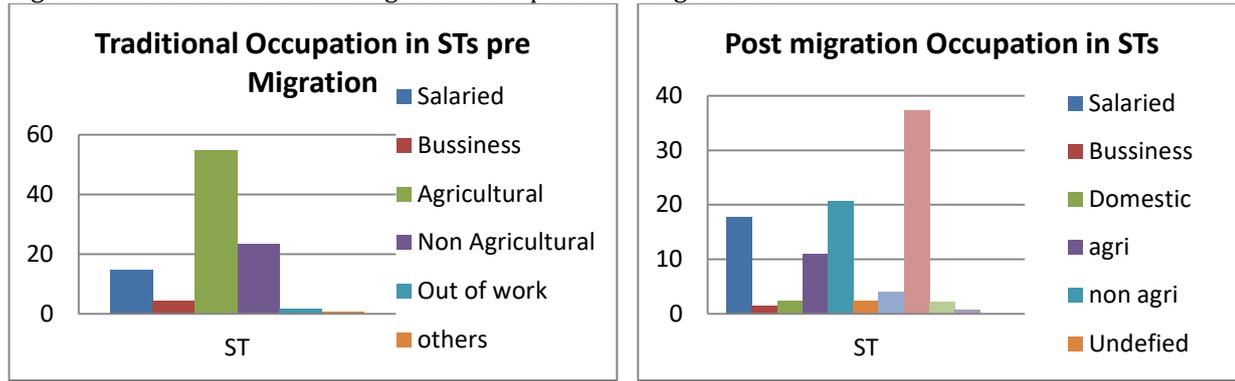
Figure 8 : Traditional and Post Migration Occupation among the SC



So it is basically the Scheduled population and the Brahmins whose traditional occupation becomes their current occupation even after the migration. The graph clearly shows the dependency on non agricultural wage labour remain

unchanged among the scheduled caste even after the migration. Percentage of salaried job also remains around 20% as it was earlier in the traditional occupation.

Figure 9: Traditional and Post Migration Occupation among the STs



The case of scheduled tribes is a bit different with a huge proportion students coming out of their natives, this can also be a result of the concentration of tribal in North Eastern region who anyway migrate to the metropolitans for the purpose of studying. Though their economic dependency remains largely same with a shift to non-agricultural activity, the proportion of salaried people also remains unaltered even after migration. Regional analysis in case of ST migrants will give a clearer picture of some of their regional variations.

So, the question comes why is that some castes after migration shift their occupation whereas others remain in the same. Now even a change in occupation cannot have a quantitative connotation to either be positive or negative. For instance a person who was traditionally in salaried job is a positive trait, where as a person who was earlier in agricultural activity if stays in agriculture even after migration may not be the same thing. On the other hand if there is a shift from the agricultural activity to salaried job this will be considered to a positive change, where as shifting to non agricultural wage labour won't be as it does not bring any fundamental change to the migrants. Often agricultural labourers come to cities and start working as a construction labour, though this bring changes in their occupation but creates marginal effect in their overall livelihood.

Table 1: caste wise distribution of post migration occupation

Caste	Salaried	Business	Domestic	Agricultural	Non Agri	Undefined
Brahmin	27.38	9.52	2.38	4.76	52.38	3.57
Forward	12.15	7.73	3.31	10.22	64.36	1.38
OBC	6.8	5.57	2.75	16.34	66.96	1.08
SC	3.81	4.03	1.96	20.7	67.43	1.31
ST	2.14	1.95	3.7	35.67	55.95	0.39
Others	8.33	16.67	16.67	4.17	54.17	0

The trend is presumable and clear, the upper caste especially that of the Brahmins remain almost 30% into salaried job which is much more than the 12% of the other forward castes. There is a heavy deployment of labour in the non agricultural activity all the castes contributing more than 50% of their labour force into it, OBC being the largest constituent of a whopping 66%. The most interesting part though remains in case of the scheduled tribe migrants where an astonishing 35% even after migration remain in the agriculture related activity. According to a report by planning commission of India, "Tribal's are engaged in various occupations like hunting, fishing, gathering of forest products, shifting cultivation to settled agriculture, rural crafts and artisans. A very few tribal groups are engaged in non-agricultural activities...tribal people migrated to the rural areas of Bihar, West Bengal mainly to work as agricultural labour (Mosse et al., 1997)."¹⁰⁰

Table 2: caste and Class wise distribution of people with no change in occupation type

Caste	1st Quartile	2nd Quartile	3rd Quartile	4th Quartile
Brahmin	13.35	18.79	24.22	43.63
Forward	16.4	21.08	23.96	38.56
OBC	27.33	25.94	26.45	20.28
SC	28.89	31.39	21.6	18.12
ST	53.87	25.1	10.42	10.62
Others	7.69	18.68	37.36	36.26

The interplay of class and caste shows, among the Brahmins and other forward castes that there is a trend of more people from the upper class to remain the same group of profession. In the previous section it was shown in both the castes, the percentages of people who are in salaried job remain almost unchanged. So the fact that people from upper class who

¹⁰⁰ Migration of Tribal Women: Its Socioeconomic Effects - An in-depth Study of Chhatisgarh, Jharkhand, M.P and Orissa; Planning Commission Government of India; October 2010.

remain in the same group of occupation are presumably those who are in salaried job. This stationary condition is a positive indicator where migration is not done as a part of survival strategy but progress or to maintain the status quo.

Whereas in case of OBC no unilinear trend is observed, till 3rd quartile there is a rise-low-rise pattern in people remaining in same occupation but when it reaches the 4th quartile it falls down. In case of OBC, the major occupation group which was equally important even after migration was non-agricultural wage labourer. This can be presumed that migrants remain in the same occupation are basically the wage labourer who defiantly will be in less number in the top most quartile.

The trend among the Scheduled Castes shows across the class realm people remain in the similar type of job, as the earlier graphs also showed. The occupation that remained almost same was the salaried one. Explanation to it can be even the salaried job that are taken up by the scheduled castes are low paid in nature, thus there is a concentration at second quartile which doesn't continued in upper two classes. But this explanation seems to be too generalised and to get an exact answer a more detailed study will be needed. The Scheduled tribes show a reverse pattern from that of the Brahmins, meaning concentration in the lower class group of people remaining in same occupation. As it was seen even in the case of seasonal migration a large section of them remain in agricultural activity even after the migration. The same condition might be occurring even for the long term migration as well. So, in case of tribals basically even after migration, the poorest remain in a condition with no drastic change in their living condition.

Table 3: Caste and Educational distribution of people with no change in occupation type

Caste	Illiterate	1 to 5th	5th to 8th	till 10th	till 12th	till graduation	post graduation
Brahmin	6.52	4.97	11.18	24.84	17.7	24.07	10.71
Forward	14.62	14.14	10.92	17.94	14.9	16.09	11.39
OBC	21.42	18.39	21.36	16.08	9.18	8.46	5.12
SC	20.73	18.55	19.81	20.96	9.97	6.78	3.19
ST	34.43	20.36	18.16	12.28	9.78	3.49	1.5
Others	23.08	10.99	5.49	39.56	5.49	8.79	6.59

Education proved to be important criteria for deciding whether to migrate or not and naturally this should be one of the major factors which decide the type of job of the migrant. There are basically two broad categories the first is a top heavy structure like that of Brahmin and partially the forward castes where migrants are mostly in salaried job like their ancestors and thus gather around the higher educational attainment if we move towards the second one, OBC, SC and ST the pattern gets reversed and more people gather around the low educational attainment. This is an important evidence to say that the lower caste people as semi or low skilled labour group even after migration engages in similar menial jobs which are mainly labour intensive.

Table 4 Caste and Land ownership among the Seasonal migrants.

Caste	marginal	small	semi medium	medium	large
Brahmin	81.28	9.83	5.4	2.96	0.54
Forward	79.98	10.19	5.7	3.41	0.72
OBC	83.01	9.51	5.04	1.85	0.59
SC	93.49	4.74	1.35	0.41	0.01
ST	79.96	14.38	4.24	1.17	0.25
Others	83.12	10.81	3.68	1.76	0.63

Source: Computed from the IHDS data (2011-12)

The land relation and the Caste remain a mysterious case which does not show a prominent trend. The division across the caste line remains almost same, with SCs having least ownership towards the higher end the Forward Castes with highest number in the large landholdings. This can be related to the present context as historically the dalits didn't have the right to own land and mostly worked as labourer in upper castes' fields. Traditionally even the Brahmins too were not supposed to own land as they according to the Hindu rituals will be a devotee to God and survive through "begging" from the people but in reality that does not seem rally happen. Though lesser than the other forward castes, Brahmins too own significant amount of land. The case of Forward castes should be understood in the framework of traditional division of labour, forward castes include caste groups like Rajputs, Bhoomihars, Kayasthas which had been the feudal lords, and as land reform was not successful in most of the part of India the ownership over big landholdings still exist with the Forward castes.

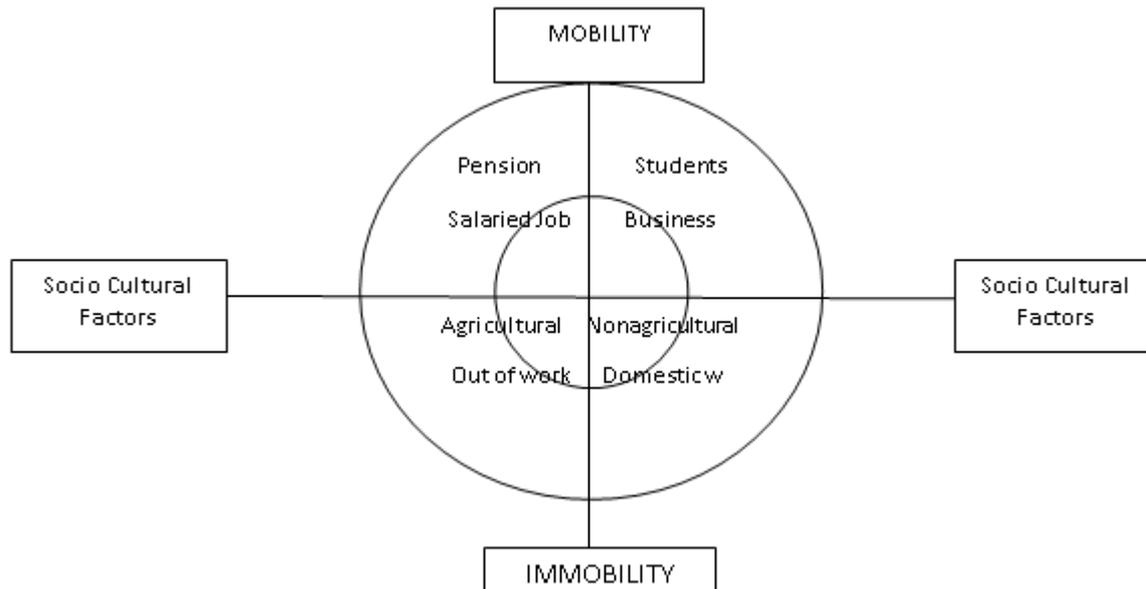
Table 5: Caste and Educational Attainment among the Seasonal migrants.

Caste	Illiterate	1st to 5t	5th to 8t 8th to 10	10th to 1	Graduates	Post Graduation
Brahmin	19.24	9.76	13.77 15.68	26.01	9.71	5.83
Forward	25.52	12.75	15.29 14.37	22.91	6.07	3.09
OBC	33.74	14.44	16.99 14.02	16.33	3.06	1.43
SC	38.67	14.34	16.83 13.92	13.26	2.03	0.97
ST	42.09	15.35	16.54 12.30	10.8	2.14	0.78
Others	29.38	12.69	20.49 13.75	17.9	3.45	2.35

Source: Computed from the IHDS data (2011-12)

Caste groups just like class differences show clear control on educational attainment where the percentage of illiterate increases towards STs and number of post graduates and graduated decrease in the same line. Among the SCs and STs the migrants pursuing higher education is actually low, which further confirms the hypothesis of lower castes who are coming from, lower class with low skill migrate as a labour stock for further exploitation.

Now the question arises about the claims of migration optimists who have always advocated the need of spatial mobility in order to gain a social or economic mobility. The discussion above clearly points out that even after migration the “historically disadvantaged” communities remain in the tail of the existing structure, only those with a certain access to skill or cultural capital may succeed to go upstream. So there is a need to theorise migration as a tool to attain mobility, in order to reach that conclusion the theoretical framework of Richmond is borrowed. Richmond had successfully blended the spirit of sociological and social psychological theories on migration and the unrealistic boundary of economical and socio political binary was broken. His postulated Richmond Axis came up with a much more holistic and multivariate approach where the centrality of the argument was shifted to the exercise of “autonomy” from the voluntarily- novoluntarily debate. Though he classified the refugee movement along the axis of Reactive and Proactive refugee, the similar framework can be followed to map down the mobility and immobility of inter-state migrants.



The figure above shows the change in occupation from any other to Salaried Job, Business or moving as students should be considered as something that helps the migrant to get the mobility. The reason being the formality of the occupation, the fundamental change in the nature of occupation and an opportunity of skill development three of these respectively provide. Now the previous discussion had already showed that salaried job and business enjoys a higher proportion of upper class across the caste line and a large chunk of Upper castes as the occupants. This further shows those with a caste privilege, or even among the deprived caste one with a better of class position that enables them to acquire skill in form of education can really avail the mobility in true sense. On the other hand agricultural labour, non agricultural labour and domestic labour being the alternate occupation which is largely run as an informal sector, with little or no assurance of the future. The analysis showed that the lower class across the caste groups either have not changed their occupation or changed from the first one to the later two. This again brings into the strict caste dominance in occupational segregation even after a spatial dislocation of migrants from their earlier societal structure.

So it can be said mobility through migration is a complex process of existing power structure, caste induced political economy and differential endowment of cultural capital, to which a individual or a community responds to. The one with higher cultural capital tends to use the political economy of migration in his or her favour by moving up with a better job and greater stability, whereas the other one with lesser endowment remain immobile or get marginal mobility by staying in same or similar occupation even after the migration.

FINDINGS:

- Migration is clearly influenced by caste, class, land ownership and educational attainment. Among the migrant’s lower castes, lower class, marginal land owner and illiterates are large in number.
- Caste becomes an important factor but even within a single caste does not reciprocate homogeneously, with upper class and higher education even those from the same caste behave very differently in taking decision about migration.
- Migrants mostly change their traditional occupation after the migration a strong stream seen where most people move from agricultural activity to non agricultural activity let it be salaried job or wage labour.
- In Long term migration change in occupation is dominated by the individuals caste, class education etc. The data shows Bramhins and upper castes who were in salaried job even before the migration stay in the same group of occupation. They maintain their social position through and after the migration. The scheduled tribes too remain in the same

occupation but that in mostly either as agricultural labourer or sometimes as non agricultural wage labour. Even after the migration they fail to achieve an upward social mobility and gets trapped into the destitute. The SC's and specially the OBC showed a higher mobility in the occupational structure. This is important to see that OBCs are in many cases the dominant or the preponderant communities with much acquired political power in recent times which is also reflected in this case. The SC's on the other hand though preponderant still hardly come across as dominant but there had been individual upliftment among them specially those who could avail reservation. Even among the dalits with a traditional occupation of salaried job, continue to be in salaried job after their migration but the proportion of such cases are much lesser than that of the upper castes.

4. POLICY RECOMMENDATION AND A WAY FORWARD

Agricultural distress had been a major reason of seasonal migration and even the people with agricultural activity as their traditional activity tend to migrate more for long term and change occupation into varied non agricultural activities. So across the class and creed the low return in the agricultural sector had pushed people to move from their native. In order to have a check on this upsurge in migrational stream corrective measure should be taken by the government, where pesticides seeds should be taken back from the hands of corporate as the increasing price of this basic material had summed the total cost production so high that earning profit for the small and medium farmers becomes next to impossible. A more regulated market control and peasant facilitating Government intervention should be promoted to revive agriculture and keep people to their origin. Now it is true that migrant labourers had been exploited badly both in terms of social and economical terms but at the same time migration is also a survival strategy for the rural poor who are dominated by the OBCs and other lower castes. To ensure that these huge portion of working population do not remain unskilled, low paid and socially stigmatised, the labour laws had to be reformed. Those who are working as contractual labour in mostly unorganised sector in the "periphery", should be provided with basic minimum wage, defined working hour and social security like other jobs. The over representation of scheduled communities, illiterates and marginal land owner in the migration stream shows the multiple vulnerability that the migrants of India are open to, now these can be only addressed with a proper implantation of welfare policies, reservations in government and private job and a real life adaption of "education to all" goal. As it is proven the higher skilled who may be emancipated due to the caste hierarchy, class position and the already gathered cultural capital after migration tend to be in a better position which do not repeat for those who lag this and remain in the same loop of destitute, thus migrating without the skills or capitals really not going to bring any sustained change among the downtrodden.

5. CONCLUSION

Migration as a survival strategy is important for the people across the different mosaic of identity. Almost in all the cases discussed here show the people from the lower class in all caste categories tend to move more than the economically better ones. India with a huge bulk of poor population thus has considerable number of people who are migrating inside the country. The table 4.1 shows that these poor people are also mainly from the rural areas, table 4.5 which gives an idea about their traditional occupation which shows that a majority of workers who are dependent on land, tend to move more than the those who are not bound with land. The agricultural distress that had been quite consistent in India just after the green revolution where marginal farmers had fallen prey to the neo-liberal market economy and rather than improving their position they had to migrate out both from their native land as well as their traditional occupation. Now who are this people, who work in fields or as labourers? The occupation diversification along the caste lines show that the backward communities, SCs and STs are the ones who are more into labourer jobs, where as the upper castes concentrates themselves more into the salaried services and business. This also brings into the fact that it is the lower castes and the backwards that are in process of moving continuously. But as the hypothesis says even among them the attainment of skills which have been considered here as education, plays a vital role. The data shows that in all the caste groups except that of the Brahmins, migrants are those, who either illiterate or have only finished their primary education. Only the Brahmins show an interesting trend where even their top most educated section tends to migrate more than the other castes.

- The lower class from all the caste attains no or minimum education and even after migrating they remain in low paid low-skilled jobs. The nature of their migration is substantial in nature and though receives a marginal change in the wages but in totality do not experience any drastic change through migration.
- Among the upper castes the education attainment ratio is much more than the lower castes, though among the other forward castes the negative relation with migration and education remain same. But the rise in migration among educated Brahmins is the only exception from the general trend. This indicates to the fact that unlike the other castes Brahmins also engage in migrations for jobs which require higher skill and well paid as well. So, the Brahmins who are traditionally into salaried job tend to escalate their occupational status by moving out.
- Even after generational change in the occupation there is no substantial change in the social or economic position of the migrant labourers. Only those who have acquired or been born with certain cultural capital can use migration as process of mobility as they engage in occupations which are more formal in nature where as the rest remain immobile due to their "lag" in skill. The occupational diversification remains completely segregated on the caste lines even after the migration taking place.

REFERENCES

Benbabaali, D. (2012). Dominant Caste and Territory in South India: Migration and Upward Social Mobility of the Kammas from Coastal

Andhra. University of Paris Ouest-Nanterre.

Byapari, M., & Mukherjee, M. (2007). Is There Dalit Writing in Bangla? *Economic and Political Weekly*, 42(41), 4116-4120.

Hear, N. V. (2014). Reconsidering Migration and Class. *International Migration Review*, 48(S1), S100-S121.

Jodhka, S. S. (1999). Community and Identities Interrogating Contemporary Discourses on India. *Economic and Political Weekly*, 34(41), 2957-2963.

Kothari, U. (2002). *Migration and Chronic Poverty*. Institute for Development, University of Manchester. doi:<https://dx.doi.org/10.2139/ssrn.1754530>

Rao, S. (2014, December). *Women and the Economy in India: Insights from the Data on Migration*. Retrieved from American Economic Association: <https://www.aeaweb.org/conference/2015/retrieve.php?pdfid=1002>

Bandyopadhyay, S. (2011). *Caste, Protest and Identity in Colonial India* (2 ed.). New Delhi: Oxford University Press.

Deshingkar, P. (2003). *Seasonal Migration for Livelihoods in India: Coping, Accumulation and Exclusion*. London: Overseas Development Institute.

Jolly, S., Reeves, H., & Piper, N. (2005). *Gender and migration: Overview report*.

Kawar, M. (2004). Gender and Migration : Why are Women more Vulnerable ? *Femmes et mouvement: genre, migrations et nouvelle division internationale du travail*, 71-87.

Parida, J. K., & Madheswaran, S. (2012). *Higher wages, cost of separation and seasonal migration in India*. Bangalore: Institute for Social and Economic Change.

Richmond, A. H. (1988). Sociological Theories of International Migration: The Case of Refugees. *Current Sociology*, 36(2), 7 - 25.

Singh, M. (1995). *Uneven development in agriculture and labour migration : a case of Bihar and Punjab*. Shimla: Indian Institute of Advanced Study.

Society for Regional Research and Analysis. (2010). *Migration of Tribal Women: Its Socio-economic Effects - An in-depth Study of Chhatisgarh, Jharkhand, M.P and Orissa*. Gurgaon.

Upadhyay, C. (1998). Conceptualising the Concept of Community in Indian Social Science: An Anthropological Perspective. *Paper Presented to National Workshop on Community and Identities - Interrogating Contemporary Discourses on India*. Department of Sociology, University of Hyderabad.

Vasavi, A. (2009). Suicides and the making of India's agrarian distress. *South African Review of Sociology*, 40, 94-108.

Vasavi, A. (2001). Narratives in the Reconstitution of Communities. In S. S. Jodhka (Ed.), *Community and Identities: Contemporary Discourses on Culture and Politics in India*. New Delhi: SAGE Publication.

1427 INFORMAL WORK AND THEIR WORKPLACES: SPATIALLY SEGMENTED LABOUR MARKET FOR SLUM DWELLERS IN KOLKATA

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ABSTRACT

Spatial segmentation of the labour market within the metropolitan is observed globally. In India it is not only compartmentalised on gender, caste, ethnic lines but also geographically segmented by the creation of spatially disjointed markets. The present paper argues that the labour market for informal workers is segmented into smaller labour markets separated by commuting (home-work) distance. Hence, the present paper has two objectives. The first is to map spatially fragmented labour market of smaller scale within a big metropolitan market. The second objective is to understand the determining factors (age, gender, social and religion groups, migration status, educational qualifications, employment types and residential locations) for home-workplace distance.

The present paper is based on case study of labour market in Kolkata. This paper is based on data collected from field survey of 1500 households located in 6 different slum clusters. The quantitative focus is on the variable like employment pattern, workers characteristics and human capital, commuting pattern (home-workplace distance) taken from the survey. For the present study, only workers with fixed workplaces are considered. This is only to reduce the complexity in conceptualising spatial labour market boundaries.

In the study it is seen that the average commuting distance (home-workplace distance) of workers are much shorter than the metropolitan-wide scale. This is true for all the locations surveyed. Often the employment field around these 6 localities (residential areas) are non-overlapping. It is indicating towards the fact that the workers in the informal employment are spatially constrained. It creates small, segmented highly localised markets within the metropolitan city. Workers in central localities travel much shorter distance compared to non-central localities. It is seen that women's spatial access is more constrained compared to men's. Similarly the self-employed workers have much spatially confined markets compared to regular and casual wage workers. The home-workplace distance increases with increasing level of education.

Keyword: Informal worker; Metropolitan labour market; Spatial segmentation, Kolkata

1 INTRODUCTION

Intra-metropolitan spatial labour market research has gain scholarly attention in the west (Hanson & Pratt 1991; Hanson & Pratt 1995; Parks 2004; Ellis et al. 2007; Wright et al. 2010). These scholars have advocated the presence of local labour market finer in scale compared to metropolitan-wide scale. The disadvantaged groups of workers tend to have lack of spatial mobility and tend to be more affected by the local employment structure. Disadvantaged groups like women (Madden 1981; Hanson & Pratt 1995), racial minorities (Kain, 1968; cited in Houston, 2005), immigrants (Ellis et al. 2007; Wright et al. 2010), low wages and lower level of skill possessions tend to be more affected by the intra-metropolitan spatial differentiation.

In developing countries, the labour market is often segmented into formal and informal sector. Indian economy is dominated by informality and informal employment occupies a large share in urban areas (Mittra 2004). Informal work is characterised by low wages, lack of security. Workers in this type of employment are generally lack in skill possessions. It is often argued that labour market is segmented along the caste, gender and ethnic line (Mittra 2006; Banerjee & Bucci 1995; Banerjee 1983). In India it is not only compartmentalised on gender, caste, ethnic lines but also geographically segmented (Gupta & Mittra 2002; Shaw & Pandit 2001). Both of these studies are focused on the low income groups and workers in informal sector employment. Gupta and Mittra (2002) mentioned that low income workers tend to work closer to home because of high transport costs. Shaw and Pandit (2001) mentioned the need to further analysis of the informal sector workers spatial segmentation.

The present paper argues that the labour market for informal workers is segmented into smaller labour markets separated by commuting (home-work) distance. Hence, the present paper has two objectives. The first is to map spatially fragmented labour market of smaller scale within a big metropolitan market. The second objective is to understand the determining factors (age, gender, social and religion groups, migration status, educational qualifications, employment types and residential locations) for home-workplace distance.

The present study has been divided into four sections. The first section builds the theoretical background for the study. The second section discusses the study area, database and methodology. The third section is dedicated to delineate the 'employment fields' of the workers in various study locations. The fourth section tries to understand the role of worker's socio-economic characteristics in shaping their commuting distance.

2. OVERVIEW OF LITERATURE

Space and Metropolitan labour market

Often the metropolitan labour market is considered as one single labour market or frictionless space. Many regional geographers tried to understand that the metropolitan area is comprised series of local labour market separated by

journey-to-work. The main aspect of spatiality of labour market is home-workplace relationship. Hanson and Pratt (1992) mentioned that the local labour market is created through dynamic dependencies between home and workplace. Because the home-work distance indicate the physical access to labour market which determines the segmentation of labour market. "At the intra-metropolitan (neighbourhood) scale of analysis, in contrast, the spotlight tends to fall on the districts where work is performed in relation to the neighbourhoods where workers reside" (Wright et al. 2010, p.1037). The home-workplace link is the central criteria for intra-metropolitan spatiality research.

Spatial accessibility plays important role in the development of many theories like '**spatial mismatch hypothesis**', '**gender and space**' and '**immigrants and spatial niche creation**'. 'Spatial mismatch hypothesis' is to understand the disadvantages faced by inner city African-American residents in job access due to sub-urbanisation of low skilled jobs. It was proposed by Kain (1968) (Houston 2005; McLafferty & Preston 1992). This explains how the inner-city residents cannot access the sub-urban jobs due to high commuting cost. On the other hand, 'immigrant's spatial niche' theory focuses on the role of residential segregation, spatial distribution of jobs and spatial accessibility in creation uneven distribution of immigrant's occupational niche creation (Ellis et al. 2007). Ellis et al (2007) and Wright et al. (2010) found the role of spatial proximity in the creation of ethnic niche. Again 'gender and space' focuses on women lesser commuting distance due to gender related segmentation, household responsibility etc. (Hanson & Pratt 1991; Hanson & Pratt 1995; Madden 1981).

The main themes of these three theories are that these theories tried to explain the intra-metropolitan spatiality of labour. All these three theories have mentioned repetitively that metropolitan area is not a frictionless space, rather the friction of distance creates differential outcome for different groups of workers. Even the space and information is closely related. The information flow about work is related to spatial proximity and vice versa.

Different theories have emphasised that the dimension of local labour market varies for different workers depending on their residential distribution, access to social network and commuting pattern. Madden (1981) mentioned women's shorter travel to work and mainly emphasised on the role of household-responsibilities for their spatial entrapment. Again Hanson and Pratt (1995) have found that women who are in female-dominated occupations and have small children tend to commute even shorter distance compared to other women. 'Spatial mismatch hypotheses' on the other hand gave emphasis on residential location on the commuting pattern of the workers. In US cities, scholars have noted that the inner city residents have to commute longer distance for low-wage jobs due to sub-urbanisation of jobs (McLafferty & Preston 1992). Most of the studies have focused on the disadvantaged groups such as minorities, women, less-educated workers, workers in low-paid jobs. This is because these workers face issues related to spatial accessibility and social accessibility.

Hence, it seems that the metropolitan labour market is not frictionless rather creates its geography through the distributive pattern of residence and workplaces.

Indian labour market and informal employment

In developing countries, urban labour market is dominated by informal employment. In case of informal employment (both wage and non-wage sector), general education is very low. The low skilled worker's job search range is much smaller than a skilled or educated worker (Simpson, 1987). As the informal workers are less in educational qualification and skill possessions, their search field is limited. In general workers in informal employment rely on their social ties for job search. As knowledge is space bound which can lead to concentration of workplace. Contact based rural-urban migration often leads to settling of migrants to the area where their peer groups are. Contact based employment leads to choice of same workplace as well where their peer group members work. Hence they end up choosing work closer to their residential areas. hence labour market is segmented physically (Gupta & Arup 2002). Village based solidarity exists in slums (Racine, 1990). Women and informal employment is highly interlinked. Majority of women are engaged in various kinds of informal activities. Engagement in home-based work can also be seen in the light of spatial entrapment for women (Soni-Sinha 2011).

Most of the research on informal sector employment in case of India is focused to understand the nature and characteristics of this sector (Marjit & Kar 2009). But there are very less research on space and labour market outcome for India. On the intra-urban variation of employment outcome of low-income rural migrants, Gupta and Mitra (2002) and Mitra (2004) mentioned the role of neighbourhood proximity based choice of employment may cause intra-urban spatial variation in employment. But the further question arises that whether these workers tend to have workplaces in the same zone where they reside? Are these workers are really spatially constrained? Shaw and Pandit (2001) tried to answer this question by mapping worker's residence on the basis of their workplaces. They covered only one industry for the analysis. But the accurate home-workplace spatial relationship for informal workers in general is not established. Hence, there is good scope for research in this field.

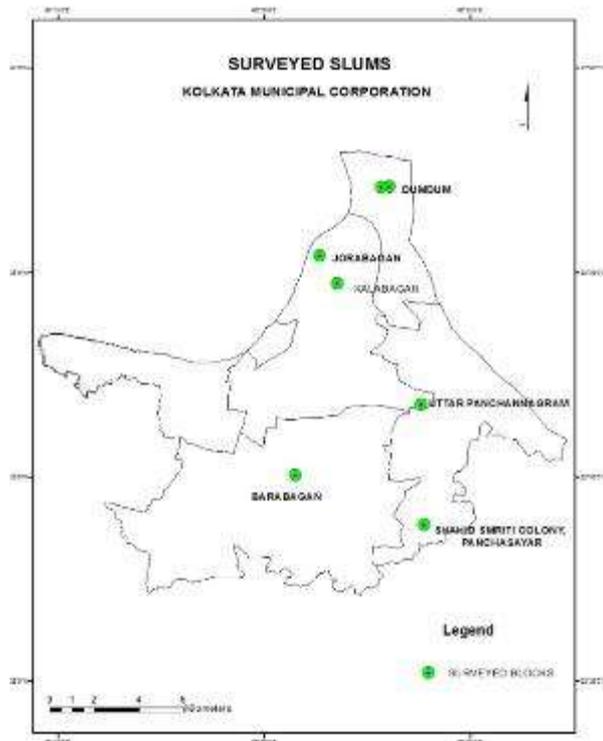
3. THE STUDY

The present study is based on Kolkata Municipal Corporation, a metropolitan city in the eastern part of India. Kolkata is an old city established in the British period. "Calcutta (former name of Kolkata) was the product of an economic and political process imposed from outside India" (Banerjee 1990, p. 89). The city was created by British and all the economic and infrastructural developments were took place by them. The downfall fall of once prosperous city started in 1960s. Since late 1960s, the formal sector employment slowed down in West Bengal. The industries started closing down. Hence the then Left Govt in power have promoted informal sector to provide employment to the poor people (Sarkar 2006).

The informal sector employment provided a living for the poor and helped them to escape unemployment (Banerjee 1990).

Kolkata is also known as the city of despire. The widespread of poverty, slums are situated here and there. The slums of Kolkata are result of huge immigration from neighbouring states like Bihar, Uttar Pradesh and Orissa. The in-migration created a social and cultural mosaic. As creation of job in organised sector is very less, the workers tend to rely on caste and language based social ties for job search. Hence the labour market is segmented in the line of caste, language, ethnic line (Bose et al, 1990). Even the residential areas are segregated on the basis of caste, language (ibid.). In this situation there is a strong possibility of the creation of geographically segmented labour market.

Map 1: Surveyed Location in Kolkata Municipal Corporation in different land use zones



Source: Collected from field survey, Jan-Dec, 2016

The present study is based on a survey conducted on slum dwellers from different parts of the city. Majority of the workers reside in slums of Kolkata are engaged in various kinds of informal work or engaged as informal employee in formal sector. Generally the informal sector is linked with slum residents. Generally slum dwellers' economic problem is linked with their employment structure i.e. bulk of them engaged in low productive informal segment of tertiary activities such as trade, transport and commerce compared to manufacturing sector (Mitra, 1990). Hence the slum dwellers were chosen as target group.

In this study, the residential neighbourhood is chosen as study unit to capture the occupational variety of workers. Hence the delineation of local labour market is done on the basis of the concept of 'employment field' or job search areas of workers from their residential areas (Vance 1960). The segmentation of local labour market is conceptualised as employment fields smaller than city scale and separated from each other.

Six blocks of slum clusters located in different parts of the city were surveyed. The rationality between selections of location in various parts of the city is to capture the impact of economic agglomeration in the creation of spatial labour markets. Jorabagan and Kalabagan are located in the central part of the city, which is very near to Central Business District of Kolkata. Mitrabagan and Noongola, Dumdum Road area is located in the northern parts of Kolkata. Again Barabagan is located in the southern part of Kolkata. On the contrast two peripheral locations Uttar Panchannagram and Shahid Smriti Colony, Panchasayar is located in the eastern and south-eastern part of the city.

Central Locations: Jorabagan area is located in the central part of Kolkata. This part of Kolkata is dominated by various kinds of *Bazaar* economy (markets of wholesale and retail trade), mixed residential areas with small household industries and commercial centres mixed with residential areas. *Bara Bazaar* (one of the central commercial market in Kolkata) is located within 1 km distance from the neighbourhood. Bara Bazaar and surrounding commercial area provide numerous opportunities for the slum dwellers. It is spatially connected with various bus routes, Circular Railway, and Metro services. The residents of Jorabagan slum cluster is a mixture of Bengali and Non-Bengali Hindus. Majority of the Non-Bengali population are chain migrants from neighbouring states like Bihar, Uttar Pradesh and Orissa. They have a fixed rented room in this area, where the migrants come generation after generations. Though there are migrants who migrate with their families.

Kalabagan is also located in the central part of Kolkata. It is located within 1 km distance from *Barabazaar*, College Street, Raja Bazaar. In these areas there are numerous opportunities in wholesale and retail and petty trading activities, small size manufacturing units of metal and shoe manufacturing. This locality is well connected by various public transports like Metro services, bus and tram services.

Non-central Older Locations: Mitrabagan and Noongola (Dum Dum Road) slum area is located in the northern part of Kolkata. This slum cluster is old, and established before independence. This area is dominated by the various industries, hence the slum areas was put up for industrial workers. Due to continuous closing down of the factories in this area, this area has left with few industrial units and mainly surrounded by residential neighbourhood. This area is connected with bus routes. Dum Dum railway station and Metro station located within 1 Km from the surveyed blocks. The surveyed clusters were dominated by Bengalis. A considerable number of Non-Bengali families are present in this area. But most of the families are old migrants or second generation migrants. This slum area is has generally better in amenities and housing compared to other surveyed region. Generally all the slums located in this region have better amenities compared to other slums of Kolkata.

Barabagan slum cluster is located in the crossing of Prince Anwar Shah Road and Deshapran Sashmal Road. This cluster is an old residential area. According to the residents of that area, this cluster is 70-80 years old. It faced deconstruction in the time of expansion of Prince Anwar Shah Road. In terms of communication, it has easy access to road as well as sub-way Metro connectivity.

Peripheral Locations: Uttar Panchannagram is located in the eastern periphery of Kolkata. It is a newly settled area which is established around 40 years ago. The eastern periphery of Kolkata is rapidly changing in last two decades. The eastern periphery has a major connectivity route Eastern Metropolitan Bypass which connects the northern and southern parts of Kolkata. The surveyed slum cluster is located besides the E M Bypass. It is dominated by Bengali migrants from Bangladesh and southern part of West Bengal. There are a considerable number of Non-Bengali migrant populations residing in this area. In this area, it is seen that women's participation in labour market is higher compared to central and northern locations.

Shahid Smriti Colony, Panchasayar is located in the south-eastern periphery of Kolkata. It is basically rehabilitation colony, supported by Left Govt. This cluster is 36 years old from the time of survey. Some of the residents were living in nearby slum before the creation of this colony. But this cluster is dominated by Bengali Hindus who are migrants from the southern districts of West Bengal. Here, the participation of women in the labour market is noted highest amongst the four surveyed locations.

Database and methodology

The paper is based on a field survey conducted in Kolkata (January-December, 2016) of above mentioned six residential blocks. The starting point of the research is to identify the 'employment fields'¹⁰¹ of different groups of workers. In the household listing survey of the survey locations, the information about their socio-economic characteristics, employment characteristics, and details about workplace is collected. Hence information about 6 locations from various parts of the city, about 1500 households, about 2469 workers are collected. Among these surveyed 2469 workers, 1557 workers have fixed workplace/s. Hence, the present study is focused on these 1557 workers.

The variety of work pattern will let us understand how different occupations have impacts on spatial dimension of labour market. The quantitative part of the survey is focused on variables like employment pattern, workers characteristics and human capital, commuting pattern (travel-to-work distance) taken from the survey. The qualitative part is focused on the perspective of selected worker to understand underlying causes. A section of workers from each location were selected for qualitative survey. The rationale behind the qualitative survey is to understand the socio-economic and behavioural process behind the spatial behaviour of economic actors.

Mapping the spatial labour market:

Some workers have fixed workplaces where others don't have any fixed workplace. Generally self-employed service related workers and casual wage labourers have no fixed places of work. Some of the workers have a region where they work. This is particularly true for the mobile vendors, self-employed service provides, worker in public transport etc. The present study has included the workers with fixed workplaces only. Workers can have one or multiple fixed places of work. In case of multiple workplaces, the average distance is considered. Workers with no fixed place of work are excluded from the present analysis.

Home-work distance: Home-workplace distance is the central idea regarding the studies of 'local labour market' and especially intra-metropolitan labour market analysis. Studies regarding home-work distance used different methods. Some have considered straight line distance from home and work, where others preferred considering the travel route. Due to lack of information straight line distance between home and work is considered in the present study. In case of multiple workplaces, the average distance is taken as the home-workplace distance. The distance has been calculated using Arc-GIS software. Worker's workplaces have been demarcated on the basis of Google Earth High Resolution Imagery 2009-10.

Least Square Regression Analysis has been performed to explain the travel distance of the workers with the help of various socio-economic, employment and locational characteristics of the workers. The home-workplace distance has been used

¹⁰¹ Coined by Vance 1960 which denotes the regions to which workers goes for work from a particular residential area.

as the dependent variable. On the other hand among supply side variables workers personal and human capital variables such as age, year of education, marital status and migration status are used. Among social characteristics, social group and religion are used. Among the employment related variables, type of employment, industry and occupation has been used. Among the locational variables, the dummy for each location has been used. The locations are used to indicate the city structure in the determination of workers home-workplace distance.

4. CHARACTERISTICS OF THE INFORMAL WORKERS IN DIFFERENT LOCATIONS

General Characteristics of the workers surveyed

This present section tries to set the background for the further analysis. In this section, location wise socio-economic characteristics of the workers will be discussed. The rationale behind this is to understand the pre-market factors which affect the employment outcome as well as the commuting behaviour of the workers.

Table 15: Characteristics of the informal workers in surveyed slum cluster

	Central Core		Older Non Central		Peripheral		Total
	Jorabagan	Kalabagan	Dumdum	Barabagan	Uttar Panchannagram	Panchasayar	
Mean Age	39.01 (12.301)	35.15 (12.865)	40.29 (11.057)	36.67 (11.921)	37.34 (10.485)	36.62 (11.264)	37.61 (11.802)
Mean Year of Education	6.27 (4.262)	4.15 (4.480)	8.22 (3.624)	6.59 (4.214)	5.37 (4.356)	4.13 (4.240)	5.82 (4.433)
Currently married (%)	76.03	62.98	71.91	72.50	80.46	81.66	74.49
Hinduism (%)	99.59	0.00	98.79	8.19	96.57	100.00	69.42
Islam (%)	0.41	100.00	0.48	91.81	3.43	0.00	30.46
SC (%)	41.41	0.00	29.10	2.50	59.89	77.18	36.01
OBC (%)	20.50	88.19	5.13	81.25	9.46	0.67	32.71
Bengali (%)	21.49	1.10	70.00	84.25	61.38	94.63	55.79
Hindi (%)	75.21	0.00	29.76	5.25	34.87	4.70	26.47
Urdu (%)	0.00	98.90	0.00	10.50	0.00	0.00	16.39
Migrants (%)	55.37	7.20	20.10	7.69	64.57	48.88	34.68
Crude Work Participation Rate (%)	20.50	14.59	21.68	17.91	25.13	22.79	19.92

Source: Collected from field survey, Jan-Dec, 2016

Note: the figures in parentheses are denoting the standard deviations.

The mean ages of the workers varies between 35 to 40 years in all the six locations, in Dumdum the mean wage is highest (40.3 years) where in Kalabagan it is lowest (35.15 years). In terms of year of schooling it is seen that average year of schooling for the sample is 5.82 years. Dumdum has highest average year of schooling (8.22 years) where Shahid Smriti Colony, Panchasayar has lowest average year of schooling (4.13 years). Most of the workers surveyed are currently married (74.5%). The percentage is highest for Shahid Smriti Colony, Panchasayar (81.7%), followed by Uttar Panchannagram (80.5%). The percentage of married workers are lower for Kalabagan (63.0%), followed by Dumdum (71.9%) and Barabagan (72.5%). In case of religious distribution of the localities, it is seen that all the localities have one dominant religion. Jorabagan, Dumdum, Uttar Panchannagram and Panchasayar are solely Hindu dominated neighbourhood, where Kalabagan and Barabagan are solely Muslim dominated neighbourhoods. In terms of social group compositions, it is seen that share of scheduled tribe (ST) population is negligible in the sample. Majority of the workers surveyed belong to lower social status (either SC or OBC) (68.72%). In the Hindu dominated neighbourhoods like Jorabagan (41.4%), Uttar Panchannagram (60.0%) and Panchasayar (77%) have high share of Scheduled Caste population. The share of SC population is even higher for peripheral areas (Uttar Panchannagram and Panchasayar). Both of the Muslim dominated locations, share of OBC category are quite high (around 80%). In terms of linguistic distribution, the surveyed locations have three dominant language speaking groups. In the central locations, Jorabagan (21%) and Kalabagan (1.1%) have very low Bengali speaking population. In other locations Bengali-speaking population is the majority. The share of migrant population is highest for Uttar Panchannagram (64.6%) followed by Jorabagan (55.4%) and Panchasayar (48.9%). On the other hand, in two Muslim dominated neighbourhoods and in Dumdum share of migrants are very low. In terms of work participation rate (%) it is seen that the participation rate is higher for peripheral locations, Uttar Panchannagram (25.1%) and Panchasayar (22.8%).

In brief, the central locations are characterised by low education, non-Bengali speaking population, mainly lower social groups. On the other hand, the peripheral location is dominated by migrants, mainly Bengali-speaking, Hindu, SC and less-educated. Compared to these two zones, the workers in non-central older locations have lower migration rate, higher education.

Employment profile of the surveyed workers

The surveyed workers with fixed workplace are more in regular salaried employment (67.4%) compared to self-employment (29.6%) and casual wage employment (3.0%). This indicates that regular wage workers tend to be more

space-bound compared to self-employed and casual wage labourers. In terms of locational difference, in peripheral locations i.e. Uttar Panchannagram (73.6%) and Panchasayar (81.5%) workers are in regular salaried employment. On the other hand, the share of self-employer is highest in central locations i.e. Jorabagan (34.5%) and Kalabagan (35.2%).

Table 16: Activity Status-wise employment profile of the workers in different surveyed locations, Kolkata Municipal Corporations

	Central Core		Older Non Central		Peripheral		Total
	Jorabagan	Kalabagan	Dumdum	Barabagan	Uttar Panchannagram	Panchasayar	
Self-Employed Workers	34.51	35.23	32.40	32.88	25.87	16.78	29.60
Regular Salaried Workers	64.44	51.52	67.25	66.22	73.63	81.47	67.36
Casual Wage Labourers	1.06	13.26	0.35	0.90	0.50	1.75	3.04
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Collected from field survey, Jan-Dec, 2016

Table 17: Industry-wise employment profile of the workers in different surveyed locations, Kolkata Municipal Corporation

	Central Core		Older Non Central		Peripheral		Total
	Jorabagan	Kalabagan	Dumdum	Barabagan	Uttar Panchannagram	Panchasayar	
Manufacturing	18.60	43.61	26.64	16.59	27.05	1.74	22.09
Construction	1.75	1.13	0.35	2.24	0.00	0.35	0.96
Trade, Hotels and Restaurants	46.67	46.99	25.95	30.94	25.12	19.16	32.69
Transport and communication	6.67	1.50	5.88	7.17	4.83	0.70	4.37
Financial, real estate and professional services	0.00	0.38	1.38	0.90	0.00	0.35	0.51
Social, community and other services	5.96	3.76	13.49	11.21	13.53	23.69	12.01
Household as Employers	17.19	1.88	22.84	26.91	27.54	52.61	24.92
Didn't specified	3.16	0.75	3.46	4.04	1.93	1.39	2.44
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00

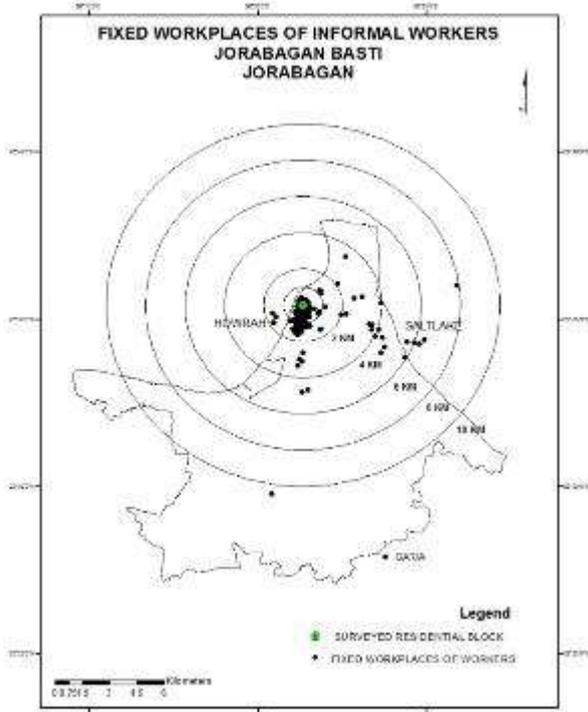
Source: Collected from field survey, Jan-Dec, 2016

The surveyed workers are mainly concentrated in three major industrial sector i.e. manufacturing (22.1%), trade, commerce and Hotel (32.7%) and household sector (24.9%). But this pattern is different for different locations. In case of Jorabagan majority of the workers are concentrated in trade, commerce and hotel (46.7%), manufacturing (18%) and household sector (17.2%). On the other hand, in Kalabagan, most of the workers are concentrated in manufacturing (43.6%) and trade, commerce and hotel (47.0%). In Dumdum, majority of the workers are concentrated manufacturing (26.6%), trade, commerce and hotel (25.9%), household sector (22.8%) and social, community services (13.49%). In Barabagan also the share of trade, commerce and hotel (30.9%), household sector (26.9%) are higher. In Uttar Panchannagram majority of the workers are concentrated in manufacturing, trade and commerce, household sector and services. In case of Shahid Smriti Colony, Panchasayar, majority of the workers are concentrated in household sector (52.6%) and services (23.7%).

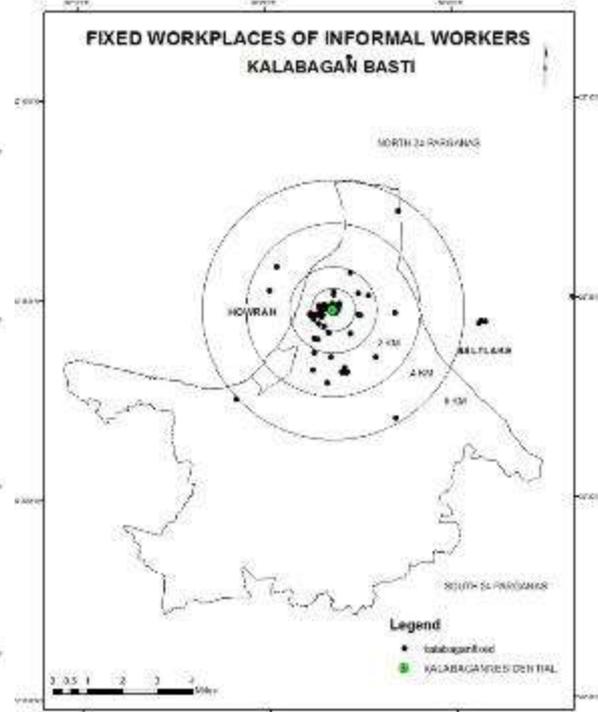
5. DELINEATION OF KOLKATA'S INTRA-URBAN 'EMPLOYMENT FIELDS'

Creation of spatial market smaller than a city-scale is the main indicator of spatial segmentation (Hanson & Pratt 1992). Hence, the first step of analysis is to understand the home-work linkages of workers engaged in different kinds of informal employment in Kolkata. The present section will try to map the employment fields of workers in different locations.

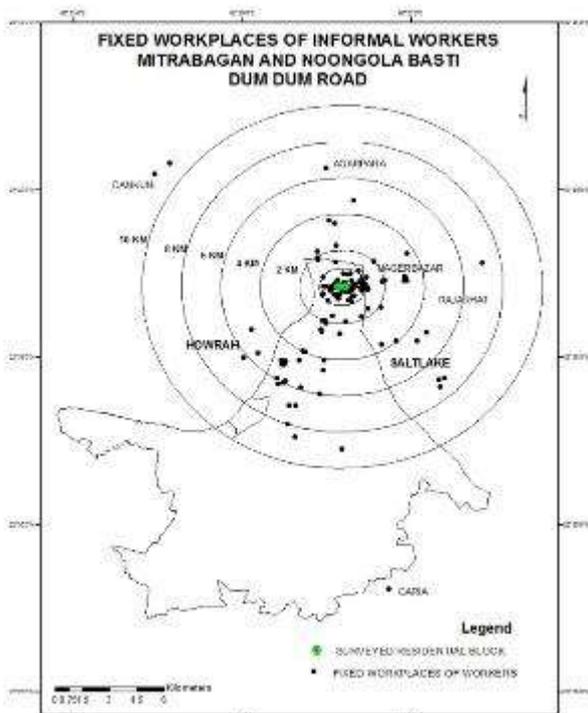
Map 2: 'Employment fields' of the informal workers in Kolkata Municipal Corporation



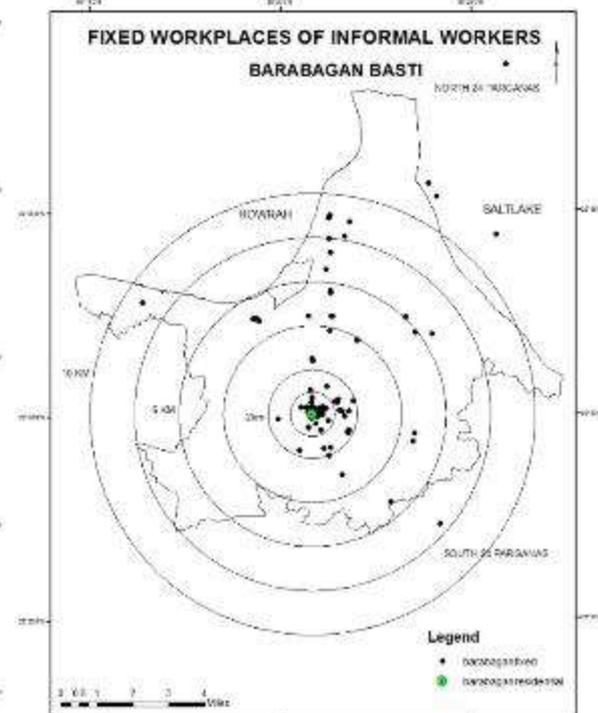
a) Jorabagan



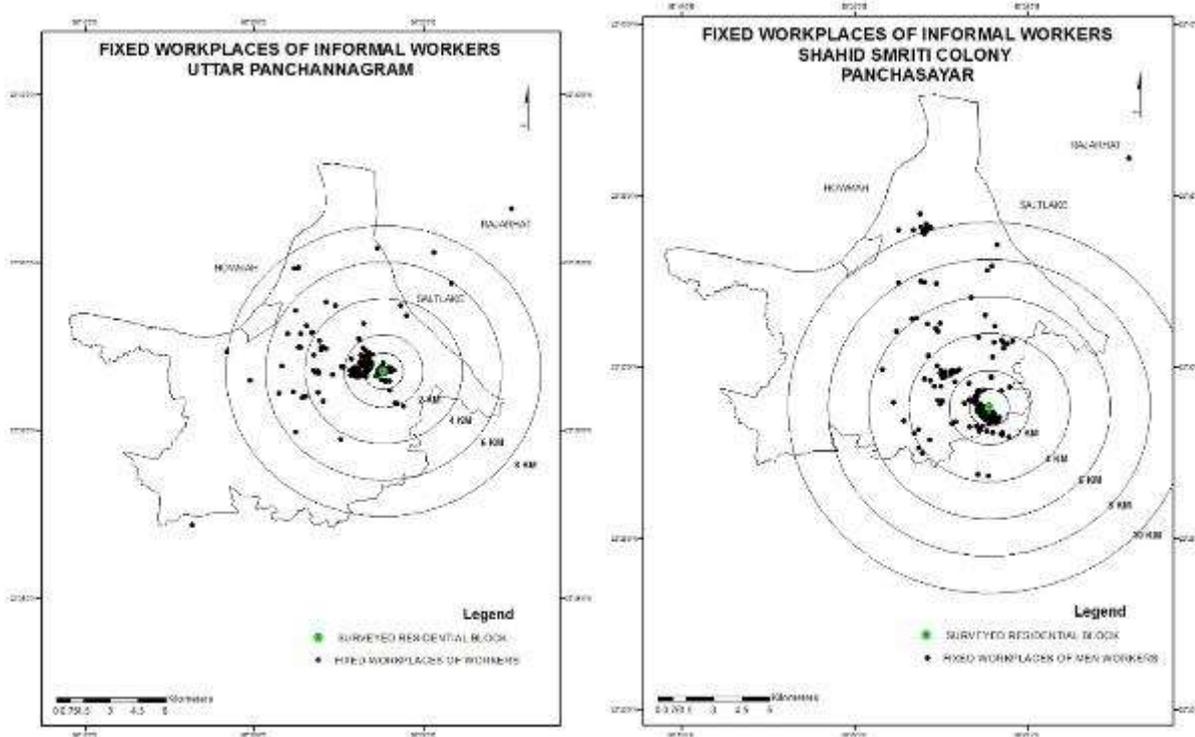
(b) Kalabagan



c) Dum Dum



(d) Barabagan



e) Uttar Panchannagram

(f) Panchasayar

Source: Data collected from field-based survey, Jan-Dec, 2016

Workplaces of Informal Workers: The average home-workplace distance (all samples) is 1.46 km (see table 3). 81% of the workers surveyed tend to work within 2 km radius from their residential neighbourhood. Hence, it can be said that majority of the workers work close to their place of residence.

Table 18: Home-to-work commuting distance of informal workers in different surveyed locations, Kolkata Municipal Corporations

		Distance				Mean	Std. Deviation	N
		< 2 km	2 -4 km	4 -6 km	>6 km			
Central Core	Jorabagan	92.22	4.81	1.11	1.85	0.98	1.519	270
	Kalabagan	92.02	4.18	0.76	3.04	0.83	2.215	263
	Dumдум	73.09	10.55	7.64	8.73	1.8	3.29	275
Older Non Central	Barabagan	81.68	3.47	6.93	7.92	1.48	2.751	202
Peripheral	Uttar Panchannagram	71.92	10.84	11.33	5.91	1.96	2.471	203
	Panchasayar	75.44	12.28	3.86	8.42	1.79	2.522	286
	Total	81.31	7.81	4.94	5.94	1.46	2.547	1499

Source: Collected from field survey, Jan-Dec, 2016

Central Locations:

The home-work distance is much shorter in central locations (for example Jorabagan and Kalabagan). It is seen that in Jorabagan, which is located in the central parts of Kolkata, has more compact ‘employment field’ around its locality. Average distance travelled by workers is around 1 km and over 92% of the workers work within 2 km radius from their neighbourhood (see table 3). In Jorabagan, majority of the workers were working in Barabazar and Posta region. As mentioned earlier, Barabazaar and Posta is a hub of wholesale trade. Hence, there are plenty of opportunities of working as shop keeper, accountant or freight handlers in this region.

The average distance travelled by workers in Kalabagan is shortest (0.8 km). In Kalabagan, majority of the workers work in Machua, in different occupations. Machua is a locality adjacent to Barabazaar, which is one of the largest wholesale fruit market in the eastern part of India. This market creates demand for a huge number of unskilled occupations such as sorting and freight handling. In other cases, the residents of Kalabagan work in surrounding localities like Jeliatoli, Phoolbagan in various small manufacturing units. Few workers work in distant locations like Park Circus, Zakaria Street, Rajabazar even in Khiddirpore. These are mainly Muslim dominated areas. This is indicating towards the fact that their economic space is segmented on communal lines.

Non-central Older Locations:

In Dumдум area, 73% of the workers work in the surrounding areas (within 2 km radius). The average commuting distance is 1.8 km which is much higher compared to central locations (Jorabagan and Kalabagan). The surrounding areas provide few economic opportunities like works in private households of the high end residential areas nearby. Few

workers work in various manufacturing units of the nearby localities. Many people commute to distant locations like Shyambazar and even to Barabazaar and other central locations.

In Barabagan, workers tend to work in surrounding areas and Tollygunj area. The average home-workplace distance is 1.5 km (see table 3). Some workers with fixed region of work tend to commute to Yadavapur and Garia. Many self-employed workers tend to work in the immediate surroundings of the locality.

Peripheral Locations: In the newer (peripheral) part of the city workers tend to travel more distances, and mostly they travel towards the central part of the city. In Uttar Panchannagram, the average home-workplace distance is highest (2.0 km) (see table 3). In Uttar Panchannagram, workers mainly go for work in manufacturing units of Topsisia and Martin Para (New extended part of Topsisia).

In Shahid Smriti Colony, Panchasayar the average commuting distance is 1.8 km (see table 3). In Shahid Smriti Colony, Panchasayar most of the workers travel up to Ruby More in the north, Bhagajatin and Yadavpur in the West. Many workers work in various localities of Yadavapur. The connection of the residents (especially older generation) with Yadavpur is very old and they have established networks there. Most of the women work in the surrounding localities as domestic helps.

6. LEAST SQUARE REGRESSION TO UNDERSTAND THE DETERMINING FACTORS

Many studies have used regression analysis to understand the commuting distance and the commuting time of the workers. Majority of the study have used various human capital related factors like age, education, gender, marital status, migration status, employment related variables (wage-non-wage, occupations, industries), locational factors (the dummy for locations).

The explaining power of the model is not very high (R^2 is 0.127). As the dynamics of city structure such as availability of jobs in the nearby areas, job densities, transport system, existing wage levels couldn't be introduced to the model, the explanatory power of the model is not very strong. But due to quantify the city structure variables and the unavailability of wage structure in the present dataset, these variables couldn't be included in the model.

From the regression analysis, it is seen that there is a commuting distance increase with increasing year of schooling. Scholars have discussed that the search boundary of the more educated workers are much wider compared to less educated workers. Again the wage level earned by the workers who are less educated tend to lower to support commuting longer distances (McLafferty & Preston 1992).

The effect of increasing age (proxy used for experience) has a positive impact on commuting distance, but the result is not statistically significant. There is a tendency of the young workers to work closer to their place of residence as their spatial information is much limited (Green et al. 2005).

As speaking of gender, it is seen women's spatially constrained workplaces. Women's shorter commuting trip have been discussed in the literature on commuting and labour market experience (Hanson & Pratt, 1991, 1992, 1995; Madden, 1981; Rapino & Cooke, 2011).

The married workers tend to commute longer distances compared to unmarried and widow/separated. Being married means more family responsibility which may lead worker to search and work at distant places. Though the effect of being married is different for women (Hanson & Pratt, 1995; Kwan, 1999; Madden, 1981; Rapino & Cooke, 2011) from men.

Table 19: Least Square Regression for the informal workers (all the locations taken together)

		B	Std. Error	Sig.
	Constant	1.495	0.638	0.019
	Age	0.009	0.006	0.148
	Year of Education	0.049	0.017	0.004
	Women (Ref: Men)	-0.928	0.174	0.000
Personal Characteristics	Currently married (Ref: Other than Married)	0.254	0.189	0.180
	Migrants (Ref: Non-migrants)	-0.122	0.158	0.441
Family Characteristics	No. of dependent family members	0.011	0.031	0.728
	Schedule Caste (Ref: Other than SC)	0.092	0.167	0.585
Social characteristics	Hindu (Ref: Other than Hindu)	-0.200	0.502	0.691
	Self-employed Workers (Ref: Wage Workers)	-1.220	0.164	0.000
	Unskilled Workers (Ref: Skilled and semi-skilled workers)	-0.536	0.158	0.001
	Manufacturing (Ref: Household industry)	-0.387	0.204	0.058
	Trade and Commerce	-0.196	0.212	0.356
	Transport	0.257	0.389	0.509
Employment Details	Service	0.199	0.236	0.400
	Kalabagan (Ref: Jorabagan)	-0.277	0.543	0.610
	Dumdum	0.687	0.222	0.002
	Barabagan	0.458	0.521	0.380
	Uttar Panchannagram	1.318	0.238	0.000
Locational Characteristics	Shahid Smriti Colony, Panchasayar	1.078	0.234	0.000
	R 2	.127		
	F	11.078		
	N	1448		

Source: Collected from field survey, Jan-Dec, 2016

Different employment types have different spatiality and hence require different commuting. It is seen that non-wage workers workplaces are more clustered closer to their place of residence compared to the wage workers. Again the workers in unskilled occupations tend to commute shorter than workers in skilled and semi-skilled occupations. The lower wages associated with unskilled occupations is thought to be a reason behind working closer to home. Various dummies are included to denote various industries. The effect of industries on commuting pattern was not statistically significant. The reason behind it is the spatial concentration of various industries at different places and the difference in residential locations of the workers. Hence the effect of various industries cannot be proven when all the locations are combined together.

Table 20: Location specific regression analysis, Kolkata Municipal Corporations

	Jorabagan		Kalabagan		Dumdum		Barabagan		Uttar Panchannagram		Panchasayar	
	B	Std. Error	B	Std. Error	B	Std. Error						
(Constant)	0.988	0.560	0.616	0.820	3.296***	1.203	2.983***	1.074	2.258**	1.024	1.990***	0.947
Age in years	0.021***	0.008	-0.006	0.013	0.001	0.020	-0.018	0.017	0.019	0.018	0.025*	0.015
Year of schooling	-0.007**	0.025	0.037	0.029	0.033	0.061	0.061	0.047	0.074*	0.042	0.009	0.042
Women (Ref: Men)	-1.139	0.301	0.631	0.573	-1.197***	0.538	-1.012***	0.452	-1.054***	0.393	-0.944**	0.434
Currently married (ref: Others)	0.297	0.258	-0.131	0.374	0.359	0.547	-0.625	0.494	-0.099	0.661	1.288**	0.596
Migrants (Ref: Non-migrants)	0.074	0.199	-0.471	0.480	-0.558	0.538	-0.305	0.660	-0.632*	0.370	0.093	0.310
SingleearnerHH	-0.182	0.216	-0.147	0.311	0.644	0.435	0.650*	0.427	0.594*	0.368	0.141	0.385
No of dependant members in the family	0.030**	0.044	0.034	0.049	-0.017	0.115	0.099	0.070	-0.061	0.108	-0.198*	0.108
Self-employed (ref: Wage workers)	-0.553	0.231	-0.750***	0.280	-1.791***	0.478	-1.723***	0.502	-1.796***	0.575	-1.425***	0.535
Unskilled (Ref: Others)	-0.481	0.222	0.002	0.303	-1.349***	0.471	-1.227***	0.428	-0.049	0.414	-0.149	0.451
Manufacturing (Ref: Household sector)	-0.316	0.309	0.043	0.526	-0.587	0.532	0.748	0.621	-0.389	0.430	1.359	1.196
service	-0.223	0.471	4.643***	0.772	-0.800	0.687	1.251**	0.635	0.611	0.648	-0.302	0.490
trade	-0.245	0.307	0.356	0.539	-0.142	0.624	0.159	0.558	-0.522	0.669	0.436	0.624
transport	-0.776*	0.438	6.323***	1.222	0.512	0.981	-1.771	1.091	1.733*	1.034	-0.777	1.818
R	0.148		0.302		.151		.269		.256		0.106	
F	3.393		8.058		3.491		5.211		4.807		2.442	

Source: Collected from field survey, Jan-Dec, 2016

Note: *** significant at 1%; ** denotes significant at 5% and * denotes significant at 10%

Residential locations have major impact on workers commuting behaviour. The workers located in central locations (Jorabagan and Kalabagan) have the shortest commuting trips and the peripheral locations (Uttar Panchannagram and Shahid Smriti Colony, Panchsayar) have the longest commute. Even the non-central older locations have the longer commuting distance compared to the Joabagan (the base category).

The migrants tend to commute lesser distance compared to non-migrants, though the result is not statistically significant.

When the regression analysis is calculated for each locations separately, it is seen that the explanatory power of the models have increased. This is indicating that the location wise factors define the commuting pattern of the workers better than the city-wide scale. Few factors like gender, self-employment and skill level of occupation has significant effect on commuting for all the locations.

CONCLUSION

It is evident from the field survey that the labour market for informal labour is segmented spatially. From the quantitative part of the study, it is seen the average home-to-work travel distance is much shorter than the city-wide scale. Majority of the worker works closer to home creating a highly localised market. It creates a micro scale segmented market smaller than a metropolis. The commuting pattern is also location specific. The central-peripheral difference in commuting pattern is somewhat similar to the spatial mismatch theory. While the centrally located workers are more spatially confined, the peripheral workers are more spatially well distributed. But many workers from peripheral areas travel to central parts of the city. This region is a receiving region of workers from peripheral areas. Hence the average distance travelled by the workers in peripheral areas are more than the central part of the city.

From the regression analysis it is seen that some workers tend to commute even shorter distance. It is seen that the home-workplace distance is much shorter for women compared to men, self-employed workers compared to wage workers, unskilled workers compared to skilled and semi-skilled workers. Inter-industry differences in home-workplace distance are not found statistically significant. Even the impact of social characteristics in commuting is not noted.

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REFERENCES

Banerjee, B., 1983. Social networks in the migration process: empirical evidence on chain migration in India. *Journal Of Developing Areas*, 17(2), pp.185-196.
 Banerjee, B. & Bucci, G. a., 1995. On-the-Job Search in a Developing Country: An Analysis Based on Indian Data on Migrants. *Economic*

Development and Cultural Change, 43, p.565.

Ellis, M., Wright, R. & Parks, V., 2007. Geography and the Immigrant Division of Labor. *Economic Geography*, 83(August 2004), pp.255–281.

Green, A., Shuttleworth, I. & Lavery, S., 2005. Young people, job search and local labour markets: The example of Belfast. *Urban Studies*, 42(2), pp.301–324. Available at: <http://dx.doi.org/10.1080/0042098042000316164>.

Gupta, I. & Arup, M., 2002. Rural an Migrants and Labour Segmentation: Micro-Level Evidence from Delhi Slums. *Economic and Political Weekly*, 37(2), pp.163–168.

Hanson, S. & Pratt, G., 1992. Dynamic dependencies : a geographic investigation of local labor markets. *Economic geography*, 68(4), pp.373–405.

Hanson, S. & Pratt, G., 1995. *Gender, work, and space*, Psychology Press.

Hanson, S. & Pratt, G., 1991. Job Search and the Occupational Segregation of Women. *Annals of the Association of American Geographers*, 81(2), pp.229–253.

Houston, D., 2005. Employability, skills mismatch and spatial mismatch in metropolitan labour markets. Available at: <http://hdl.handle.net/10588/3794>.

KWAN, M.-P., 1999. GENDER, THE HOME-WORK LINK, AND SPACE-TIME PATTERNS OF NONEMPLOYMENT ACTIVITIES*. *ECONOMIC GEOGRAPHY*, 75(4), PP.370–394. AVAILABLE AT: <HTTP://ONLINELIBRARY.WILEY.COM/DOI/10.1111/J.1944-8287.1999.TB00126.X/ABSTRACT>.

Madden, J.F., 1981. Why Women Work Closer to Home. *Urban Studies*, 18(2), pp.181–194. Available at: <http://usj.sagepub.com/content/18/2/181>\n<http://usj.sagepub.com/content/18/2/181.short>.

Marjit, S. & Kar, S., 2009. A contemporary perspective on the informal labour market: theory, policy and the indian experience. *Economic and Political Weekly*, XVIV(14), pp.60–71.

McLafferty, S. & Preston, V., 1992. Spatial Mismatch and Labor Market Segmentation for African-American and Latina Women. *Economic Geography*, 68(4), pp.406–431. Available at: <http://www.jstor.org/stable/144026>.

Mitra, A., 2004. Informal Sector, Networks and Intra-City Variations in Activities: Findings From Delhi Slums. *Review of Urban and Regional Development Studies*, 16(2), pp.154–169. Available at: <http://doi.wiley.com/10.1111/j.1467-940X.2004.00083.x>.

Mitra, A., 2006. Labour Market Mobility of Low Income Households. *Economic and Political Weekly*, 41(21), pp.2123–2130.

Parks, V., 2004. Access to Work : The Effects of Spatial and Social Accessibility on Unemployment for Native-Born Black and Immigrant Women in Los Angeles. *Economic Geography*, 80(2), pp.141–172.

Rapino*, M. a. & Cooke, T.J., 2011. Commuting, Gender Roles, and Entrapment: A National Study Utilizing Spatial Fixed Effects and Control Groups. *The Professional Geographer*, 63(January 2015), pp.277–294.

Sarkar, A., 2006. Political Economy of West Bengal: A Puzzle and a Hypothesis. *Economic and Political Weekly*, pp.341–348.

Shaw, A. & Pandit, K., 2001. The Geography of Segmentation of Informal Labor Markets: The Case of Motor Vehicle Repair in Calcutta. *Economic Geography*, 77(2), pp.180–196. Available at: <http://www.jstor.org/stable/3594063>.

Soni-Sinha, U., 2011. Invisible women: a study of jewellery production in West Bengal, India. *Journal of Gender Studies*, 20(May 2014), pp.105–123.

Vance, J.E., 1960. Labor-shed, employment field, and dynamic analysis in urban geography. *Economic Geography*, pp.189–220.

Wright, R., Ellis, M. & Parks, V., 2010. Immigrant Niches and the Intrametropolitan Spatial Division of Labour. *Journal of Ethnic and Migration Studies*, 36(April 2014), pp.1033–1059.

1539 CITY ANATOMY – A PLANNING DECISION-SUPPORT DASHBOARD FOR SMART CITIES IN INDIA

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ABSTRACT

Amidst the sweeping trends of urbanisation and growing complexities of urban problems, public authorities, planners and researchers require novel methods to understand cities and identify appropriate solution pathways. This paper builds a dashboard—“City Anatomy”, by bringing together data on a range of urban indicators to recognize the state and trends in cities performance across 100 smart cities in India. The dashboard through a series of interactive applications, maps and charts illustrate a tangible, coherent and hard-to-grasp aspect of urban quality of life. City Anatomy dashboard harnesses the value offered by the advances in data science and urban informatics to support evidence-based planning decision-making in the aspiring smart cities. This article explains the approach, the data and the technology used to develop the City Anatomy dashboard and offers some vital lessons for building urban indicator data visualisation platforms at the national or regional scale.

Keywords: City Anatomy, dashboard, urban indicators, smart city, India

INTRODUCTION

Survey is essential to our understanding of cities, with data pertaining to the city as a prerequisite to effective planning and policy making. (Geddes, 1949)

Governments have long been generating data about cities, regions and the communities and infrastructure within their territories with an aim to deliver better services and guide public policies. Of late, the quantity and granularity of data productions have taken a massive leap with the introduction and deployment of the Information and Communication Technologies (ICT) drawing information from a range of networked devices, sensors and cameras embedded into the urban systems. Cities and governments that are applying the data-driven methodologies and practices in framing responses to urban challenges are branded as “smart cities” (Batty, 2013; Kitchin, 2014). As the production and analysis of data become increasingly vital for the management of cities, the field of urban informatics has opened up immense possibilities. In some senses, urban informatics is coincident with the smart cities movement—both looking to strategically use ICT, data and advanced analytics to understand the city and influence policy decision-making (Gray, O’Brien, & Hügél, 2016).

For many cities, the smart city has materialised into urban indicator projects that seek to compare urban performance within and across cities. Indicators are recurrent quantified measures that can be tracked over time to establish how well an area/city is performing with respect to its stated goals (Godin, 2003). As Kitchin (2015) mentions, indicator data provide a rational, neutral and comprehensive evidential basis for assessing the robustness of existing policies, to develop new interventions, and to decode and manage cities through measurement. Indicator-based assessments offer tangible evidence that brings a powerful sense of certainty, stability and control in public decision-making, and enhance the quality of urban policy debates. Cities that employ indicators have also cited gains in terms of educating and inspiring citizens, helping diverse stakeholders speak using a common terminology by breaking down “siloeed” mentality and coordinating actions in the same direction (Sulkowski, 2016). In other words, as Hezri & Dovers (2006) says, indicators act to provide a normative and rational bridge between knowledge and policy.

Although urban indicator and benchmarking projects have rapidly proliferated globally, most of them have remained relatively closed, with the underlying data, analytical approaches, and outputs locked inside organisations that undertake them. Such protectionist tendencies have faced sharp criticism (Kitchin et al., 2015a) as they fail to reveal the underlying assumptions, hidden agendas and falls short in shaping a dialogue around urban conditions. However, there has been a recent move by cities to open up the data, underpinning indicators and share them with citizens through “city dashboards”—focused on sharing information relevant to a city’s operation and performance via simple data visualisations, widgets and analytics (Batty, 2015). These dashboards provide dynamic graphics, maps and barometers in an easy to understand environment to engage widely with the policy-makers and citizenry. Experts believe that indicators and dashboards form crucial elements in the move towards data-driven smart cities as they employ a rigorous and transparent realist epistemology replacing protectionism and unaccountability, which have historically challenged rational decision-making and the management of cities (Kitchin, Lauriault, & McArdle, 2015b).

This paper reveals the making of “City Anatomy”—a dashboard built with open urban data and open source software for supporting smart city policy decision-making in India. The “anatomy of a city” is defined by Ascher (2005) as the art of separating the parts of urban systems in order to ascertain their position, relations, structure, and function. Our research uses the term “City Anatomy” to designate urban areas as organisms. We divide the cities functions into indicators and quantify them through data and visualisation to reveal the status and trends in urban performance and the health and metabolism of cities. The project assembles data on a range of indicators from across 100 cities in India selected for development under the recent “Smart Cities Mission”. By creating a national level digital platform, our research aids the theory of the post-democratic city in data-driven form (Barns, 2016) that enables “governance-beyond-the-state”. Our dashboard is conceived as an information output produced through the constructs of the smart city where the interplay

of data and urban informatics shape dynamic municipal conversations. We develop the dashboard as a planning support system (PSS) (Pettit, Bakelmun, et al., 2017) that can help policy planners navigate the growing complexities in making sense of data and urban conditions. By doing so, we fuel the debate around what Mackenzie (2006) terms “secondary agency” in the contemporary governance of the city—in which technologies and codes enable autonomous processing of data and evaluation of policies that do not necessarily require human intelligence.

SMART CITIES MISSION IN INDIA AND THE EXPERIENCES AROUND INDICATORS AND DASHBOARDS

The Smart Cities Mission (SCM) is a \$15 billion venture of the Government of India rolled out in 2015 with an aim to drive economic growth and improve the quality of life for people in selected cities. Each of the cities receives funding of \$150 million between 2015 and 2020 for developing modern infrastructure and regenerating designated precincts to enhance urban sustainability. Although the mission strongly advocates for performance-linked urban investments and merit-based project selection, the guidelines of the SCM (GoI, 2015) could not provide a practical framework to achieve such outcomes. Together with the smart cities initiative, the Indian government has also announced programmes for urban renewal, heritage development, improvements in sanitation etc.—all of which are devoid of any effective mechanisms for selection of projects or measuring their impacts on the baseline conditions over time. With an intensifying rate of urbanisation and an accompanying proliferation of urban development programmes, there is an increasing need for evidence-based planning decision support system that can help both in identifying the core challenges of cities and assess the outcomes of public infrastructure investments.

India’s experience around urban performance measurement through indicators is limited. The only major initiative came under the Indian Ministry of Urban Development (MoUD) in 2006, labelled as Service Level Benchmarking (SLB). The project (GoI, 2010) established key performance indicators (KPIs) covering water supply, wastewater, solid waste management, stormwater drainage and transport sectors. It encompassed: a) collation of performance data on selected indicators, b) implementation of improved information systems at the city and state level to support the provision of this data on an ongoing basis, and c) development of performance improvement plans based on the benchmarking data. In December 2009, MoUD released the SLB performance data of 28 pilot cities that highlighted the comparative advantage and disadvantages of cities. However, the outcome was merely published as a two-page Abstract report leaving little scope for digital engagement with the dataset. Neither the raw data was made available, nor it was visually mapped for broader sharing with the non-technical audience. The World Bank (2016) in an appraisal of this initiative denounced the diminutive reach of the benchmarking outcomes that lead to the failure of this initiative in generating significant debates, engaging the deep states and influencing policy discourse.

A more dynamic five-year action research project on urban indicator based measurement was initiated at CEPT University in Ahmedabad, operating under the franchise—Performance Assessment System (PAS). The project develops appropriate tools and methods to measure, monitor and improve delivery of water and sanitation services in urban India. PAS has adopted a set of KPIs for reforms by the states, as well as municipal corporations that are analysed to achieve city specific improvements in the sanitation sector. Currently, the PAS web portal (available at <http://www.pas.org.in>) hosts data repository contributed by 900 town and cities, from across 5 Indian states. The platform offers visualisations of the data at both state and city level and provides unrestricted access to each city’s database. Various tools developed by the PAS team enables interactive analysis of data for effective communication and dissemination of the assessment outcomes (Mehta & Mehta, 2013). PAS is indeed a successful venture for gathering, analysing and open publication of data on urban sanitation related services. But, the limited scope of the project on a specific sector meant that it could not be referred as a comprehensive model for planning decision-support.

In 2017, the Government of India has published a set of ‘Liveability Standards in Cities’ (GoI, 2016) to generate a Liveability Index of 116 selected cities under the SCM. The framework identifies a total of 79 Indicators (57 Core Indicators and 22 Supporting Indicators) grouped under 15 domains, such as governance, mobility, education, health, water supply, pollution etc. While the report outlining the methodology of the Liveability Index, spells out the process of data collection and definition of each of the indicators, it falls short in articulating whether the data will be openly accessible. There is apparently lack of intention to harness data from digital sources as the index is solely built around static data (Hickok, Lakshané, & Tiwari, 2016). More significantly, the initiative has translated into a backroom exercise with no interest shown towards the application of analytics for dynamic visualisation of data for generating democratic debates. Amidst these developments, experts are raising concern on the apathy of civil administration in India towards utilising digital technologies for visualising and opening up of public data (Patro, 2017), and there seem to be no lessons learnt from the experience of SLBs.

GLOBAL CASE STUDIES AROUND URBAN INDICATOR AND CITY DATA VISUALISATION

Since its emergence in the early 1990s, urban indicator projects have manifested at two different scales. First, a worldwide sustainability agenda has driven the shaping of indicators for city comparison at the global scale. A desire by cities and responsible organisations to conform to the UN Sustainable Development Goals (SDGs) and the Chapter 40 of Agenda 21 from the United Nations Conference on Environment and Development (UNCED) has translated into these projects. The Goal 11 of the SDG (United Nations, 2017) is to make “make cities and human settlements inclusive, safe, resilient and sustainable”, which along with the UNCED statement (1992) emphasises on the need for urban sustainable development indicators to provide solid bases for decision-making at all levels of governments. The best set of universal urban sustainability indicators is developed by the International Standards Organization (ISO) published in 2014 as the ISO 37120 - Indicators for city services and quality of life.

World Council on City Data (WCCD) hosts a consistent and comprehensive platform bringing together data on ISO 37120 indicators from across 82 cities. The WCCD portal (available at <http://open.dataforcities.org>) provides data, maps, and an interactive dashboard to visualise, explore and compare the cities performance over 100 indicators. The participating cities provide third-party verified data to the WCCD Global Cities Registry which is then uploaded to the datastore. Data are then visualised against indicators distributed across 18 themes, such as transportation, water and sanitation, and health. The portal provides three interfaces for data display—map view, graph view and trends view. The Map view (see Figure 1) scales down the data into proportionate circles displayed over the location of respective cities, translating into a dashboard. The graph view projects the data in a horizontal plane organising the cities based on their performance over an indicator in ascending order from left to right. The trends view provides annual historical data plotted over a line graph to indicate cities progress on a specific aspect over time. It is possible to explore the data of each city, or a few of specific interest, separately on the portal, in which the data on profile indicators are displayed on bar charts. Urban planners (Kitchin et al., 2015a; Pettit, Lieske, & Jamal, 2017) observe that the portal serves as a goldmine for policy decision-makers, businesses and interested citizens wishing to compare the performance between cities.



Figure 1: A snapshot of the map view under the WCCD web portal.

Source: <http://open.dataforcities.org/>.

The second group of indicator projects are undertaken at the national, sub-regional and even at the scale of municipalities. These are more bottom-up exercises driven by the rise of new managerialism and the demand for efficiency and transparency in public sector management. In these initiatives, indicators are used to diagnose local issues and assess the outcomes of public policies, programmes and investments (Holden, 2006). In doing so, the governments are moving beyond what Goldsmith and Crawford (2014) terms as ‘compliance model’—whereby public authorities view data reporting as a mere response to transparency agenda. Instead, they utilise data intelligence towards developing more active, problem- solving capabilities for the benefit of their constituencies.

The Centre for Cities in the UK has launched a national data tool at the beginning of 2015 with an aim to map out the patterns of economic growth and drivers of urban success. The portal is based on 18 indicators covering areas, such as demographics, housing, jobs and employment, environment and inequality, highlights the variation in performance across Britain’s 63 largest cities. The “Cities Data Tool” (available at www.centreforcities.org/data-tool) developed with the support of Future Cities Catapult gives users access to data on UK cities in a variety of formats. The datastore is designed with the capability of displaying data through maps, bar charts, time series analysis, scatter graph, bubble diagrams and through simple tables. The maps and bar charts allow visualisation of data on a specific indicator providing a comparative understanding of cities performance (see Figure 2). To measure trends over a specified period or simultaneously analyse multiple indicators, the users can select to display data through time series, scatter and bubble graphs. While performing the analysis over the portal, the national average on any indicator is shown along with the list of top 10 and bottom 10 performers. The site provides users with the option to download data, tables, maps and images, add their feedback on the data and share the outputs through popular social media channels.



Figure 2: Bar chart view in the Cities Data Tool hosted by The Centre for Cities.
Source: www.centreforcities.org/data-tool/.

CITY ANATOMY: A PORTAL FOR 100 SMART CITIES IN INDIA

After reviewing the state of play of global indicator dashboards and given there was no comprehensive, authoritative data visualisation portal for Indian cities, we decided to build “City Anatomy”. City Anatomy was developed to bring together data on a range of urban indicators and present complex datasets in an easy to use format for rapid screening and understanding. The project is also called the “100 Smart Cities Portal” as the analysis is undertaken with data from over 100 cities selected under the ongoing Smart Cities Mission in India. The organisation and layout of City Anatomy are significantly influenced by the WCCD portal. However, the challenges and complexity of building the City Anatomy were far more significant as we have mapped double the number of cities analysed over the WCCD platform. Also, our work had to deal with the requirement of simultaneously displaying data over 100 urban centres located in close proximities. In compare, the cities mapped by WCCD have more relaxed spacing as they spread across the world. This meant that we had to find a novel way to avoid clutter in the visualisation output. We have also made significant innovations in presenting data through charts whereby multiple indicators can be selected together for a superimposed view providing a richer understanding of comparative urban performance.

System Architecture and Technologies

City Anatomy is a web application consisting of a series of navigation controls for accessing content and visualising data. The interface is built using a Model-View-Controller (MVC) architectural pattern efficiently separating- (a) the backend data, logic and rules of the application, (b) controller which accepts input and converts it to commands for the model, and (c) the output view of the information. There are many third-party applications and online services, such as AWS QuickSight, Tableau, Qlikview and FusionCharts that can support visual analytics of data. These are very powerful tools and popularly used in a business context but lack support for highly customised interfaces. So, we decided to build a bespoke solution using best practice approaches, open source libraries and common standards to make the portal usable by almost everyone with a computer and internet access. The use of free, open source and interoperable technologies within the dashboard has enhanced the affordability and accessibility of the project. The design adheres to the classic web-information seeking mantra—general overview first followed by detailed information on demand.

The City Anatomy dashboard is built on an HTML5 language which provides openly licenced resources for use by all web developers. JavaScript libraries are used for the graphical user interface of the dashboard. Specifically, the Leaflet 1.2.0 JavaScript has been used to build the interactive maps and visual outputs that efficiently works across all major desktop and mobile platforms. The base map on which the analytics is presented has been adapted from the openly archived ‘Light Grey Canvas’—featuring an overall soft grey colour for land and darker grey for oceans, available at the ArcGIS Online collection. We have used Chart.js JavaScript to achieve a clear visual distinction between datasets through graphs

and animated charts. This technology supports redrawing of charts based on window size for perfect scale granularity of visual outputs. The jQuery (1.12.4) and Bootstrap (2.3.2) open source toolkit has been used in the front-end component library over CSS3 for developing a responsive grid system and smooth transitions. There is no server-side scripting of the portal. All assets are brought together in the presentation layer (web browser) and rendered into position using JavaScript. Data is manually ingested into the system from an Excel spreadsheet which is then passed on to the output side of the view through the logic system and content delivery network (CDN) where it is rendered on the web page and ultimately shown to the user. Figure 3 breaks down the process and technologies used in the project for a simplified understanding.

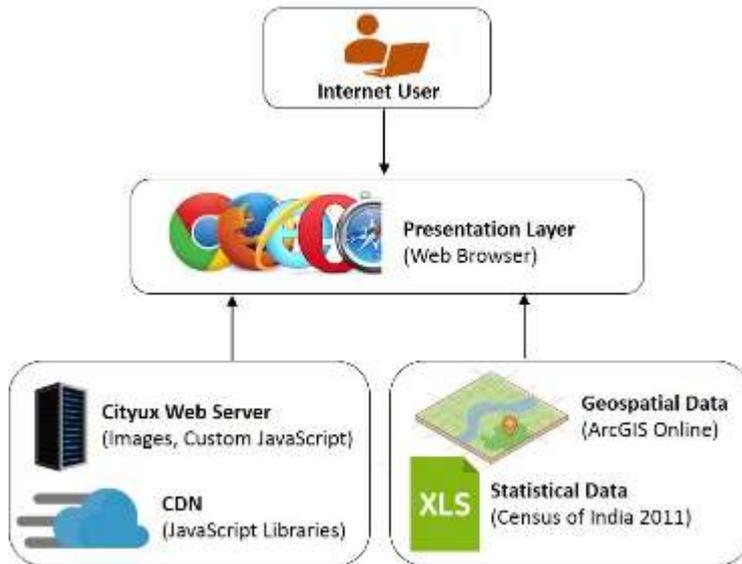


Figure 3: Technical Architecture of City Anatomy

Indicator Selection, Cities and Data

This paper focuses on 100 cities selected explicitly by the Government of India for development under the Smart Cities Mission. Each of these 100 cities receives funding of US\$150 million between 2015 and 2020 for developing smart infrastructure solutions in areas such as urban transport, water supply, solid waste management, command and control centres, environmental pollution management and health facilities. The current analysis thus can potentially facilitate the selection of policies and projects under the Indian Smart Cities Mission.

The research follows three basic principles for indicator selection: policy relevance, data availability, and geographical unit consistency. A thorough review of globally acclaimed city rankings and indexes was done to identify the most common thematic policy domains around which indicators will be formed. In terms of their focus, these indices span the interrelated areas of smart city ranking (Cohen, 2014; Giffinger et al., 2007; GoI, 2016; IESE, 2016), liveability (The Economist Intelligence Unit, 2017) and quality of life (ISO, 2014). We have taken specific care to select the most recognised publications that express opinions from a range of perspectives (i.e., government, academia and the private sector). We have also taken specific care to ensure that a lack of data availability does not influence the selection of proxy measures. Instead, the emphasis of this paper is to identify and use essential yet locally relevant indicators (Praharaj, Han, & Hawken, 2018) for which reliable data is available from public sources. Further, to avoid spatial scale mismatches in the data, known as ‘areal unit problems’ (Fotheringham & Wong, 1991), we have used data at the level of city municipal corporations on a consistent basis.

While the economy, mobility and physical infrastructure etc. have featured across the indicator systems consulted for this study, areas such as social cohesion often neglected as measures of smartness in cities. In this study, we have used a total of 60 indicators around nine thematic domains, as illustrated in Table 1. Social cohesion, behaviour and lifestyle have been included in this study as core predictors along with the commonly referred domains from literature. This inclusive approach in defining the broad indicator themes was necessary due to the high level of existing social and economic inequality in India’s cities (Kundu & Samanta, 2011) and an increasing trend of insecurity among disadvantaged communities with the emergence of smart city discourses (Datta, 2015). A total of seven variables were grouped under the demographic and social cohesion domain to uncover the patterns of social vulnerabilities in India’s aspiring smart cities. The second group of variables in Table 1 captures the economic potentials of cities and the supply of jobs amidst a rapid surge in young and working age population in India. A maximum of thirteen variables was selected under the domain of physical infrastructure and municipal service delivery. A set of five indicators are formed around skills and creative capacities. Six predictors define the domain of behaviour and lifestyle while seven are listed for measuring the shelter adequacy in cities. A total of 11 indicators are assigned over two themes overlooking local governance—urban development framework and resources and transparency and open administration.

The town amenities section of the district census handbook, published by the Office of the Registrar General and Census Commissioner at the Ministry of Home Affairs in India (Census of India, 2011), was referred to as the primary source of data. The latest available data on GDP was collected from the Open Government Data platform managed by the

Government of India's National Informatics Centre (<https://data.gov.in/>). Transport-related information was retrieved from a report issued by the National Transport Development Policy Committee set up under the Planning Commission, Government of India (NTDPC, 2013). The data on matters of governance and municipal capital expenditure were gathered from the individual local government websites.

Table 1: List of Indicators Used in the Analysis and Their Thematic Domains

Thematic domains	Indicators
Demography and social advancement	Population density in km/sq. km
	Decadal population growth rate in percentage
	Sex ratio
	Chile sex ratio
	Household size
	Female share of workers
	Literacy rate
Economic lead	Per capita GDP
	Work participation rate
	Working age population
	Dependent population
	Share of main workers
	Share of marginal workers
	Share of secondary and service sector workers
Access to public infrastructure	Percentage of households availing banking services
	Road density in km/sq. km
	Mode share of public transport (in percentage)
	Average trip length in km
	Percentage of households having access to treated tap water
	Percentage of households with access to drinking water within premises
	Percentage of households having electricity connection
	Percentage of households having access to latrine within premises
	Percentage of households having piped sewer connection with latrine
	Wastewater connected to closed drainage (percentage of households)
	Percentage of households with no waste water drainage connection
	Household level coverage of municipal solid waste (MSW)
	Efficiency of collection of MSW (in percentage)
Extent of MSW recycled and recovered (in percentage)	
Skills and creative resources	Gross enrolment ratio in higher education
	Number of colleges/lakh population
	Number of universities/lakh population
	Number of college graduates each year
	Creative and agile population (15-44 age group)
Behaviour and lifestyle	Percentage of households using solar energy
	Percentage of households using cleaner energy for cooking
	Percentage of households using fossil fuels for cooking
	Percentage of households having bicycle
	Percentage of households having enclosed bathroom
Digital services and communication	Percentage of households practising open defecation
	Percentage of households having fixed internet
	Percentage of households having computer/laptop
Housing and shelter	Percentage of households using mobile phones
	Percentage of households with condition of house as good
	Percentage of households having permanent house structures
	Percentage of households with condition of house as dilapidated
	Percentage of households with temporary/unclassifiable house structures
	Percentage of households residing in own houses
	Percentage of households residing in rented accommodation
Urban development framework and resources	Percentage of city population living in slums
	Status of city level Spatial development plans/Master plans/CDP
	Status of Ward level/Micro area Spatial development plans
	Functioning status of dedicated urban planning wing within ULB/DA
	Status of ULB empowerment to set and collect property tax
Transparency and open governance	Per Capita Capital Expenditure of the ULB
	Dedicated Local Government Website
	Status of online municipal budget sharing
	Initiation of e-procurement system (including vendor registration)
	Status of online availability of citizen Charters
	Status of online publication of Service level benchmarks
Availability of single-window civic service centres in the ULB	

Visualisation Outputs

The City Metric data visualisation platform has two core components: the map view and the chart view. The purpose of the map view module is to provide a single graphical representation of the current values for key indicators. The map view (see Figure 4) offers a navigation panel with nine icons placed at the left side of the screen, each representing a broad indicator domain. Once a user moves the cursor over one of those icons the individual indicators are shown in a separate panel running from top to downwards. Selection of an indicator will send a command to the system leading to animated visualisation of the data over respective cities. Figure 4 illustrates a visual output from the selection of “number of hospital beds/1000 population” within the domain of access to public infrastructure. By clicking on the circles, one can view the data and drill down to get more information from the data box displayed over the city. Such visual analytics support the identification of comparative advantage and disadvantage across cities on a particular indicator.

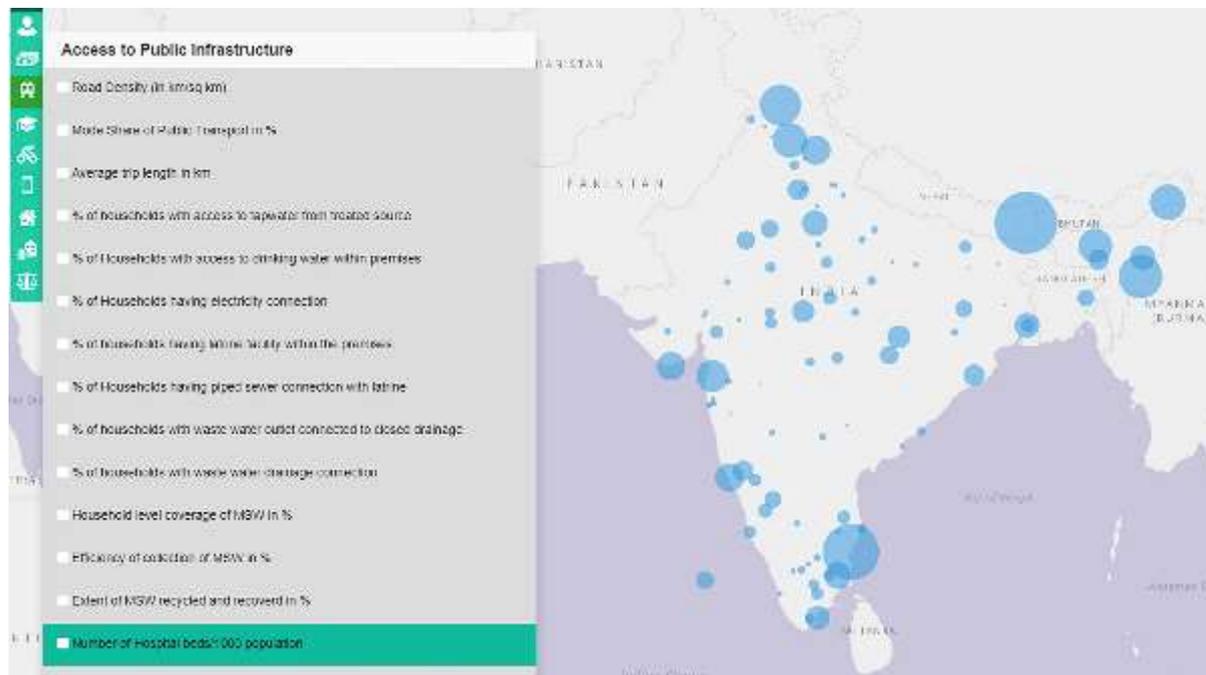


Figure 4: Map view in the City Anatomy Dashboard.

Source: <http://www.cityux.com.au/sarbeswar/map-view.html/>.

In contrast to the map view where one indicator can be selected at a time, the chart view provides the opportunity to choose two or more indicators for a detailed cross-cutting analysis and understanding of issues. Clicking on one of the icons in the left panel of the chart view module will automatically select all the indicators within the thematic domain, and a line graph will be generated as a superimposed view. The cities are represented on the X-axis, whereas, the Y-axis acts as a percentage scale of the data. The chart displayed in Figure 5 offer visualisation of a selection of 6 indicators within the behaviour and lifestyle domain. The indicators are presented in distinct colour with a legend provided at the top of the chart. It is possible to select or deselect by clicking on the respective indicators as required for the purpose of the user and the visual outputs will transform automatically based on the command. The interface is designed in a way that allows the operator to switch over from the chart view to the map view and vice-e-versa at any time for examining correlations in the analysis. The unique aspect of the chart view is that it advances understanding of the trends and consistencies in the performance of a city over a plethora of issues portrayed through the visual heartbeats.

time data is unavailable for Indian cities. However, with the smart cities projects taking shape and the urban environment getting intensely networked across the 100 cities, there will be possibilities of digital data generation. We will explore in future the opportunities of automated benchmarking of urban performance through finer grained real-time data feeds which we believe are essential for the success of the project. The goal is to continuously experiment with the digital tools for measuring and monitoring the advantage and disparities within and across the smart cities. Such projects help assert the role of government as a “platform provider” and facilitator of urban conversations for shaping healthy and democratic cities. Ultimately, the paper aids to reviving the art of town planning in the age of digital technologies and reinforces the view of Patrick Geddes (1949)—“survey is essential to our understanding of cities, with data pertaining to the city as a prerequisite to effective planning and policy making”.

REFERENCES

- Ascher, K. (2005). *The works: Anatomy of a city*. Penguin Group USA.
- Barns, S. (2016). Mine your data : open data , digital strategies and entrepreneurial governance by code governance by code. *Urban Geography*, 37(4), 554–571. <http://doi.org/10.1080/02723638.2016.1139876>
- Batty, M. (2013). Big data, smart cities and city planning. *Dialogues in Human Geography*, 3(3), 274–279. <http://doi.org/10.1177/2043820613513390>
- Batty, M. (2015). A perspective on city dashboards. *Regional Studies, Regional Science*, 2(1), 29–32. <http://doi.org/10.1080/21681376.2014.987540>
- Bettencourt, L. M. A. (2014). The Uses of Big Data in Cities. *Big Data*, 2(1), 12–22. <http://doi.org/10.1089/big.2013.0042>
- Boyd, D., & Crawford, K. (2012). Critical questions for big data: Provocations for a cultural, technological, and scholarly phenomenon. *Information Communication and Society*, 15(5), 662–679. <http://doi.org/10.1080/1369118X.2012.678878>
- Census of India. (2011). District Census Hand Book. Retrieved November 16, 2017, from <http://www.censusindia.gov.in/2011census/dchb/DCHB.html>
- Cohen, B. (2014). The Smartest Cities In The World. Retrieved December 20, 2017, from <https://www.fastcompany.com/3038765/the-smartest-cities-in-the-world>
- Coletta, C., & Kitchin, R. (2017). Algorhythmic governance: Regulating the “heartbeat” of a city using the Internet of Things. *Big Data & Society*, 4(2), 205395171774241. <http://doi.org/10.1177/2053951717742418>
- Datta, A. (2015). New urban utopias of postcolonial India: “Entrepreneurial urbanization” in Dholera smart city, Gujarat. *Dialogues in Human Geography*, 5(1), 3–22.
- Fotheringham, A. S., & Wong, D. W. S. (1991). The modifiable areal unit problem in multivariate statistical analysis. *Environment and Planning A*, 23(7), 1025–1044.
- Geddes, P. (1949). *Cities in evolution*. London: Williams & Norgate.
- Giffinger, R., Fertner, C., Kramar, H., Kalasek, R., Milanović, N., & Meijers, E. (2007). *Smart cities - Ranking of European medium-sized cities*. Centre of Regional Science, Vienna University of Technology.
- Godin, B. (2003). The emergence of S&T indicators: Why did governments supplement statistics with indicators? *Research Policy*, 32(4), 679–691. [http://doi.org/10.1016/S0048-7333\(02\)00032-X](http://doi.org/10.1016/S0048-7333(02)00032-X)
- GoI. (2010). *Improving urban services through Service Level Benchmarking*. New Delhi: Ministry of Urban Development, Government of India. Retrieved from http://www.indiaenvironmentportal.org.in/files/GOI_Benchmarking.pdf
- GoI. (2015). *Mission Statement and Guidelines. Ministry of urban development, Government of India*. Retrieved from <http://smartcities.gov.in/content/innerpage/guidelines.php>
- GoI. (2016). *Liveability Standards in Cities*. New Delhi: Ministry of Urban Development, Government of India. Retrieved from <http://smartcities.gov.in/upload/uploadfiles/files/LiveabilityStandards.pdf>
- Goldsmith, S., & Crawford, S. (2014). *The responsive city: Engaging communities through data-smart governance*. John Wiley & Sons.
- Gray, S., O'Brien, O., & Hügel, S. (2016). Collecting and visualizing real-time urban data through city dashboards. *Built Environment*, 42(3), 498–509. <http://doi.org/10.2148/benv.42.3.498>
- Hezri, A. A., & Dovers, S. R. (2006). Sustainability indicators, policy and governance: Issues for ecological economics. *Ecological Economics*, 60(1), 86–99. <http://doi.org/10.1016/j.ecolecon.2005.11.019>
- Hickok, E., Lakshané, R., & Tiwari, U. (2016). Comments to the BIS on Smart Cities Indicators. Retrieved October 22, 2017, from <https://cis-india.org/internet-governance/blog/comments-to-bis-on-smart-cities-indicators>
- Holden, M. (2006). Urban indicators and the integrative ideals of cities. *Cities*, 23(3), 170–183.
- IESE. (2016). *IESE Cities in Motion Index*. Retrieved from <http://www.iese.edu/research/pdfs/ST-0396-E.pdf>
- ISO. (2014). Sustainable development of communities — Indicators for city services and quality of life. Retrieved February 12, 2018, from <https://www.iso.org/obp/ui/#iso:std:iso:37120:ed-1:v1:en>
- Keim, D., Andrienko, G., Fekete, J. D., Görg, C., Kohlhammer, J., & Melançon, G. (2008). Visual analytics: Definition, process, and challenges. In *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)* (Vol. 4950 LNCS, pp. 154–175). http://doi.org/10.1007/978-3-540-70956-5_7
- Kitchin, R. (2014). The real-time city? Big data and smart urbanism. *Geojournal*, 79(1), 1–14. <http://doi.org/10.1007/s10708-013-9516-8>
- Kitchin, R., Lauriault, T. P., & McArdle, G. (2015a). Knowing and governing cities through urban indicators, city benchmarking and real-time dashboards. *Regional Studies, Regional Science*, 2(1), 6–28. <http://doi.org/10.1080/21681376.2014.983149>
- Kitchin, R., Lauriault, T. P., & McArdle, G. (2015b). Urban indicators and dashboards: Epistemology, contradictions and power/knowledge. *Regional Studies, Regional Science*, 2(1), 43–45. <http://doi.org/10.1080/21681376.2014.991485>
- Kundu, D., & Samanta, D. (2011). Redefining the inclusive urban agenda in India. *Economic and Political Weekly*, 55–63.
- Mackenzie, A. (2006). *Cutting code: Software and sociality*. New York: Peter Lang.
- Mattern, S. (2013). Methodolatry and the Art of Measure: The new wave of urban data science. *Places Journal*, (November).
- Mehta, M., & Mehta, D. (2013). City sanitation ladder: moving from household to citywide sanitation assessment. *Journal of Water Sanitation and Hygiene for Development*, 3(4), 481–488.
- NTDPC. (2013). *Urban Transport - National Transport Development Policy Committee*. New Delhi: Planning Commission, Government of India. Retrieved from http://planningcommission.nic.in/sectors/NTDPC/voulme3_p2/urban_v3_p2.pdf
- Patro, S. (2017). Smart City indicators by BIS. Retrieved March 24, 2018, from

- http://www.cstep.in/uploads/default/files/pressroom/stuff/CSTEP_Smart_City_indicators_by_BIS_Feb_13_BA.pdf
- Pettit, C., Bakelmun, A., Lieske, S. N., Glackin, S., Hargroves, K. C., Thomson, G., ... Newman, P. (2017). Planning support systems for smart cities. *City, Culture and Society*, 12(August 2017), 13–24. <http://doi.org/10.1016/j.ccs.2017.10.002>
- Pettit, C., Lieske, S. N., & Jamal, M. (2017). CityDash: Visualising a Changing City Using Open Data. In *International Conference on Computers in Urban Planning and Urban Management* (pp. 337–353). Cham: Springer. <http://doi.org/10.1007/978-3-319-57819-4>
- Praharaj, S., Han, J. H., & Hawken, S. (2018). Evolving a Locally Appropriate Indicator System for Benchmarking Sustainable Smart Cities in India. In *Sustainable Development Research in the Asia-Pacific Region* (pp. 253–274). Springer.
- Sulkowski, A. J. (2016). City Sustainability Reporting: An Emerging and Desirable Legal Necessity. *Pace Environmental Law Review*, 33(2), 278–299. <http://doi.org/10.2139/ssrn.2789829>
- The Economist Intelligence Unit. (2017). *The Global Liveability Report 2017*. Retrieved from <http://www.smh.com.au/cqstatic/gxx114/LiveabilityReport2017.pdf>
- UNCED. (1992). Agenda 21, Chapter 40: Information for Decision-Making. In *UN Conference on Environment & Development* (pp. 13–14). Rio de Janeiro, Brazil: United Nations. Retrieved from <https://sustainabledevelopment.un.org/content/documents/Agenda21.pdf>
- United Nations. (2017). Sustainable Development Goal 11. Retrieved January 12, 2018, from <https://sustainabledevelopment.un.org/sdg11>
- Wilson, M. W. (2015). Flashing lights in the quantified self-city-nation. *Regional Studies, Regional Science*. <http://doi.org/10.1080/21681376.2014.987542>
- World Bank. (2016). *Republic of India: Service Level Benchmarking, Citizen Voice and Performance Improvement Strategies in Urban Water Supply and Sanitation*. (Report No: ACS18249). World Bank. Retrieved from <https://books.google.com.au/books?id=Sh9atAECAAJ>

PY.5. RSAI Young Researchers Prize

1093A CRITICAL PERSPECTIVE OF SMART CITIES INITIATIVE IN INDIA: INVENTORY AND PROSPECTS

ABSTRACT

The Smart City paradigm aims to improve citizens’ physical quality of life in a scenario where the percentage of people living in urban India is getting higher and higher (World Urbanization Prospects, 2014). With the advent of “smartphones”, technology has helped mankind to solve some of its difficulties. On a similar note, “smart city” is a futuristic approach to alleviate obstacles triggered by ever-increasing population and fast urbanization which is going to benefit the governments as well as the masses. Modern day cities are deprived of vital elements like quality of life and socio-economic development which can be delivered by the smart cities. Smart cities are an endeavor to make cities more efficient, intelligent, sustainable and livable. This research paper explores various aspects and dimensions of a smart city. To bridge the gap in literature regarding the concept of smart and intelligent cities and its implementation, a framework has been developed to get better insights about the idea of smart and intelligent city. In this article, a new methodological approach is presented to evaluate to what extent the smart cities’ development pursues sustainable development goals in the fast growing cities of India. This methodology is called City Sustainable Indicators (CSI) approach. The CSI approach allows to estimate, with qualitative and quantitative indicators, how far smart cities are more intelligent and smart in environmental, economical and social perspectives. Moreover, this estimate can be performed before the technologies deployment. The methodology has been tested on the case study of metro cities of India like, Delhi, Mumbai, Kolkata and Bangalore etc. The implementation on the field, demonstrates that this methodology is able to give decision makers useful information on benefits generated by smart solutions deployment. This manuscript is relevant for the four major issues: Smart city initiative is used to enhance quality, performance and interactivity of urban services, to reduce costs and resource consumption and to improve contact between citizens and government; benefits are expressed with quantitative indicators; indicators are estimated before technologies or solutions implementation; smart city applications are developed to manage urban flows and allow for real-time responses; a smart city may therefore be more prepared to respond to challenges than one with a simple "transnational" relationship with its citizens. The paper highlighted how these factors can make the smart city initiative a successful initiative in India. The proposed methodological framework has been used to figure out various agendas for research and traces its practical implications.

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1264 AND YET IT MOVES: PRICE BEHAVIOR IN URBAN PAKISTAN

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ABSTRACT

This paper examines monthly prices from 2012 to 2017 for thirty-eight consumer goods across seventeen Pakistani cities. Prices converge both temporally and spatially. Goods that are not subject to price controls behave like those in other countries. A wage-adjusted Consumer Price Index shows that Pakistani cities are either “high” or “low” cost of living. Finally, a novel measure of cointegration ranks the most and least economically integrated cities. Pakistan’s urban markets are not perfectly integrated, but divergence typically does not occur along provincial, linguistic or ethnic boundaries.

JEL Codes: E30, N95, O12

1. INTRODUCTION

Do Pakistan’s cities work? Are they trapped in a nearly failed state unable to ensure the welfare of its people? Or has Pakistan created a space for urban firms and consumers to efficiently buy and sell goods? Plenty of evidence might suggest the former.

In 2011, President Obama called the disintegration of Pakistan “his biggest national security concern.” (Sanger, 2012, p. 112) How plausible is this nightmare scenario? Alesina, Easterly and Matuszeski (2011) constructed two measures of an “artificial state,” one for the straightness of borders and another for the number of ethnic groups straddling those borders. Pakistan was one of 13 countries in the worst third for both categories, alongside a since-dismembered Sudan. We don’t expect disintegrating states like South Sudan to provide their citizens with a surfeit of consumer goods.

But if failure was imminent, why did the World Bank’s 2016 Logistics Performance Index rank Pakistan 68th, well ahead of richer countries such as Lebanon, Iran, and Russia? According to a metric based on calorie consumption, The World Bank (2016) also found that poverty in Pakistan fell from 64 to 30 percent from 2001 to 2014. China’s government plans to invest over \$55 billion in Pakistan in coming years. They surely expect a return on those funds. (Sender and Stacey, 2017)

This paper will show what the World Bank and the Chinese already know: that Pakistan’s economy works, especially in cities. Firms can conduct arbitrage to ensure urban consumers have the basics of food, clothing and energy. Migration has largely eliminated significant differences in the urban cost of living in different provinces. That might not sound exciting, but it contradicts the dominant idea of Pakistan as a dysfunctional state unable to provide for its citizens.

This essay contributes to two strands of the economic literature. The first concerns price behavior. If the same good sells for two different prices it invites arbitrageurs to buy low and sell high until that discrepancy disappears, the “Law of One Price.” Thus price deviations convey information about market integration or lack thereof. Engel and Rogers (1996) found the international border between US and Canadian cities contributed more to their relative price volatility than thousands of miles of distance within each country. This occurred despite a free trade agreement, a common language and similar legal systems. Subsequent papers have focused more on prices within a single nation to eliminate confounding factors like borders and exchange rates. For the United States, Parley and Wei (1996) used a unit root test to show that prices converged nonlinearly; larger price differences provoked faster convergence. Morshed, Ahn and Lee (2006) found that price indices in India showed faster temporal convergence than those in the United States.

Much of the previous literature relied on unit-root tests, which may show a random walk when relative prices remain within the bounds set by theory. That explains the findings of nonlinear convergence also found by Fan and Wei (2006) in China. This paper tests for spatial and temporal convergence using econometric techniques that do not conflict with the underlying model. I will show that Pakistan’s price convergence compares favorably with that of India. This paper also reinforces previous literature on Pakistani prices. My results for specific consumer goods support those found in Alam and Bhatti (2014) while my attempt at quantifying changes in the cost of living in recent years updates Ahmad and Gulzar’s (2008) paper.

The second line of literature relates to urbanization in the developing world. Pakistan’s population disproportionately resides in the Indus river basin, one of 11 “mega-delta” regions in Asia and Africa. Seto (2011) noted these regions are at once magnets for migration, economically productive and threatened by rising sea levels. To explain the growth of cities in such poor countries, Glaeser (2014) constructed an open economy model where urbanization no longer relied on raising agricultural productivity or even a competent government. Glaeser found that optimal policies depended on both the quality of institutions and the size of the city. Most of the results in this paper will point to Pakistan’s policies being more effective than is commonly acknowledged, even by Pakistanis themselves.

Part 2 of this essay provides a brief overview of Pakistan’s history since 1947 with an emphasis on the erratic growth of cities. Part 3 describes the economic model and econometric techniques. Part 4 explains the data. Part 5 presents results supporting my conclusion that Pakistan’s urbanization has been more successful than is often recognized. Part 6 concludes.

2. PAKISTAN’S URBAN CONTEXT

When the British delineated Pakistan in 1947, they imposed that country on people which, outside of the Punjab, they themselves had been “unable to incorporate into their bureaucracy, running it instead as a military fiefdom.” (Kaplan, 2012). The new government maintained that hands-off approach; today the central government does not control sixty percent of its nominal territory (Rumi, 2012). Table 1, below, summarizes how that lack of effective governance means that quality of life still varies dramatically for cities in different provinces.

Table 1: Urban Pakistan by Province

Province	Population	Urbanization Rate	Gini	% Urban Children Fully Vaccinated	% Urban in Top Wealth Quintile
Punjab	110,012,442	0.37	0.30	74.4	49.6
Sindh	47,886,051	0.52	0.38	51.5	55.3
Khyber Pakhtunkhwa	30,523,371	0.19	0.31	58.0	17.7
Baluchistan	12,344,408	0.28	0.27	35.9	39.1

Source: Provisional Province Wise Population by Sex and Rural/Urban Census 2017, Pakistan Demographic and Health Survey 2012-13

The first major shock to Pakistan’s cities occurred in 1947 when millions of Urdu-speaking Muslims abandoned their ancestral homes in India for a new homeland. Over four and a half million Hindus and Sikhs left, while some six and a half million Muslims arrived (Mustafa and Sawas, 2013). Personified by Pakistan’s founding father (and Bombay lawyer) Muhamad Ali Jinnah, these “Muhajirs” gravitated towards cities like the capital in Karachi. (Inskeep, 2011). The 1951 census found that 48 percent of urban Pakistanis were recent immigrants from India. (Hasan, 2010).

After Independence, factors driving urbanization across much of the developing world arrived in Pakistan. Rising agricultural productivity in the 1960s pushed many villagers into the cities in search of work (Hasan, 2010). More often than not, they found it: gross domestic product per capita nearly tripled from 1950 to 1999 (Easterly, 2001).

Chaos in neighboring Afghanistan pushed over three million refugees into Pakistan in the years after 1978 (Memon, 2005). Laws preventing the cultivation of land funneled those Afghans into cities, a trend that continued after international aid declined in 1995 (Mustafa and Sawas, 2013). Not every disaster was manmade: widespread flooding in Punjab and Sindh in 2010 destroyed countless farms and hurled hundreds of thousands into makeshift camps on the edge of urban areas (Constable, 2011).

Today most internal migrants leave the poorer states of Khyber Pakhtunkhwa and Baluchistan and arrive at large cities in Sindh and Punjab (Memon, 2005 and Hasan, 2010). While no longer the capital, Karachi still grew from one million inhabitants in 1950 to over thirteen million in 2010 (Inskeep, 2011). Today native Sindhis are about ten percent of the population of Karachi, roughly half the size of the Pashtun population of that city (ICG, 2017).

Blank, Clary and Nichporuk (2014) found what while the residents of major cities in Pakistan enjoyed better access to education and healthcare, they increasingly saw their economic situation as worse than deprived rural areas. Blank, et al. argued that the center of gravity in Pakistan’s elections has shifted away from the rural areas to cities. The quality of life in urban Pakistan has real implications for the domestic and foreign policy of a nuclear power.

3. MODEL AND ECONOMETRIC TECHNIQUES

This paper assumes the same theoretical model as Engel and Rogers (1996), where a local monopolist maximizes profits selling each good. We model each good as the product of two intermediate inputs, one tradeable and one non-tradeable. Think of the non-tradable component as capturing transportation and marketing costs. In this model, the seller’s markup depends on the local elasticity of demand. Both the non-tradeable components and the markup prevent prices from fully converging. Still, if prices vary too much arbitrage can occur. What defines “too much?” Both transportation and opportunity costs increase with distance, so even with all other factors held constant we expect to see the relative price of some good in locations j and k fluctuating within a range proportional to the distance between j and k .

$$\frac{1}{d_{j,k}} \leq \frac{p_j}{p_k} \leq d_{j,k} \tag{1}$$

The range in (1) is the reason the literature began testing for non-linear convergence or discarding unit root tests entirely. If the relative price of a good in two places wanders within these bounds, prices might appear to behave like a unit root while simply remaining within the bounds set by our model. We should not expect to see perfect convergence across all locations or even between two cities in close proximity. However we can test whether or not the prices for a particular good in a particular city ever become truly untethered from the national market, or if convergence seems to occur spatially within each province to the exclusion of cities in other provinces. Either outcome would could indicate a market failure.

We need to identify items that could prove or disprove this hypothesis. If the government imposes price controls, we might misinterpret that similarity as evidence of an integrated market when it is instead the result of government intervention. This paper uses each item’s coefficient of variation as a baseline for inclusion. If the ratio of an item’s standard deviation to its mean averages less than 0.05, I assume that there is insufficient opportunity to cross the threshold in equation (1).

$$\frac{1}{T} \sum_{t=1}^{t=T} \frac{\sigma_t}{\mu_t} > 0.05 \tag{2}$$

I will examine price behavior at the level of individual consumer goods with two tests: one for each item temporally without city effects, another that measures an item’s convergence spatially between cities.

An autoregressive function of a price on its first lag tell conveys how quickly a price reverts to its mean. That is, how long does it take for a price shock to dissipate? Half-life offers the most intuitive measure of mean-reversion, telling us how it takes for a price shock to dissipate by half. A relatively short half-life could indicate a good that is seasonal, perishable or difficult to transport. Similarly, a beta coefficient approaching one might indicate a good that is not as susceptible to arbitrage.

$$price_t^* = \alpha + \beta price_{t-1}^* + \varepsilon_t \tag{3}$$

$$half - life \equiv \frac{\ln 1/2}{\ln \beta} \tag{4}$$

In order to remove individual city effects, I transformed prices using the forward orthogonal deviation described in Arellano and Bover (1995). Instead of losing an observation by taking a first difference, this subtracts the average of all future values.¹⁰²

$$price_{i,t}^* \equiv \sqrt{\frac{T-t}{T-t+1}} \left[price_{i,t} - \frac{1}{T-t} \sum_{s>t} price_{i,s} \right] \tag{5}$$

However, this still leaves us with correlation between our transformed error terms and the transformed lag. To avoid this complication, Arellano and Bover recommend using the second lag in levels as an instrumental variable¹⁰³. While every item undergoes the same transformations, the resulting half-lives should still be heterogeneous. While the incentives behind arbitrage are the same for different goods, we cannot assume every price behaves the same. For example, transportation costs will rise for easily damaged goods, while perishable items require either expensive storage or immediate resale.

While half-lives provide some sense of how quickly arbitrageurs take advantage of price discrepancies, they do not tell the entire story. Phillips and Sul (2007) devised a test for panel data with this dynamic in mind. Think of each individual city’s time series for any given commodity as having a time-varying idiosyncratic distance from the country’s overall trend, μ_t .

$$X_{i,t} = \delta_i \mu_t + \varepsilon_t \tag{6}$$

$$\delta_{it} = \delta_i + \sigma_i \xi_{it} L(t)^{-1} t^{-\alpha} \tag{7}$$

$L(t)$ is some increasing function that is divergent at infinity; I follow standard practice and use $\log(t)$. ξ_{it} is an error term. This semi-parametric form for $\delta_{i,t}$ under certain conditions allows me to test the null hypothesis $H_0: \delta_{i,t} \rightarrow \delta$ as $t \rightarrow \infty$ with a one-sided t-test. Phillips and Sul called this “log-t convergence.” This null hypothesis is the same as testing $H_0: \alpha \geq 0$,¹⁰⁴ a test that each city’s divergence from the common trend tends towards zero.

$$h_{i,t} \equiv \frac{\delta_{i,t}}{\frac{1}{N} \sum_{i=1}^N \delta_{i,t}} = \frac{X_{i,t}}{\frac{1}{N} \sum_{i=1}^N X_{i,t}} \rightarrow H_t \equiv \frac{1}{N} \sum_{i=1}^N (h_{i,t} - 1)^2 \tag{8}$$

$$\ln \left(\frac{H_1}{H_t} \right) - 2 \ln(L(t)) = \alpha + \beta \ln(t) + \varepsilon_t \tag{9}$$

In every period, the mean of h_t equals one, so H_t provides a scale-invariant measure of price dispersion during period t . If prices converge, H_t falls, which raises the left-hand side of the regression. Phillips and Sul found that discarding the first thirty percent of observations optimized their test for both size and power. While we might expect a positive beta coefficient, Phillips and Sul found that a $t_{\hat{\beta}} < -1.65$ represents the cut-off point for rejecting the null hypothesis of convergence at the 5 percent significance level.

In that initial paper, Phillips and Sul tested consumer price indices for 19 cities in the United States from 1960 to 2000. They decisively rejected convergence with $t_{\hat{\beta}} = -51.4$. But surely prices in each US city were not moving without any correlation to each other, so Phillips and Sul tested for “club convergence.” They ordered the indices by last observation, ran the log-t regression for the two most expensive cities, then kept adding more cities one at a time until the t-statistic fell below the -1.65 threshold. Whatever combination maximized the t-statistic they designated the “core group.” They then added cities to the core group one at a time, leaving cities in so long as the t-statistic exceeds zero, the threshold which Phillips and Sul found minimized the sum of Type I and Type II errors. Whatever combination of cities met this

¹⁰² Hayakawa (2009) showed that forward orthogonal deviation outperforms the first-difference method in both estimator bias and root mean squared error.

¹⁰³ I used the `xtabond2` command in STATA, per Roodman (2009).

¹⁰⁴ Phillips and Sul (2007) show that $\hat{\beta} = 2\hat{\alpha}$.

cut-off is now the first “club.” Then they repeated the process with the remaining cities. A city that does not fall into any club they labeled “divergent.”¹⁰⁵

The theoretical model at the start of this section prevents us from reading too much into a cities’ convergence into one club or another for any particular item. The final price captures local elasticity and a non-tradeable factor of production. Even holding that constant, the price of a good in any two cities could always wander within the boundaries in (1). The key signal in the noise is divergence, not convergence to any particular club.

In this paper I construct a monthly Consumer Price Index that controls for wages, a rough measure for each city’s cost of living. As described above, Pakistanis migrate freely within the country. If we subject those wage adjusted indices to the log-t test, we would not expect to see any divergent cities. Given free labor movement, a city with high cost of living would either need to provide amenities valued by its citizens or risk losing inhabitants to migration, whereas as a low cost of living city would attract them. “Clubs” inside of Pakistan should not be any more concerning than those found in America, assuming that they do not emerge along provincial or ethnic lines that might presage a genuine national cleavage à la Sudan.

If the Law of One Price held perfectly, then any differences we encounter should reflect either differences in mark-ups or transportation costs. For example, 95 percent of Pakistan’s international trade goes through the southern port city of Karachi (World Bank, 2016). So the price of an imported good in every other city could reflect the cost of the good in Karachi plus the local mark-up and transportation costs. If the cost in Karachi rises by 100 rupees, then the cost in other cities should rise by a predictable amount. If supply and demand adjust seamlessly to changes in price, then the relative price of a good in two cities will not vary over time. An unstable relative price indicates two cities are not integrated. This paper measures “relative volatility” of good *i* in cities *j* and *k* as the standard deviation of the normalized price difference.

$$rv_{j,k} \equiv sd \left[\frac{p_{j,t} - p_{k,t}}{\frac{p_{j,t} + p_{k,t}}{2}} \right] \tag{10}$$

If a good always costs twenty percent more in one city, $rv_{j,k}^i = 0$. Although their prices never converge we infer that they are perfectly cointegrated¹⁰⁶. The sum of relative volatilities provides an intuitive measure of different cities’ levels of integration for that item. The sum of all item’s $rv_{j,k}^i$ in one city tells us about the city’s economic integration overall. If one region had significantly higher scores across most or all of its cities, we may infer that something about that region is inhibiting arbitrage.

I chose this untraditional metric to take advantage of the available data. For any one good, we have seventeen cities’ worth of data. Multiple panel unit root tests can determine if two or more *I*(1) time series are in a long-run equilibrium, but the Pedroni (1999) and Westerlund (2005) tests can only test for seven covariates, while Kao (1995) assumes a constant integrating vector. In addition, all three assume that the covariates themselves are not cointegrated which is obviously not the case here¹⁰⁷.

4. DATA

Every Thursday, the Pakistani Bureau of Statistics visits multiple markets to record prices for 53 “essential commodities” in 17 cities across Pakistan: The capital, Islamabad, eight in Punjab (Rawalpindi, Gujranwala, Sialkot, Lahore, Faisalabad, Sargodha, Multan, Bahawalpur), four in Sindh (Karachi, Hyderabad, Sukkur, Larkana), two in Khyber Pakhtunkhwa (Peshawar, Bannu) and two in Baluchistan (Quetta, Khuzdar) (PBS, Methodology). Field offices contact shopkeepers directly in order to avoid nominal price controls. A weighted average of these prices forms the “Sensitive Price Indicator” (SPI). Prices for individual goods in different cities have been posted since January 2012. This paper makes use of 72 monthly observations for every item, from January of 2012 to December of 2017.¹⁰⁸

The PBS also collects prices for a broader Consumer Price Index (487 items) and a Wholesale Price Index (463 items). Prices for every good in the wider Consumer and Wholesale indices are not publically available. Table 2, below, summarizes the recent behavior for the indices. For the time period covered in this paper, we see an early surge in inflation followed by a gradual and irregular decline.

Table 2: Price Indices, 2007-2008=100

Period	CPI	WPI	SPI
2011-2012	162.6	181.3	178.7
2012-2013	174.5	194.6	189.6
2013-2014	189.6	210.5	208.7
2014-2015	198.2	209.9	212.6
2015-2015	203.8	207.6	216.2
2016-2017	212.3	216.02	220.1

Source: State Bank of Pakistan

¹⁰⁵ The log-t convergence results in this paper were obtained using the Stata module introduced by Du (2017), which filters the raw data in order to remove both trend and cyclical components prior to running the above tests.

¹⁰⁶ When $j = k, rv = 0$.

¹⁰⁷ For an accessible overview of these tests, see <https://www.stata.com/manuals/xtxtcointtest.pdf>

¹⁰⁸ The PBS posts the data in the .pdf file format; I extracted all prices using the Tabula program.

Almost every week, the Pakistani Bureau of Statistics posts daily wages in rupees for five occupations in the same cities as the Sensitive Price Indicator. Three trades have uninterrupted observations for every month: carpenter, electrician and mason. The wages used in this paper are the first available wage data for each month from January 2013 to December of 2017. The “wage” of a particular city refers to the mean of these three daily wage rates. Note that when we control for wages we lose the 2012 price data and have only 60 monthly observations.

5. RESULTS

Many items lack sufficient price variation to test convergence or divergence. I exclude fourteen goods with an average Coefficient of Variation less than .05 because I assume that their prices left insufficient opportunity for arbitrageurs to buy low and sell high. All were either utilities, processed foods or manufactured goods. See Table 3, column 2, below.

Utilities such as electricity charges and telephone calls are not subject to arbitrage, while certain manufactured name-brands such as "Lipton Yellow Label" tea are so standardized that even without price controls it still displays too little variation. Near-uniform prices do not imply integration or even a functioning market. For instance, sugar’s coefficient of variation was 0.032. Salman (2009) explained how price controls on sugar resulted in domestic shortages while millers predictably smuggled their sugar into India and Afghanistan to take advantage of higher prices. Before I tested the data, Salman mentioned in private correspondence that both ghee and cooking oil were under price control; both had a coefficient of variation less than .05 and were excluded. Of the 38 remaining goods, bananas had the highest Coefficient of Variation, at .30. That squares with our intuition that perishable, easily damaged goods are less subject to arbitrage. I exclude gas charges due to missing observations in Bannu and Khuzdar.

I measured the half-lives for 38 goods using the specifications in equations (3), (4) and (5). The closer the β coefficient on the first lag to 1, the more “sticky” the price. We would expect seasonal and perishable items to vary more month-to-month as the supply is irregular. That would leave them with lower coefficients and shorter half-lives. Non-perishable goods that are easy to transport and store should have more stable prices, coefficients closer to one and longer half-lives.

As detailed below in column 4 of Table 3, the overall median half-live across all items is 19.3 months. The median for perishable, and hence volatile, food was below that of non-food, at 16.3 and 24.6 months, respectively. How should we interpret these numbers? Parsley and Wei (1996) found that tradable goods in the United States from 1975 to 1992 tended to display a half-life of 16 to 20 months, exactly the range I find.

Alam and Bhatti (2014) also tested for the half-lives of Pakistani goods, although for a different specification: the half-live of the price relative to the price in Karachi or Lahore. While my numbers differ in magnitude, the relative sizes are similar for the same items. For example, Alam and Bhatti found that the half-life of prices in 10 cities relative to Lahore for onions and propane cylinders were 0.58 and 1.16 months, respectively. My specification produced 1.66 and 3.80.

When I examine items spatially by finding their Phillips and Sul log-t convergence clubs, I found similar results, as shown in Table 3, column 5. Out of 646 time series (17 cities by 38 items) only 43 were divergent from any club, about 6.6 percent. The two cities most likely to diverge were Peshawar and Bannu with 5 each, followed by Islamabad, Bahawalpur and Khuzdar at 4 each. While it is not heartening for the two cities in Khyber Pakhtunkhwa to diverge more often, the major Pashtun city of Quetta in Baluchistan only saw one item out of 38 diverge. The market for any given consumer good functions about as well in Pashtun areas as it does in the rest of the country.

Table 3: Sensitive Price Indicator Goods

	Name	C of V	FOD R	FOD HL	P&S Clubs	P&S Divergent Cities	CPI Weight
1	WHEAT	0.053	0.858	4.516	2	1	0.0167
2	WHEAT FLOUR BAG	0.055	0.893	6.122	3	3	0.0167
3	RICE BASMATI BROKEN	0.137	0.964	18.894	3	2	0.0167
4	RICE IRRI-6	0.150	0.958	16.227	2	0	0.0167
5	BREAD PLAIN MED.SIZE	0.088	0.968	21.506	3	3	0.0167
6	BEEF	0.081	0.992	86.232	3	0	0.0167
7	MUTTON	0.095	1.004	-174.865	2	4	0.0167
8	CHICKEN LIVE (FARM)	0.119	0.413	0.784	2	0	0.0167
9	MILK FRESH	0.112	0.976	28.367	2	0	0.0167
10	CURD	0.138	0.983	39.326	2	0	0.0167
11	MILK POWDERED NIDO	0.013	.	.	.	.	.
12	EGG HEN (FARM)	0.065	0.550	1.158	3	1	0.0167
13	MUSTARD OIL	0.147	0.988	55.971	3	0	0.0167
14	COOKING OIL (TIN)	0.020	.	.	.	.	.
15	VEG. GHEE (TIN)	0.021	.	.	.	.	.
16	VEG.GHEE LOOSE	0.068	0.961	17.565	4	1	0.0167
17	BANANAS	0.298	0.715	2.070	2	1	0.0167
18	MASOOR PULSE WASHED	0.096	0.961	17.518	4	0	0.0167
19	MOONG PULSE WASHED	0.089	0.959	16.440	5	2	0.0167
20	MASH PULSE WASHED	0.097	0.968	21.594	3	0	0.0167
21	GRAM PULSE WASHED	0.091	0.946	12.412	1	0	0.0167
22	POTATOES	0.220	0.778	2.768	4	1	0.0167
23	ONIONS	0.184	0.659	1.661	2	2	0.0167

24	TOMATOES	0.185	0.419	0.798	4	2	0.0167
25	SUGAR	0.032	.	.	.	.	.
26	GUR	0.126	0.883	5.582	3	1	0.0167
27	SALT POWDERED LOOSE (LAHORI)	0.113	0.976	28.295	2	0	0.0167
28	RED CHILLIES POWDER LOOSE	0.128	0.924	8.803	1	0	0.0167
29	GARLIC	0.143	0.921	8.415	2	0	0.0167
30	TEA (YELLOW LABLE 200 GM.)	0.020	.	.	.	.	.
31	COOKED BEEF PLATE	0.218	0.986	50.566	2	2	0.0077
32	COOKED DAL PLATE	0.217	0.992	84.243	3	0	0.0077
33	TEA PREPARED (SADA)	0.124	0.979	32.839	1	2	0.0167
34	CIGARETTES K-2 (20's)	0.046	.	.	.	.	.
35	LONG CLOTH	0.227	0.966	19.839	3	1	0.0237
36	SHIRTING	0.235	0.989	60.279	2	4	0.0237
37	LAWN	0.285	0.973	24.863	4	1	0.0237
38	GEORGETTE	0.154	0.972	24.347	2	2	0.0237
39	SANDAL GENTS BATA	0.000	.	.	.	.	.
40	CHAPPAL SPNG.BATA (GENTS)	0.001	.	.	.	.	.
41	SANDAL LADIES BATA	0.008	.	.	.	.	.
42	ELECTRIC CHARGES (1-50)	0.000	.	.	.	.	.
43	GAS CHARGES	0.105	.	.	.	.	.
44	KEROSENE	0.102	0.968	21.351	5	0	0.0919
45	FIREWOOD	0.203	0.990	66.294	3	1	0.0919
46	ENERGY SAVOR 14 WATS	0.059	0.956	15.477	4	1	0.0919
47	WASHING SOAP (200-250 GM.)	0.295	0.987	51.299	2	3	0.0526
48	MATCH BOX	0.232	0.977	29.662	1	1	0.0344
49	PETROL	0.012	.	.	.	.	.
50	DIESEL	0.011	.	.	.	.	.
51	L.P.G.(11 KG CYLINDER.)	0.075	0.833	3.804	2	1	0.0919
52	TELE. LOCAL CALL	0.000	.	.	.	.	.
53	BATH SOAP LIFEBOUY (STANDARD)	0.011	.	.	.	.	.

The average item had 2 or 3 clubs. Kerosene, item number 44 in Table 3, broke down along provincial lines. Baluchistan and Khyber Pakhtunkhwa each saw their cities converge to each other and not cities in any other province. Even for kerosene, though, I still find that no city diverges, as specified by the model in (1). The only other paper I could find using the Phillips and Sul test on a wide range of goods, Dang, Yang and Chan (2017) looked at 85 tradable prices across 15 Asian cities from 1990-2008 and found that only 5 percent converged into a single club. While this study is not international and thus not directly comparable to theirs, it does highlight how difficult it is for prices to converge into a single club via the Phillips and Sul test, hence the emphasis on divergent cities and not the particular number of clubs.

To understand how this price behavior affects quality of life, we need a measure of price levels overall for each city. I was not able to locate an official CPI or SPI for different Pakistani cities, so I constructed one using the 38 items in this paper. As this index is composed entirely of items above the 0.05 coefficient of variation threshold, it is biased towards divergence and could serve as an upper-bound on price volatility. It excludes several basic items like cooking oil, electricity and diesel fuel. I weighted the remaining items by modifying the full Pakistani CPI weights found in the State Bank of Pakistan’s Inflation Monitor. Certain categories were not counted at all, such as health, transport, communication and education. The items in our 38 fell into categories that total .8, so I adjusted food and non-alcoholic beverages, for example, from 0.348 to 0.435 (i.e. 0.348/0.8). Items within each category received equal weight, so all 26 items in the food and non-alcoholic beverage category were weighted .0167 (.435/26).

For each city, I take the product of every price and its weight, then sum for the city CPI for that month. Then I divide by “wage” for the cost of living. Recall that I define “wages” as the mean daily wage for a carpenter, an electrician and a mason in that city-month. When I subjected the 17 cities’ cost of living time series to the Phillips and Sul test, I find that all cities converged into one of two groups: a “low” cost of living group of Islamabad, Rawalpindi, Sargodha and Bannu, while all other cities were in “high” cost of living group. See Figure 1, below. These clubs are in line with Phillips and Sul’s (2007) estimation that consumer price indices for 19 cities in the United States fell into three groups.

While urban Pakistan is not perfectly integrated, I do not see a single divergent city. That should not be surprising since Memon (2005) classified between 1.7 and 4.7 percent of Pakistan’s population as economic migrants. In spite of regional tensions, language differences and other obstacles, that freedom of movement ensures living standards remain somewhat even across the country.

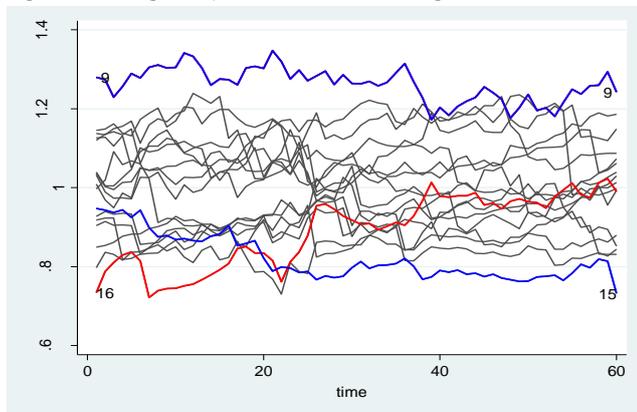
I found each city’s “relative volatility” by constructing a 38x17 matrix where each entry was the solution to equation (10) for one item and city. The last column of Table 4 represents the sum of all entries in each city’s matrix, normalized to a mean of 100. While the capital Islamabad is nominally the most expensive city over the time period, its high wages more than compensate for high prices. Islamabad is the most integrated city in Pakistan by equation (10). After Islamabad, the next six most integrated cities are all in Punjab, which matches our intuition since they are in close proximity both spatially and linguistically. Baluchistan’s cities are the least integrated by far. Until now, our results tended to support the notion of Pakistan as an integrated market, but some provinces appear more integrated than others.

Table 4: City Summary

City	Province	Population	Average CPI	Average Wage	Relative Volatility
1. Islamabad	Capital Territory	1,014,825	111.50	125.22	87.15
2. Rawalpindi	Punjab	2,875,516	107.40	123.85	88.95
3. Gujranwala	Punjab	2,948,936	99.97	99.50	94.50
4. Sialkot	Punjab	1,143,362	101.13	98.80	93.90
5. Lahore	Punjab	11,126,285	103.90	96.60	95.17
6. Faisalabad	Punjab	3,760,328	100.23	86.53	102.65
7. Sargodha	Punjab	1,091,045	96.29	90.42	99.55
8. Multan	Punjab	2,058,290	98.35	92.62	92.32
9. Bahawalpur	Punjab	1,171,258	99.70	77.13	94.33
10. Karachi	Sindh	14,910,352	96.71	104.20	102.93
11. Hyderabad	Sindh	1,832,755	93.76	100.50	97.82
12. Sukkur	Sindh	720,115	93.48	81.58	100.10
13. Larkana	Sindh	701,637	95.26	91.27	108.72
14. Peshawar	K-P	1,970,042	109.89	95.80	98.52
15. Bannu	K-P	49,965	93.49	112.49	98.22
16. Quetta	Baluchistan	1,001,205	103.84	115.03	115.60
17. Khuzdar	Baluchistan	277,136	95.07	108.45	129.59

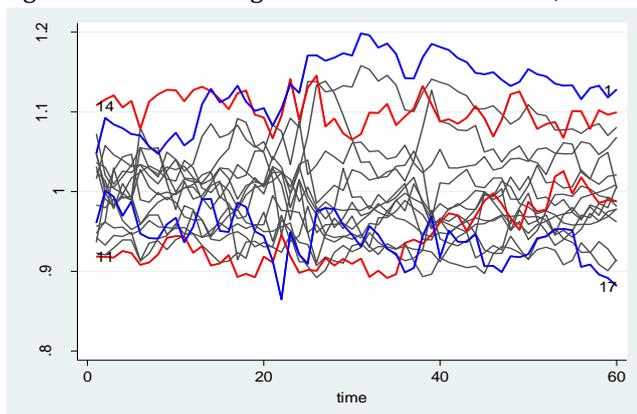
Note: Population from 2017 Census, Provisional Results. All values normalized to mean equals 100.

Figure 1: Wage-Adjusted Cost of Living Index for Pakistani Cities, 2013-2017



Note: Numbered time series in Figure 1 correspond to list in Table 4; 9 is Bahawalpur, etc.

Figure 2: Cost of Living Index for Pakistani Cities, 2013-2017



Note: Numbered time series in Figure 1 correspond to list in Table 4; 1 is Islamabad, etc.

To understand what drives relative volatility, I used the normalized value for all city pairs as a dependent variable in a cross-sectional ordinary least squares regression. Results are shown in Table 5, below. After controlling for individual city effects, a provincial border between two cities has the same effect as roughly 435 kilometers of distance. While they used a different specification for volatility, my findings are still an order of magnitude lower than Engel and Rogers' (1996) findings for the border between the United States and Canada.

Table 5: Relative Volatility

VARIABLES	(1) Model 1	(2) With City Controls
distance	0.000693** (0.000281)	0.000699*** (0.000222)
border	0.806***	0.305**

	(0.174)	(0.153)
Constant	-1.006***	2.008**
	(0.153)	(0.769)
Observations	136	136
R-squared	0.346	0.837

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

6. ROBUSTNESS CHECKS

The initial screening for a 0.05 coefficient of variation could have produced a “false positive.” If I include any of the discarded items and subject it to any of the same tests or place it in the Consumer Price Index, I would find a more integrated market with fewer opportunities for arbitrage. The results in this paper serve as an upper-bound on divergence and market failure for goods in the Sensitive Price Indicator.

While the half-lives generated by the forward orthogonal deviation are more reliable, I took the first difference of all prices and regressed it on the first lag and three lagged differences. This resulted in a median half-life of 33 months. I also ran a simple AR(1) regression using ordinary least squares; here the median half-life was 39 months. Those tests imply that arbitrage occurs much more slowly, but that is still well within the half-lives seen in the United States by Cechetti, Mark and Sonora (2002).

In the course of writing this paper, I repeatedly ran the Phillips and Sul test with new data as the Pakistani Bureau of Statistics updated its website. Because the club convergence algorithm starts with proximity in the last available time period, the individual cities in particular clubs did alter somewhat month to month. However, the average number of clubs and divergent series remained nearly constant.

When I just run the consumer price indices without controlling for wages, I obtain three groups and two divergent cities. However, it also has a much smaller vertical axis on Figure 2, below. That is to say, the cost of living after controlling for wages displays greater variation than the goods-based indices alone. This might be interpreted as evidence that goods are more mobile than labor.

The relative volatility scores could just be a proxy for city size. Imagine three cities all equidistant from each other. If some good costs less in one city and a firm wanted to buy low and sell high in one of the other cities, all else equal they would transport those goods to the larger market. I do find a negative correlation between cities’ population and relative volatility, but at roughly -0.1, there is certainly more driving this than market size. I regressed city volatility on population and total distance from the 16 other cities. The R-squared value was .4, which leaves a lot to explain beyond market size and opportunity cost.

7. CONCLUSION

I have passed over many of the problems facing Pakistan. Its shortcomings in education, healthcare and security remain severe. The roots of those problems lie in Pakistan’s history (Jaffrelot, 2015) and political economy (Ahmed, 2016). They are beyond the scope of this paper. Denial is a sure way to perpetuate failure, but too much focus on the negative means we could be blind to the rising living standards and economic opportunities that Pakistan’s cities offer for residents and migrants alike.

This paper used price behavior as a proxy for Pakistan’s economic integration. Certain frictions are evident, such as price controls that distort markets, incentivize smuggling and cause needless shortages. But when I consider basic consumer goods in a free market, I found that those prices behave much like our model predicts: a variety of local conditions might prevent perfect convergence, but across all goods I rarely see divergence either temporally or spatially. Furthermore, a measure of urban cost-of-living shows that every city falls into one of two groups. That lack of divergence might seem mundane, but it is worth noting that the government has very little influence across much of its own territory. When I measure how quickly relative prices adjust, the results indicate a highly integrated Punjab and a less integrated Baluchistan.

Why bother showing that Pakistan behaves much like any other country? Because it counters the dominant narrative of Pakistan: a flawed democracy rife with religious extremists, a nuclear-armed South Asian country unable to defeat insurgencies within its own borders. But that description could also apply to India. As Naseemullah (2013) noted “India tends to inspire more confidence than a more objective assessment of its condition would merit, and Pakistan inspires much less.” I hope that this essay can play some small role in changing that assessment for investors and policy makers.

REFERENCES

- Ahmad, Sonia, and Ahmed Gulzar. "Inter-city variation in prices." *The Pakistan Development Review* (2008): 877-892.
- Ahmed, Shahid. *Rentier capitalism: disorganised development and social injustice in Pakistan*. Springer, 2016.
- Alam, Azra, and Arshad Ali Bhatti. "Relative Commodity Price Convergence in Pakistan." *Working Paper* (2014).
- Alesina, Alberto, William Easterly, and Janina Matuszeski. "Artificial states." *Journal of the European Economic Association* 9.2 (2011): 246-277.
- Arellano, Manuel, and Olympia Bover. "Another look at the instrumental variable estimation of error-components models." *Journal of econometrics* 68.1 (1995): 29-51.
- Blank, Jonah, Christopher Clary, and Brian Nichiporuk. *Drivers of long-term insecurity and instability in Pakistan: Urbanization*. Rand Corporation, 2014.

- Cecchetti, Stephen G., Nelson C. Mark, and Robert J. Sonora. "Price index convergence among United States cities." *International Economic Review* 43.4 (2002): 1081-1099.
- Constable, Pamela. *Playing with fire: Pakistan at war with itself*. Random House, 2011.
- Dang, Vinh QT, Yu Alan Yang, and Kenneth S. Chan. "Yen or Yuan? The law of one price and economic integration in Asia." *The World Economy* 41.1 (2018): 171-193.
- Easterly, William. "The political economy of growth without development." *In search of prosperity: Analytic narratives on economic growth* Editor Dani Rodrik. Princeton University Press, 2003.
- Engel, Charles, and John H. Rogers. "How Wide Is the Border?." *The American Economic Review* 86.5 (1996): 1112-1125.
- Fan, C. Simon, and Xiangdong Wei. "The law of one price: evidence from the transitional economy of China." *The Review of Economics and Statistics* 88.4 (2006): 682-697.
- Glaeser, Edward L. "A world of cities: The causes and consequences of urbanization in poorer countries." *Journal of the European Economic Association* 12.5 (2014): 1154-1199.
- Hasan, Arif. "Migration, small towns and social transformations in Pakistan." *Environment and Urbanization* 22.1 (2010): 33-50.
- Hayakawa, Kazuhiko. "First difference or forward orthogonal deviation-Which transformation should be used in dynamic panel data models?: A simulation study." *Economics Bulletin* 29.3 (2009): 2008-2017.
- Inskeep, Steve. *Instant city: life and death in Karachi*. Penguin Books, 2012.
- International Crisis Group. "Pakistan: Stoking the fire in Karachi." *Asia Report*. 284 (2017)
- Jaffrelot, Christophe. *The Pakistan paradox: Instability and resilience*. Oxford University Press, 2015.
- Kao, Chihwa, and Bangtian Chen. "On the estimation and inference for cointegration in panel data when the cross section and time series dimensions are comparable." *Manuscript* (1995).
- Kaplan, Robert D. "What's wrong with Pakistan?" *Foreign Policy* 194 (2012): 94.
- Memon, Rashid. "Determinants and Trends of Internal Migration in Pakistan." *Internal Labour Migration in Pakistan. Institute of Developing Economies, Japan External Trade Organisation, Chiba, Japan* (2005).
- Morshed, AKM Mahbub, Sung K. Ahn, and Minsoo Lee. "Price convergence among Indian cities: a cointegration approach." *Journal of Asian Economics* 17.6 (2006): 1030-1043.
- Mustafa, Daanish, and Amiera Sawas. "Urbanisation and political change in Pakistan: Exploring the known unknowns." *Third World Quarterly* 34.7 (2013): 1293-1304.
- Naseemullah, Adnan Dann. "Common pressures, divergent trajectories? Industrialization in India and Pakistan." (2013).
- Pakistan Demographic and Health Survey, 2012-2013. Accessed 13 February 2018: <https://dhsprogram.com/pubs/pdf/fr290/fr290.pdf>
- Pakistani Bureau of Statistics. *Methodology of Price Collection and Computing Price Indices*. Accessed 18 NOV 2017: <http://www.pbs.gov.pk/content/methodology-2>.
- Pakistani Bureau of Statistics. *Monthly Price Indices*. Accessed 18 NOV 2017: <http://www.pbs.gov.pk/cpi>.
- Pakistani Bureau of Statistics. *Provisional Summary Results of 6th Population and Housing Census-2017*. Accessed 14 JAN 2018: http://www.pbs.gov.pk/sites/default/files//DISTRICT_WISE_CENSUS_RESULTS_CENSUS_2017.pdf.
- Parsley, David C., and Shang-Jin Wei. "Convergence to the law of one price without trade barriers or currency fluctuations." *The Quarterly Journal of Economics* 111.4 (1996): 1211-1236.
- Pedroni, Peter. "Critical values for cointegration tests in heterogeneous panels with multiple regressors." *Oxford Bulletin of Economics and statistics* 61.S1 (1999): 653-670.
- Phillips, Peter CB, and Donggyu Sul. "Transition modeling and econometric convergence tests." *Econometrica* 75.6 (2007): 1771-1855.
- Roodman, David. "How to do xtabond2: An Introduction to Difference and System GMM in Stata." *The Stata Journal* 9.1 (2009): 86-136.
- Rumi, Raza. "Pakistan: ungoverned spaces." *Telling the story. Sources of tension in Afghanistan and Pakistan: a regional perspective (2011-2016)*. Editor Emma Hooper. CIDOB, 2016. 179-200.
- Salman, Ali. "Price controls: implications for liberty and welfare" *Economic Freedom Network Pakistan* (2009).
- Sanger, David E. *Confront and conceal: Obama's secret wars and surprising use of American power*. Crown, 2012.
- Sender, Henry and Kiran Stacey. "China takes 'project of the century' to Pakistan." 17 May 2017. Financial Times. Accessed 11 February 2018: <https://www.ft.com/content/05979e18-2fe4-11e7-9555-23ef563ecf9a>
- Seto, Karen C. "Exploring the dynamics of migration to mega-delta cities in Asia and Africa: Contemporary drivers and future scenarios." *Global Environmental Change* 21 (2011): S94-S107.
- State Bank of Pakistan. *Inflation Monitor*. Accessed 13 February 2018: http://www.sbp.org.pk/publications/inflation_Monitor/
- Westerlund, Joakim. "New simple tests for panel cointegration." *Econometric Reviews* 24.3 (2005): 297-316.
- World Bank. *Logistics Performance Index*. Accessed 13 February 2018: <https://lpi.worldbank.org/international/global>
- World Bank. *Pakistan development update: from stability to prosperity*. World Bank Group, 2016.

1287 URBAN POOR AT THE MARGIN OF THE CAPITAL CITY OF NEW DELHI, INDIA: NEGOTIATING MARGINALITIES AND THE STRUGGLE FOR URBAN IDENTITIES

ABSTRACT

The concern of my research has been based on two sets of processes; the increasing urban affiliation of the working class leading to enormous migration and the continuing process of gentrification of the city leading to constant demolition of slums and squatter settlements to make a place for the 'exclusives'. With the presence of two such processes, I found this interesting to understand how the urban poor are making a sense of their place where increasing aestheticization of the city is continually pushing them out to the distant peripheries, denying their due share in the city-space and its benefits. With the sole objective to take out the real-life stories of hope and despair, the present work tries to inquire about the life in a city where I anticipate this attempt to provide a useful lens for evaluating the on-going urbanisation process and the nature inclusiveness of the poor into the city- space. The study is completely based on both quantitative and qualitative interviews across various working-class colonies in peri-urban Delhi where I expect the narratives to throw lights upon the way the people are trying to establish a stake in the city and accomplish an actual sense of the 'right to the city'. I believe, the way space is imagined by this majority can be a useful tool to explore how the process of place making is contemplating the global economic and political conditions of lived-spaces in an urban setting and how identity or citizenry is being shaped by the place and vice-versa.

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1333 BRIDGING THE EAST-WEST DIVIDE? REFLECTIONS ON 'MULUND' AS A DIVIDED SUBURB OF MUMBAI

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ABSTRACT

Cities in India are surfacing as hubs of spatial inequality. The presence of disparities in Indian cities has been turning all efforts of urban development into a herculean task. Though various developmental strategies have been directed towards tackling this issue in India, spatial disparities have continued to grow in the country posing serious challenges to the policymakers. This is most evident in case of Mumbai, a city where the presence of skyscrapers and high-rises lay side by side with slums and squatter settlements. It is a city housing the multi-millionaires on one hand and the underprivileged on the other. The list perhaps can be endless when it comes to counting the spatial disparities confronting Mumbai. Lately, the Mumbai Suburban district has undergone tremendous growth that has brought it almost at par with the Mumbai City District. In fact, urban growth in the city district has been stagnant in the recent years, with most of the growth taking place in the suburban district region. However, the nature of growth has been uneven, leading to further intensification of spatial disparities. Empirical realities reveal that each suburb of Mumbai is endowed with its own unique urban-social character. Therefore, to comprehend the nature of spatial inequalities in suburban Mumbai in a holistic way a deeper inquiry focusing on individual suburbs is required. Taking this into consideration, the present study is focused on Mulund, the easternmost suburb of Mumbai. Mulund is the first planned suburb of Mumbai. It is also popularly known as the prince of suburbs. But as a matter of fact, in recent times Mulund has undergone the emergence of tremendous spatial disparities. These disparities have rendered the suburb a dualistic character, where on an average the western part of the suburb is flourishing and the eastern part is decaying. This divided nature of the suburb stands as an obstacle to its balanced socioeconomic development. Hence, keeping this in mind, in this study, an attempt has been made to analyze the east-west divide of Mulund comprehensively. It is anticipated that by means of attaining a deeper understanding of the issue, necessary insights can be drawn from it for bridging this unwanted divide.

Keywords: City, Suburb, Spatial inequality, Spatial Disparity, Growth, Development

INTRODUCTION

In present times, cities across the world are emerging as complex entities. Amin and Thrift, (2009) describes the changing characteristics of cities, in the following words,

'Cities have become extraordinarily intricate, and for this, difficult to generalize. We can no longer even agree on what counts as a city ... Most cities now sprawl across many miles incorporating settlements of varying composition, derelict areas, parks and gardens, factories, shopping centers, parking areas, warehouses, dumps.'

This holds true for Indian cities too, including Mumbai. The fast pace of growth in Mumbai has already pushed its core or the Mumbai City District into a saturated state, with most of the present growth taking place in the Mumbai Suburban District. Thus, suburban growth has become a major characteristic feature of Mumbai. However, the nature of growth has not been even, leading to the emergence and intensification of spatial disparities. Since, each suburb of Mumbai is unique and is endowed with its own urban-social character, for comprehending the nature of spatial disparities in suburban Mumbai in a proper way it is necessary to undertake an in-depth inquiry focusing on individual suburbs. Taking this into consideration, the present study is focused on Mulund, the easternmost suburb of Mumbai. This suburb has not only been witnessing tremendous growth but also has been struggling to cope with the emerging spatial disparities. These disparities have rendered it a divided character that stands as an obstacle to its balanced socio-economic development. With a focus on the issue, the present study attempts to analyze this east-west divide of Mulund comprehensively.

It is worth mentioning that the east-west divide is not an exception to Mulund. It is in fact, a common feature throughout Mumbai. Therefore, by means of this study, it is hoped to gain a deeper understanding of the issue, with necessary insights drawn that can help in bridging this divide for Mulund in particular and Mumbai in general.

Study Area

The study area, Mulund is a prominent suburb of Mumbai. It lies in the T ward of Mumbai Suburban District (Fig 1) and forms a part of the Kurla *Taluka*. Though the T-ward also includes some portion of the Sanjay Gandhi National Park adjacent to the suburb of Mulund, for this study the focus is on the suburb area.

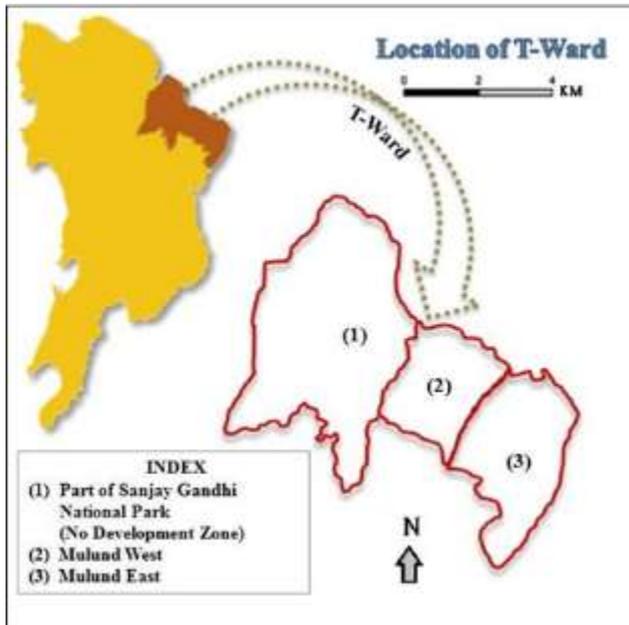


Fig 1 – Location of T-ward in Mumbai

It is surrounded by the city of Thane in the north, the Sanjay Gandhi National Park in the west, the Thane creek in the east, Bhandup in the southwest, and Kanjurmarg in the south. It geographically extends from 19°13'N to 19°17'N latitudes and 72°94'E to 72°96'E longitudes.

Mulund is one of the most densely populated suburbs of Mumbai. As per the 2011 census, its total population is 3,41,463 persons. The total male population of Mulund is 1,76,156 and the female population is 1,65,307 (District Census Handbook: Mumbai Suburban District (2011) Village and Town Wise Primary Census Abstract (PCA), 2011). The suburb is spread over 35.88 acres. It is divided into two parts – Mulund East and Mulund West – by the suburban railway line passing through it. Mulund East stands as a predominantly residential area, whereas, Mulund West is dominated by residential complexes, several business centers, and plush shopping malls.

OBJECTIVES

The main objectives pertaining to the study are –

1. To examine the nature of east-west divide in Mulund,
2. To identify and elucidate the problems associated with the east-west divide in the suburb.
3. To reflect on the necessity and possibilities of bridging this divide.
4. To formulate viable measures for confronting the issue.

METHODOLOGY

The study is based on both primary and secondary data. Primary data are mainly collected by means of personally visiting the study area and interviewing the residents using semi structured questionnaires. A total of 100 residents' selected using simple random sampling, were interviewed. Besides, various secondary sources of data published in the form of reports, books, and journals are also consulted. The data thus collected are synthesized to prepare the research paper.

ANALYSIS AND DISCUSSION

Mulund is said to be the earliest planned suburb of Mumbai. It is one of the most popular eastern suburbs of Mumbai. Mulund's infrastructural development has even earned it the title of 'prince of suburbs'. However, the emergence of spatial inequalities has rendered the suburb a divided nature in the form of its emerging east-west divide that has overcast its picture perfect status.

THE EAST-WEST DIVIDE

Characteristically, Mulund East stands as a predominantly residential area, whereas, Mulund West is dominated by residential complexes, several business centers, and plush shopping malls. The dramatic change of Mulund, especially its western part began during the late nineties when old factories and mills came to be replaced by new malls, multiplexes, and skyscrapers. This eventually paved way for the growth of service sector in Mulund. The LBS Road passing through the western part of the suburb has emerged as the hub of real-estate development in Mulund. Two prominent malls, namely, the R-Mall and the Nirmal Lifestyle emerged along the LBS Road to mark the beginning of mall culture in Mulund. At present, the R-Mall is fully functional; however, the Nirmal Lifestyle has been shut down and is developed into a residential project. The evolving landscape along the R-Mall and the Nirmal Lifestyle is evident from a comparison of the past and present satellite imageries of the area.

The magnificent growth of real-estate along the LBS Road and ACC Road has brought about dramatic changes to the landscape of Mulund west (Fig 2 & Fig 3). Many defunct factories, and *Chawls* housing the factory workers, have been

replaced by residential and commercial high rises. The occurrence of ‘rent gap’ or the difference between actual rent and potential rent has benefited the developers, contributing to the occurrence of redevelopment and gentrification in the area.



Fig 3: Changing Landscape along the LBS Road. [Source: Google Earth Pro, 2018] (1) Imagery Dated 20/10/2000, (2) Imagery Dated 12/10/2009, and (3) Imagery Dated 25/01/2018.

Knox and Pinch (2006) points out that,

By means of buying run-down properties at a cheaper rate, the developers are easily able to pay builders’ costs along with the interest incurred on mortgage and construction loans, and thereafter sell the redeveloped property at high-profit margin.

Thus, the once working-class neighborhood of Mulund west witnessed gentrification – ‘the process by which working class residential neighborhoods are rehabilitated by middle-class homebuyers, landlords and professional developers’ (Smith, 1982). Consequently, real-estate prices in Mulund shot up sky high, especially along the LBS road. According to Patel, one of the residents of a posh housing society along the LBS road:

Growth in real estate sector of Mulund has been tremendous. I remember, in the year 1984, Independent villas were sold at the rate of Rs.300 to Rs.500 per sq.ft, but today their prices have gone as high as Rs.15,000 to Rs.25,000 per sq.ft.

The impact of this growth has also percolated to the nearby areas. The western part of the suburb today not only stands as a retail and realty hub but is also emerging as an important Secondary Business District (SBD) of Mumbai. Due to the growth of commercial realty, comparatively lesser prices to the existent business hubs of Mumbai (Fig 4), and availability of larger floor space, etc various organizations like ‘BFSI-India’ and ‘ValueAdd’ have relocated their offices from other areas to Mulund West.

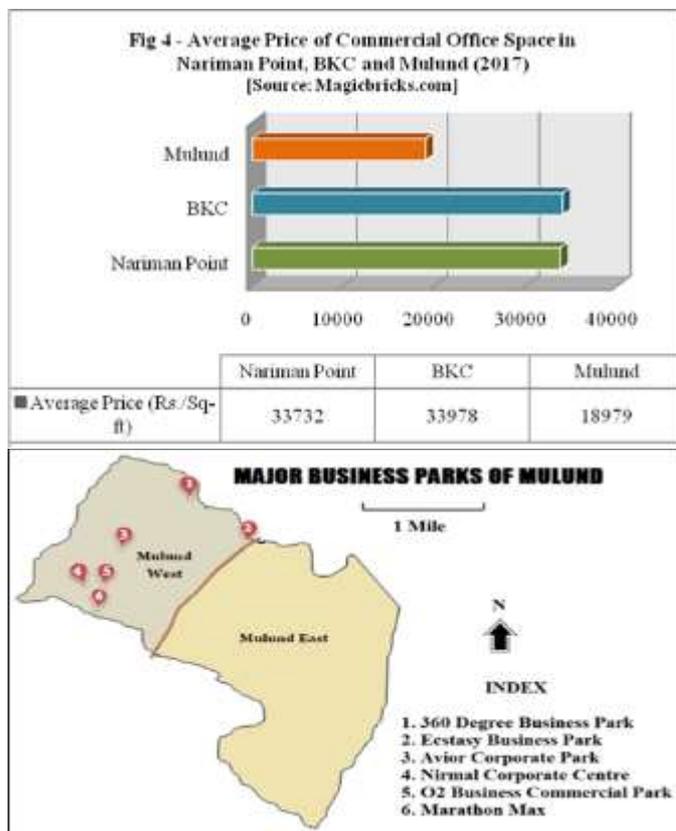


Fig 5 – Major Bussiness Parks of Mulund

Considering the advantages that the area offers as a business hub it has also become a preferred location for many business startups too. The coming up of a number of business parks like the 306 Degree Business Park, O2 Business Commercial Park, and Ecstasy Business Park have accommodated the emerging office spaces in the area (Fig 5).

Considering the tremendous growth of the commercial market in Mulund West, and the higher returns offered by the commercial spaces here, the area has turned into an investment hub. However, on the flip side, Mulund East is not able to keep up with the fast-paced development of Mulund West. An article published in the Indian Express states,

‘Mulund East has a sizable number of the working class, government servants, several pensioners and a large Marathi population. But much of the real estate activity is in the more prosperous Mulund West. (Alok, 2017)’

The process of gentrification post de-industrialization and consequent displacement of the working class and pouring in of the more affluent population changed the basic economic structure of Mulund West. An analysis of the real-estate prices in Mulund during the last five years reveals the growing edge of Mulund West over Mulund East in terms of real-estate business (Fig 6).

The provisions of civic amenities in Mulund too, reveal an imbalanced pattern adding to the grievance of the residents of the east.

According to Waghmarhe, a resident of Mulund East,

The western part of Mulund is emerging as a self-sufficient area with ever-growing amenities and facilities. From the street food to top quality restaurants, and from street markets to branded lifestyle shopping facilities, Mulund West has it all. Boutiques, spas, and salons have come up in the area to cater to the high-end fashion and beauty needs. People residing in the east are often required to depend on the western part for availing these facilities. The western part is also safer compared to the east. If required, women can safely move around in the west even at 2 AM, but the same cannot be said for the east.

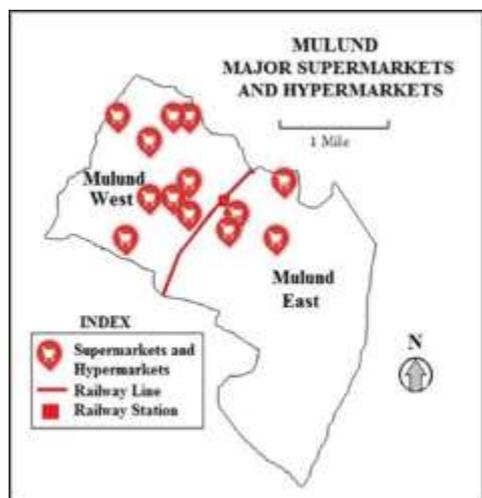


Fig 7 – Map of showing the spread of major supermarkets and hypermarkets in Mulund

Another resident of Mulund East, Shinde points out,

All petrol pumps and gas stations of Mulund are located in the west. People residing in the east are compelled to go to the west for getting their vehicles fueled. This adds to the problem of traffic congestion in the west. Even the number of public toilets in the east is negligible. Comparatively, there are many public toilets in the west. The eastern part also suffers because of the existence of a huge landfill overloaded with waste.

Mulund houses a prominent dumping ground of Mumbai. This 44-year old dumping ground is spread across 25 hectares in the eastern part of the suburb. According to an article published in The Asian Age,

‘Every day about 60,000 metric tonnes of garbage is dumped at Mulund dumping ground. Currently, there is around 70 lakh metric tonnes of garbage, with its height as high as 36 metres, at the dump. (Parab, 2017)’



Fig 8: Increasing area under dump at Mulund dumping ground. Source: [Google Earth Pro, 2018] – (1) Imagery Dated 03/12/2000, (2) Imagery dated 15/12/2009, and (3) Imagery dated 25/01/2018.

It is worth mentioning that the dumping yard is second largest in the city and it has long exceeded its capacity. The people residing in its vicinity are living amidst foul smell and threat of vector-borne diseases. Another article published in the Times of India states,

'The Mulund dumping ground has left citizens gasping for breath, not just because of the horrid stench, but also because of frequent fires which envelop large swathes in thick smoke. The dumping ground has become a health hazard for 3,000 flats of Hariom Nagar, barely 100 meters away. (Sen, 2017)'

These spatial inequalities within Mulund, existent in the form its east-west divide, stands as an obstacle to the balanced development of the suburb. With the intensification of these disparities, both halves of Mulund are attaining dissimilar characteristics. It is a cause of discomfort and distress to the residents, especially of the eastern part as Mulund.

BRIDGING THE DIVIDE

In order to ensure balanced socio-economic development of Mulund, it is necessary to bridge the existing east-west divide immediately. Although various policies have been implemented by the government to tackle the issues of uneven urban growth in Mumbai, specific policies targeting the east-west divide of Mumbai in general and Mulund, in particular, are absent. In fact, many of the issues such as, lack of public toilets and absence of petrol pumps in the east are the result of policy drawbacks. It is most likely that the presence of east-west divide went unnoticed during the allotment of these facilities to the suburb. Thus, the foremost task towards bridging the east-west divide is to address it through proper policy interventions of the government.

Infrastructural drawbacks, lack of civic amenities, and incidences of crime etc. in Mulund East require a close attention of the concerned authorities. In this regard, BMC's (BrihanMumbai Municipal Corporation) plan to start a 'waste to energy' project at the Mulund dumping ground is commendable. Though the plan is still at an infancy stage, it definitely reflects on the concern of the policymakers to resolve the issue. Another important milestone towards waste management is the new mandate issued by BMC 'for all new buildings to have a permanent arrangement for segregation of waste before they are granted a no-objection certificate from the BMC' (Vaidya, 2018). As per the Development Plan for Greater Mumbai 2014 – 34, the Mulund Dumping Ground is going to be shut down, but for various reasons the October 2017, deadline for the same has already been missed. The same plan laid down various provisions for development across Mumbai including Mulund. For instance, the proposed Goregaon-Mulund Link Road project, and the Tansa pipeline cycle track project. However, majority of these policies are framed with the perspectives on overall development, rather than any specific take on bridging the east-west divide. This necessitates the need for formulating proper policies to bridge this divide and thus, combat the existent spatial inequalities.

SUMMARY AND CONCLUSION

The key findings of the study reveal a fourfold scenario, comprising – strengths, problems, prospects, and threats, summarized as follows

Strengths:

- There is a growth of real estate, business, and service sector activities in Mulund West.
- Mulund West is emerging as a business district.
- Mulund West is a preferred location for many business startups.

Problems:

- The growth of spatial disparities has led to the formation of an east-west divide in Mulund.
- Mulund East is not able to keep up with the fast-paced development of the west.
- There is a dearth of petrol pumps and gas stations in the east.
- Mulund East is comparatively less safe than the west.
- There are a negligible number of public toilets in the east.
- Dumping ground in the east, has long exceeded its capacity, and is causing several problems

Prospects:

- Policy interventions of the government targeting the east-west divide can control the problem.
- BMC's plan to start a 'waste to energy' project at the Mulund dumping ground is a positive aspect.
- BMC's rule for new buildings to have a permanent arrangement for waste segregation at the source for receiving NOC is another positive aspect.
- Plan for the closure of Mulund dumping ground as per the Development Plan for Greater Mumbai 2014 – 34 can be of great help.

Threats:

- The east-west divide poses an obstacle to balanced development of Mulund.
- Both the halves of Mulund are attaining dissimilar characteristics.
- Infrastructural drawbacks, lack of civic amenities, and incidences of crime are growing in Mulund East.
- A threat to health from contamination and vector-borne diseases is faced by the residents of the east.

Thus, in conclusion, it can be said that for ensuring a balanced development of Mulund, it is of utmost necessity to bridge the existing east-west divide. The adoption and implementation of the following measures can serve towards bridging the divide:

1. Specific policies targeting the issue of east-west divide must be framed by the government. For example, plans for setting up petrol pumps and public toilets in Mulund east must be framed;
2. Efforts must be made to promote the growth of business and service sector uniformly across the suburb;
3. Strict actions must be taken to control the issues related to crime in the suburb. The necessary measure must be made to make the eastern part of Mulund safe like the western part.
4. A master plan is to be made by BMC to create alternative spots for garbage dumping. Also, people should be educated to sort waste into biodegradable, recyclable, inert, composite and hazardous or toxic at the source before disposal.
5. The plans that have been formulated (like the closure of Mulund Dumping Ground) must be implemented within the stipulated time.
6. Residents must be encouraged to get actively involved in the development activities of the suburb.

REFERENCES

- Alok, R. (2017). East-West divide in Mulund clearly visible. *The Indian Express*. [online] Available at: <http://indianexpress.com/article/cities/mumbai/east-west-divide-in-mulund-clearly-visible/> [Accessed 22 Jan. 2018].
- Amin, A. and Thrift, N. (2009). *Cities Reimagining the urban*. Cambridge, UK: Polity Press, p.1.
- District Census Handbook: Mumbai Suburban District (2011) Village and Town Wise Primary Census Abstract (PCA). (2011). Series 28 Part XII B. Mumbai: Directorate of Census Operations Maharashtra, pp.30-284.
- Google Earth Pro 7.1. (2018). Google.
- Knox, P. and Pinch, S. (2010). *Urban Social Geography*. 6th ed. Essex: Pearson Education Limited, p.142.
- Magicbricks.com. (n.d.). *Commercial Office Space Prices, Rates & Trends in Nariman Point,, Mumbai | MagicBricks*. [online] Available at: <https://www.magicbricks.com/Property-Rates-Trends/Commercial-Office-Space-rates-Nariman-Point-in-Mumbai> [Accessed 3 Nov. 2017].
- Magicbricks.com. (n.d.). *Commercial Office Space Prices, Rates & Trends in Mulund,, Mumbai | MagicBricks*. [online] Available at: <https://www.magicbricks.com/Property-Rates-Trends/Commercial-Office-Space-rates-Mulund-in-Mumbai> [Accessed 3 Nov. 2017].
- Magicbricks.com. (n.d.). *Commercial Office Space Prices, Rates & Trends in Bandra Kurla Complex,, Mumbai | MagicBricks*. [online] Available at: <https://www.magicbricks.com/Property-Rates-Trends/Commercial-Office-Space-rates-Bandra-Kurla-Complex-in-Mumbai> [Accessed 3 Nov. 2017].
- Parab, B. (2017). Mulund dump closure cost doubles. *The Asian Age*. [online] Available at: <http://www.asianage.com/metros/mumbai/260617/mulund-dump-closure-cost-doubles.html> [Accessed 26 Jan. 2018].
- Proptiger.com. (n.d.). *Proptiger.com*. [online] Available at: <https://www.proptiger.com/mumbai-real-estate/mulund-east-overview-51739> [Accessed 16 Dec. 2017].
- Proptiger.com. (n.d.). *Proptiger.com*. [online] Available at: <https://www.proptiger.com/mumbai-real-estate/mulund-west-overview-50015> [Accessed 16 Dec. 2017].
- Sen, S. (2017). Mulund east: Dumped, diseased, forgotten. *The Times of India*. [online] Available at: <https://timesofindia.indiatimes.com/city/mumbai/mulund-east-dumped-diseased-forgotten/articleshow/56529342.cms> [Accessed 19 Feb. 2018].
- Smith, N. (1982). Gentrification and Uneven Development. *Economic Geography*, [online] 58(2), p.139. Available at: <https://www.jstor.org/stable/143793?origin=crossref> [Accessed 8 Feb. 2018].
- Vaidya, K. (2018). DNA Exclusive: Builders employing ingenuity to dodge waste handling rules. *DNA*. [online] Available at: <http://www.dnaindia.com/india/report-dna-exclusive-builders-employing-ingenuity-to-dodge-waste-handling-rules-2595210> [Accessed 24 Mar. 2018].

Regular Sessions

RS02.1. Cooperation and Development

1474 DEVELOPMENT WITHOUT, DEVELOPMENT WITHIN: REGIONALISM AS THE KEY TO SUSTAINABILITY AND INCLUSIVENESS IN SOUTH ASIA

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ABSTRACT

The post 1990s world order has witnessed a swell in the waves of Regionalism and Regional Cooperation. The perceptible dilution of borders, demarcation of the world in terms of geographical regions determined by common characteristics, shared interests and patterned interactions primarily governed by Regional Associations formed to address regional security, political and economic issues are concentrating majorly on developmental aspects more than ever before. South Asia being one such emerging region, where, apart from the two major Regional Associations namely SAARC and ASEAN, various sub-regional groupings like BCIM Economic Corridor, BIMSTEC, BBIN etc., are concerted interstate initiatives at infrastructural development within the region in order to facilitate free flow of goods and services and enhance people to people contact. However, the borders, much of which is undefined, the presence of a huge number of different and often warring ethnic groups and the political instability of the member states often posed constraints in realizing the objectives of planning chalked out by the policy makers of the supranational regional bodies for regional development. The complex milieu depicts a picture of violence and instability at the domestic spheres of states that, again, is seen to bar regional progress. However, it is important to note that regionalism can actually be viewed as a prime mover for addressing pressing domestic issues and securing development that is inclusive and ensuring wellbeing that is sustainable in this region of very rich biodiversity. For instance, the Kaladan Multimodal Project, which is a bilateral project of India and Myanmar passes through the Rakhine state of Myanmar, inhabited by the Rohingyas. What is important is to understand that Rohingyas and the related issues of violence have already hampered the potentials of the project. On the contrary it can be assumed that Kaladan Multimodal Project in the long term can actually help in eradicating the problem as it may have a positive impact on Myanmar's most underdeveloped state, the Rakhine. These cases in point are delved into this submission, based upon a combination of research methods, making use of secondary data sources on the main, in an attempt to underline the contention that institutionalized regionalism per se could actually help constituent member states in successfully addressing excruciating domestic issues by ushering in development that is inclusive and sustainable. This paper hopes to tease out posers in context of participation, empowerment, consensus, equity and governance that may be taken up for future research.

Key Words: Regionalism, Development, Sustainability, Inclusiveness, South Asia.

INTRODUCTION

The connotation of the word "Development" still blows the center stage of debates especially when the term is used in the context of Political-Economic sphere. The basic questions that eventually emanates from such debates includes, for instance, what is development? What is the thin line of difference between 'growth' and 'development'? What are the basic parameters of measuring the extent of development? so on and so forth, still remains ambiguous and therefore have often given rise to tumultuous discussions amongst the academic circles. In spite of the ambivalent nature of the term, a certainly weak but unanimous agreed definition of the term can be used as an introduction to this paper. The term Development can be defined as a process of improving the quality of human life through multi-dimensional processes that ensures improving living conditions and quality of life, that ensures in enhancing a feeling of self-esteem amongst the individual through the establishment of social, economic and political institutions and finally providing individuals, freedom of choice by creating a plethora of alternatives at their disposal. Through the introspection of the aforementioned definition of Development, it is clear that the process of development is convoluted in the sense that it requires the engagement of an array of socio-political and essentially economic institutions to go deep into the predicaments of society and address through a more transnational approach rather than staying confined within the territorial boundaries of the 'Nation-states'.

In this context, the role of Globalizations calls for greater analysis, as the concept of Transnational Development for the first time was brought into limelight by adopting the process of Regionalism and Regionalization which shall be discussed in greater details in the later part of this paper. Apparently the process of regionalism has brought about considerable success in the developed region of the world namely the Europe, the North America and significantly Asia Pacific but the same process has spurred conflicts and confrontations in the underdeveloped Global South to a considerable extent. What also requires analysis is the eventual fragmentation and breaking down of European Union in the wake of the recent refugee influx and the challenges it has posed on the celebrated concept of Regional Integration. Following the process of Globalization and under the compulsions of Structural Adjustment Programs, most under developed and developing nations did adhere to the policies of World Trade Organization. In order to challenge the discriminating standards laid down by the hegemonic west, the Third World nations also began to organize themselves into regional and sub-regional groupings but the inherent political instability and severe underdevelopment had backfired the process of regionalization in such areas and one such region is the South Asia.

The complex milieu of the South Asian Politics have often challenged the regional settings that was perceived by the policy makers of the organizing states. The presence of China as a powerful and essentially *realpolitik* nation have remained another impediment towards the achievement of a successful regional setting. However, India with the objectives of 'developing' the region through the process of integration and cooperation has occasionally failed in the face

of ethnic conflicts, political confrontations, illegal immigration and problems of insurgency as a culmination of uneven growth and development. Irrespective of such dilemmas, India have frequently engaged in Regional Associations like SAARC and Sub-Regional Groupings like Bangladesh-China-India-Myanmar Economic Corridor (BCIM EC) or BIMSTEC¹⁰⁹ Cooperation. At bilateral levels India have constantly tried to maintain amicable relations with its neighboring states through her non-interventionist Foreign Policy. However, the Indira Doctrine and the subsequent incorporation of the doctrine into Indian Foreign Policy objectives strained her relations with Sri Lanka and other potential neighbors. India's estrangement with Pakistan and the Sino-Pakistan all weather friendship has lured India to turn towards her South East Asian Neighbors in general and ASEAN in particular.

India's engagement with Myanmar blatantly proves that India is now more interested in carrying out its diplomacy with South East Asia. India's Look East Policy followed by the terminologically transformed Act East Policy have accentuated the Indo-Myanmar Relations by considering India's North East a launching pad. However, question arises as to whether such arrangements on the part of South Block will actually have any positive implication? The underdevelopment of North East as a region until now have proved to be a major inhibition in the smooth harnessing of regional integration and in this context, sustainability plays an imperative role. Yes, it is true that regionalism does play a pivotal role in ensuring development that is inclusive in nature but in case the region is inundated with insurgency, warring ethnic communities and social economic blemishes, then the question of sustainable development comes into the play. Sustainability and inclusiveness in South Asian context is yet challenging, taking into account the motley socio-economic and political scenario. Regionalism is expendable if the policy makers only consider transnational development, as regional development sounds ludicrous when the states themselves are underdeveloped.

Thus, the present attempt shall focus on analyzing the challenges of creating sub-regional arrangement within South Asia with special emphasis on India's engagement with Myanmar. On the basis of a methodology mostly based on secondary data and a sophisticated extent of non-participant observation, the paper shall tease out the issues and causes of impediments that the policy makers in the region are facing regarding development. The paper shall attempt to analyze the question of sustainability and inclusiveness of a geographical area that is marked by rich biodiversity and at the same time an area that is considered potential in terms of a launching pad for diplomacy and consequent regional development. The paper shall focus primarily on the Indo-Myanmar border regions with consideration to Kaladan multi-modal project and shall also upheld the issue of the ongoing crisis in the Rakhine state of Myanmar which is a party in the Kaladan Project. In the process, the paper shall try to broach the Rohingya issue as a major impediment towards the successful regional integration and will try to understand how, Sustainability and regionalization can ensure inclusiveness in South Asia.

REGIONALISM AND DEVELOPMENT: CAN BOTH BE ABUTTED? A THEORETICAL MANIFESTATION

Regionalism in the discourse of International Relations is defined as a contiguous geographical landmass, which may include water bodies and archipelagos as well, and the nation states fitted within this area has shared characteristics, common interests and patterned interactions. This definition clearly states that that a 'region' essentially consists of nations that shares their territorial boundaries and at the diplomatic level they have certain interests that are common in the sense that, within the region they are trying to promote policies that are beneficial for all the member states. Following this definition, therefore it can be extrapolated that European Union is a Region, similarly Asia Pacific is a region but BRICS¹¹⁰ or IBSA¹¹¹ is not a region rather multilateral forums. Rajiv Sikri, advocates that Regionalism is posthumous phenomenon, that culminated first, from the advent of globalization, that in itself became a dilemma because of the limited role of state and the restrictions that were imposed on border trade and people to people contact. Secondly, as the end of cold war, that has given opportunities to the states to establish relationships and reopen the borders to resuscitate economic and political cooperation and finally, the colonial borders that had apparently lost its relevance in the second half of the 20th Century (Sikri, 2009). The increasing scope, fluidity and non-conformity of the new region was often known as the wave of "New Regionalism". Schulz essentially argued that regionalism is a heterogeneous, pluralistic and multi-dimensional but nevertheless global (Michael Schulz, 2001). Schulz also argued that the world order, today is a tri-polar one that centres around EU, NAFTA and Asia Pacific. In this context, regionalism therefore became a fledging opportunity for the nation states in the world to create a new apotheosis of development, cooperation and growth. Regionalism is often viewed as a counterintuitive process of Globalization amongst the third world nations. Regionalization has enabled the third world to create a labyrinth of developmental ventures that will promote an all-round development of region and at the same time allow the states to recover the afflictions imposed by the colonial boundaries through enhanced border trade and people to people contact. SAARC¹¹² and ASEAN¹¹³ are two such regional groupings that are working to meet the challenges of the discriminatory world order that still amplifies the dichotomy of the Global North and the Global South.

Analysis of the aforementioned explanation of Regionalism portrays that, it is now a tool used by the nations to promote development through transnational cooperation and engagement. India being the most powerful in terms of economy and politics amongst its neighborhood is also extracting regionalism as a process in order to achieve its foreign policy

¹⁰⁹ Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation.

¹¹⁰ Brazil, Russia, India, China and South Africa Multilateral Forum.

¹¹¹ India, Brazil, South Africa Multilateral Forum.

¹¹² South Asian Association for Regional Cooperation.

¹¹³ Association for South East Asian nations.

goals. India's advocacy with Myanmar is considered one of the most delicate areas of Indian diplomacy as it focuses on enhancing India's long term foreign policy goal of engaging with the ASEAN nations and in the course achieve an all pervasive development for India's North East that remains India's most neglected area in terms of growth and progress. But the most germane question that arises is, can India actually achieve an all pervasive development through regionalism? The answer is complicated, it is convoluted because on one hand, Regionalism is obviously a sustainable approach but at the same time, 'development without' achieving 'development within' becomes superfluous. In order to understand this complex milieu, it is important to analyze Walt Rostow's Developmental Theory. The five stages of development as enumerated by Walt Rostow is an extraordinary contribution to field. Rostow's economic theory is essentially based on five stages of development, which he argued to be incontrovertible for all the developing nations. The First Stage is traditional stage, where it is difficult to expand production beyond a limited ceiling, because the nation's pre-Newtonian science and technology, rigid agriculture and hierarchical social structure. The Second Stage, pre-condition for take-off, is marked by some external source or impulse, that manifests a change in whole range of institution, which may include policies. The Third, Stage is where take off is attained, the industrial output increases appreciably, the economic and political institutions are shaped in order to permit growth. The Fourth Stage is the 'Drive to Maturity', a period of consolidation. A period where modern science, technology is extended to most of the branches and finally the Fifth Stage, where development process is reached resulting in an era of mass consumption which further involves consolidation and advancement (Rostow, 1959).

According to Rostow's stages of Development, Regionalism or diplomatic policies of Bilateral Engagement and Regional Integration can be considered as the second stage in the developmental process. The Neo-functional theorists who proposes development through Regional integration like Lindberg tried to argue that political socialization, interest articulation and aggregation, political communication and decision output are some of the chief categories of political integration(Lindberg, 1970). Therefore, it is clear that in order to achieve development through regionalism, a change in the range of political institution becomes necessary and this very dogma of the Neo-functional paradigm coincides with Rostow's second stage of the developmental theory. This entire theoretical enigma therefore raises the question that can regional development be a success story? What is important is to understand that Neo-functionalism as a school of thought emerged with the success of European Union in the post-World War II scenario as a result it calls one attention to the issues and opportunities that emanate from the growth of regions amongst the third world nation who are still in the transitional phase of development following Rostow's model. In this context, the paper shall try to nurture and introspect the ground realities of regional integration in South Asia with special emphasis on India-Myanmar Bilateral Engagements and projects.

INDIA-MYANMAR ENTENTE: A 'REGION' WITHIN A 'REGION'

India's Look East Policy adopted in 1991 by P.V Narshima Rao was an initiative to enhance India's bilateral ties with the ASEAN Nations, yet India considered Myanmar to be diplomatically the most important and pivotal to India's foreign Policy objectives. Professor Baladas Ghoshal points out that the drivers of India's recent Myanmar policy is first, the fact that Myanmar is the gateway of the South East Asia, it is the only country that shares land and maritime boundaries with ASEAN nations which can be lucrative for Trade and Commerce especially for the North Eastern states of India. Secondly, the problem of insurgency and the vulnerability of the Indo-Myanmar border to illegal arms trade, drugs trade and infiltration compelled India to engage with Myanmar on a more amiable terms in order to occlude the problems at the buffer zone. Finally, India's policy to counter China as the regional hegemony was another determinant in India's derivatives to engage with Myanmar. Myanmar's all-weather friendly relation with China and the China-Pakistani entente left no other option at India's disposition but to actually shake hands with Myanmar's Military Junta as a strategy to counter Chinese influence in the sub-continent (Ghosal, August 2014). In the course of time, India's bilateral relations with Myanmar which was essentially directed towards ushering in development and security for India's most underdeveloped North East compelled India to enter into certain sub-regional groupings that were mostly based on infrastructural development and connectivity, for instance the BCIM Economic Corridor¹¹⁴ a multilateral arrangement and the Kaldan Multimodal Transport Project, a bilateral arrangement.

BCIM EC

The Bangladesh China India Myanmar Economic Corridor (BCIM EC) is a connectivity and infrastructural development project that aims to connect Kolkata in India and Kunming in China through a roadway that will enhance connectivity and trade amongst the four host countries. What is important is to note that Bangladesh and Myanmar are two most underdeveloped nations in the region while China and India are the two most developed ones, but the fact that this particular initiative will bring about development in India's North east and China's South West, the nations 'most underdeveloped sections draws the attention. The BCIM EC as a part of India's Act East Policy and China's Belt and Road Initiative is now considered to be a 'Bridgehead Strategy' by the Chinese government in order to develop its relations with Russia and other Asian Neighbours¹¹⁵. BCIM is obviously promising as a regional integration process but certain issues call for a more sustainable approach especially when it comes to the question of developing India's North East.

The Regional ethno-political conflicts have spurred insurgency activities along the North Eastern and North and South Western part of Myanmar. The plethora of tribes marked by their lingo-religion and ethnic diversity along with the

¹¹⁴Bangladesh, China, India, Myanmar Economic Corridor.

¹¹⁵Reinhardt, Dieter and AnjaSenz. 2014. "Closer Cooperation in the BCIM Region-A New Success story of Asian Regionalism?". *Connecting India, China and South East Asia*. <http://econpapers.repee.org/scripts/redir.pdf> (accessed on February 14, 2017).

problem of impecuniousness of the population that compels them to engage in illicit activities, precipitated by the region's nexus with countries like Bangladesh, Bhutan, Myanmar and necessarily China have inundated the region with insurgency activities sponsored mostly by China, some of which are gross and dangerous for instance NSCN (K) and ULFA (Chatterjee, 2015). The fact that this region have remained untouched in terms of growth and development is now proving to be gouging for India.

These groups are mainly recruited by ethnic minorities and they demand for greater autonomy or an independent state¹¹⁶. The primary reason for such secessionism is the uneven development. The destitution and poverty and the still undergoing process of civilization of the tribes have been a major factor. Resource conflicts regarding usage of river water and the allocation of the imperative metals amongst the bordering states adds up to the conflict. Land use rights and environmental issues again calls for a sustainable approach on the part of the policy makers. What is important is to understand that the region is rich in bio-diversity and has bounteous reservoirs of metals and other resources often inhibits government's actions to take up developmental projects as most tribes especially those of Nagaland and Mizoram protests against such development projects through violent means¹¹⁷.

The Asian Highway 1 of which, BCIM EC is just an attached string starts from Kolkata and reaches up to Moreh, the bordering town in Manipur and enters Myanmar through Tamu. What astonishes, is the condition of the so called international roadway on the Indian side, the lose security, cases of frauds where the military personnel are involved and the open selling of arms at Moreh. It is true that Manipur in itself is critical in the eyes of Indian policy makers due to presence of a large number of insurgents but at the same time, the negligence on the part of government stakeholders in the borders is noteworthy. On the contrary, the road after entering Tamu in Myanmar takes an antithetical course, where security is comparatively tightened, the condition of the road is spellbinding and the town with all facilities of proper boarding and lodging is suitable enough for porters to carry out trade and transaction¹¹⁸. The Chinese investment in maintaining the section of the roadway that passes through Myanmar depicts the degree of seriousness of China on entering into regional cooperation with India. Such a seriousness is somewhat missing on the Indian side, the Rhi-Zhowkhatar border illustrates this sufficiently as the Rhi-Tidim road is supposed to be built by India on behalf of Myanmar, but the progress is tremendously slow. India's adoption of regionalism and the subsequent decisions of investing in Myanmar at times sounds gibberish due to India's negligence and corrupted local governments. This is what is needed to be transformed and renovated to reach the desired regional goals.

The Kaladan Multimodal Transport Project

The Kaladan Multimodal Transit transport Project is another watershed in the India-Myanmar relations. The transport project aims at connecting the land and the Maritime Bordering Areas through a multimodal transportation project under the Nodal agencies of Ministry of External Affairs on the Indian Side and Ministry of Foreign Affairs at the Myanmar side. The project perceives to connect Sitwe port in the Rakhine state of Myanmar to the Kolkata Port, via inland water transport from Sitwe to Paletwa, from Paletwa to the Indo-Myanmar Border and then entering Mizoram through Lawngtlai and joining the National Highway 35¹¹⁹. What calls for greater attention is the fact that the project is supposed to connect two most underdeveloped divisions of India and Myanmar. Mizoram on the Indian side is untouched in terms of development and growth. It is mostly inhabited by numerous tribes with Christian missionary as the principal civil society. The Rhi-Zhowkhatar border trade post is fledging in terms of trade where a paltry number of items are traded legally while substantial amount is exchanged through the Indo-Myanmar friendship bridge illegally.

The area surrounding the friendship bridge is inhabited by small tribal population, a population that is insolvent and this destitution compels them to engage in phony arms and drugs trade that brings in huge sinecures. Such an illegal arms and drugs trade is mostly controlled by the mafias¹²⁰. Face to face interaction with the police commissioner and the district magistrate of Champai, revealed that the arms are mostly manufactured in Cambodia and is carried by the local stakeholders and traded to India illegally while synthetic drugs are manufactured in Myanmar itself as Myanmar is part of the 'Golden Crescent'. The officials as well as the solvent middle class population of the Zhowkhatar village also advocated that children and women are mostly engaged in the illicit trade and they are paid substantially. What is also very important is to note that the governments of Myanmar as well as India have received adequate amount of funds for constructing the Rhi-Tidim Road from the Asian Development Bank, but astonishing enough is the fact that some private enterprise have infiltrated into the project enervating the degree of progress (Singh, 2015).

The Lawngtai border outpost is at its neophyte stage, where it can be assumed that the scenario could not be better, if not worse. Guwahati based Journalist Rajeev Bhattacharya in his article in First post proposes that although Lawngtai is pristine in regards to militancy and local tribal agitation, the rugged topography and the inaccessible terrain inhibits the

¹¹⁶Das, Rani Pathak and Arunav Goswami (2014). Northeast Peace and Security Scene 2013: A Review. Centre for Development and Peace Studies (CDPS). <http://cdpsindia.org/point-of-view.asp> (Accessed on April 25, 2018).

¹¹⁷Op. Cit., 6.

¹¹⁸ The section is mostly based on the author's observation of the border trade scenario during the field visit to Moreh-Tamu Border in Manipur as a part of delegation for a MAKAIAS sponsored project titled "*Peace, Development and Community: The Look East imagination with special reference to the North East India*" from January 9-14, 2015.

¹¹⁹Report of the Ministry of External Affairs, Government of India published on April, 2014, <http://www.mdoner.gov.in/content/introduction> (Accessed on April 26, 2018)

¹²⁰The section is mostly based on the author's observation of the border trade scenario during the field visit to Rhi-Zhowkhatar Border in Mizoram as a part of Delegation for a MAKAIAS sponsored project titled "*Peace, Development and Community: The Look East imagination with special reference to the North East India*" from march 20-25, 2015.

smooth completion of the project. He furthermore claims that the worker's condition is heinous and the dearth of medical facilities and technology and hostile living conditions along the stretch is prohibiting the project's success.¹²¹ What has also become a major impediment is the local landowner's agitation against the government to disburse compensation for a slice of land acquired for the project¹²². However, the ushering in of the new regime under Prime Minister Narendra Modi and his inquisitiveness to develop North East, brings about some hope that the Kaladan Multimodal Project along with the two functioning Border Trade Zone along the Indo-Myanmar Border stretch, the Rhi-Zhowkhatar in Mizoram and the much celebrated Moreh-Tamu in Manipur will endure a resuscitation in terms of development and growth.

On the other side, the Rakhine state of Myanmar is the most underdeveloped area within the country. Sitwe port being situated in the Rakhine state and the subsequent involvement of the Sitwe port in the Kaladan Project is supposed to have positive implications on the Rakhine state but the major challenge that is chugging the process of completion of the Project on the Myanmar side is essentially the ongoing ethnic conflict surrounding the 'Rohingyas'. The issue of Rohingyas although is no longer confined within the boundaries of Myanmar, it has been played as a political game by both Myanmar and India, where India's stand until now has been ambiguous. India's objective of countering the Chinese influence on her eastern neighbour has compelled India to remain silent on the Rohingyas. The fact that Rohingyas are increasingly infiltrating in India through the Bangladesh Border is also making India skittish. India is oscillating between humanitarianism and power politics and in this case India's position is quite clear. But can power alone help India to achieve its desired goals is now a major question.

Narendra Modi's recent visit to Myanmar, after the violent conflict that broke out in the Rakhine state between the Military forces and the Arakan Rohingya Salvation Army (ARSA) was a skilful attempt to sidestep the violence. Modi, signed 11 economic deals and also encountered Aung San Syu Ki regarding the delayed Kaladan Multimodal Transport Project which is supposed to encompass a substantial area of the conflict stricken state of Rakhine¹²³. Modi, adeptly avoided to use the term Rohingyas and in the firm belief that the Myanmar Government is dominated by the Buddhist majorities, Modi, found the time suitable to strike a number of deals and maintain a good relation with Myanmar in order to achieve its Act East Policy goals. But can only policies bring about the desired level of development?

Going back to the theoretical manifestations used to explain the relationship between development and regionalism, it is now quite clear that regionalism as a policy can be one of the best ways to ensure development. Taking into account the fact that Regionalism can be designated under the second stage in Rostow's model, it is important that the nations strengthen and transforms adequately the base, that is the first stage in itself. In case of India and Myanmar in particular and the South Asia in general, the nations have successfully adopted the policies of Regionalism and Regional Integration without achieving the desired level of development within the limits of their territorial boundaries. In case of North East, a sector that is already underdeveloped, still following a rigid agricultural economic model and where the population is known to have been engaged in illicit activities of arms and drugs trade for a long period of time, in order to appropriate monetary benefits for themselves, infrastructural development, for instance, transnational roadways and cross border people to people contact is somehow acting as a boon in earning greater sums through such apocryphal means, where the loose security mechanisms at the borders as well as cases of frauds that are quite common is just another blast in the already ignited fire of violence.

In order to reach the Third Stage of Rostow's model, the very basic attributions of development at the grass root level is needed to be attained. In case of South Asia, there is a huge gap in between the first and the second stages let alone the question of reaching the third stage. Nations have adopted policies, there have been huge institutional transformations, but where is the implementation? It is highly important that India tries to develop North East as a whole, at least to a desired level where substantial population is employed, the problems with land acquisition is settled with the local stake holders, the problem of inaccessibility is resolved and the government is well accepted by the localities. Regionalism is the key to ensure development but a considerable development is also needed to adopt regionalism and regional integration as a process. This conundrum is now becoming increasingly critical. The recent Rohingya influx in India and crisis surrounding the Buddhist refugees in Mizoram is what needs exigent policy making for activating Kaladan's successful completion.

CONCLUSION

Institutional regionalism, is obviously the most potential and effective tool to ensure inclusiveness and sustainability in South Asia. It is now quite clear that the North Eastern borders of India is critical, in the sense that the presence of warring ethnic groups and the pernicious insurgencies spurred by the area's inaccessible topography have not only impeded the government's repeated attempts to open up the sector to external forces of International transactions and creating a regional market but at times have used such initiatives to activate their illicit activities of arms and drugs trade sponsored mainly by China which is now divulging.

On, the contrary, the nations within a region should have a desired level of development and political consolidation to engage in regional integration. In fact the refugee crisis of Europe have considerably challenged the very idea of regional

¹²¹Bhattacharya, Rajeev. 'Road to Nowhere: Kaladan Project Chugs Ahead on Treacherous Terrain at high Cost to Human Lives, Resources'. Firstpost, March 15, 2018. (Accessed on April 26, 2018).

¹²²Bhattacharya, Rajeev. 'Road to Nowhere: Agitating Mizoram landowners, escalating costs, dearth of records stalls Kaladan Project', Firstpost March 15, 2018 (Accessed on April 26, 2018).

¹²³In Myanmar, India's Prime Minister Skilfully Sidesteps the Rohingya Controversy', Startfor- Worldview, September 6, 2017, <https://worldview.stratfor.com> (Accessed on April 27, 2018).

integration and the estrangement of Britain from the Union have called for greater attention and discussion on the part of the academicians and policy makers. The conundrum in case of the South Asia lies in the fact that the nations are mostly underdeveloped, political instability and corruption is another major factor that is adding to this enigma and finally the presence of China, and its *realpolitik* foreign policy is highly intervening the regionalization process involving India. It is important to note that, if India really needs to succeed as a regional power, it first needs to ensure its own socio-economic and political development. India precarious borders and its fragmented politics is increasingly being used by China to nurture insurgency activities by providing arms and ammunitions as well as by infiltrating huge sums of money. It is also important to realize that to lure India's neighbours, India should essentially invest exorbitantly on the neighbouring states' infrastructural development and this particular area is substantially captured by China as China is confident about its own economic power.

India's ambivalence regarding the Rohingyas and her ignorance towards the crisis may have negative implications for the Kaladan Multimodal Transit Transport Project. It is also important that India secures its borders adequately in order to open up for cross border trade and people to people contact, this is where sustainability comes into the picture. What is creating the fuss is the fact that such transnational infrastructural projects are actually opening up greater possibilities of illegal arms and drugs trade. India needs to realize the fact that her borders are already susceptible to baneful infiltrations and this calls for a tightened up security at the domestic level itself. Development that is sustainable and inclusive in South Asia is possible through regionalism only when the member states' domestic development has attained considerable development within itself. The policy makers need to be more circumspect while adopting policies of regional integration, especially when the spatial development is at an exigent stage. The present scenario of the Indo-Myanmar integration can have two possible outcomes, one, where the present pace of regional integration actually resolves the crises and successfully achieves the desired result of development, as perceived by the policy makers or the regionalization process as a whole fails and shatters into pieces in the face of violent conflicts, refugee influxes, phony trades, geographical inaccessibility and last but not the least corruption on the part of local government stakeholders. This paradox of regional integration in South Asia calls for future research and introspection through participatory observations and critical anthropological surveys.

REFERENCES

- Chandran, S and Singh Bhavna.(2015). *India, China and Sub-regional Connectivity in South Asia*. New Delhi: Sage Publications.
- Chatterjee, G. (2015). North East Insurgencies: An Introspection. *JAIR Journal of International Relations Vol.2, Issue.2, 73-75*.
- Donnan, W. and T. Hastings. (2012). *A Companion to Border Studies*. New Jersey: Willey Blackwell.
- Hagerty, D.T. (1991). India's Regional Security Doctrine. *Asian Survey*, Vol. 31, No.4, 351-363
- Hu, R. W. (2017). China's One Belt One Road Strategy: Opportunity or Challenge for India? *China Report*, Vol.53, Issue 2, 107-124.
- Ghosal, B. (August 2014). India's Engagement with Myanmar. *Journal of Indian Ocean Studies*, Vol.22, No. 2, 218-227.
- Lindberg, L. (1970). Political Intergration as a Multidimensional Phenomenon requiring Multi-variate Analysis. *International Organisation*, 649-731.
- Michael Schulz, F. Soderbaun, J. Ojendal. (2001). *Regionalization in a Globalizing World; A Comparative Perspectives on Forms, Actors and Processes*. London: Zed Books.
- Nepam, B. (2002). *South Asia's Fractured frontier; Armed Conflicts, narcotics and Small Arms Proliferation in India's North East*. New Delhi: Mittal Publications.
- Rostow, W. W. (1959). *The Stages of Economic Growth : A Non-Communist Manifesto*. Cambridge: Cambridge University Press.
- Sikri, R. (2009). *Challenges and strategy: Rethinking India's Foreign Policy*. New Delhi: Sage.
- Singh, L. S. (2015). Conceptualizing Zhoukhatar-Rhi Cross Border Trade from the Perspectives of India and Myanmar: The Road Ahead. *Jair Journal of International Relations*, Vol. 2, Issue-2, 1-8.

1562 COMPARISON OF THE POTENTIAL COMPETITIVENESS OF ASIAN COUNTRIES

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ABSTRACT

Country's competitiveness is very important notion for companies and even government. Business people and government pay attention to the ranking of their country. But definition of competitiveness is unclear. We define the competitiveness from an economic point of view.

We have developed a ranking of potential competitiveness for South India, ASEAN countries, China, Hong Kong, Korea and Japan. The word "competitiveness" is popular and several institutes such as Institute for Management Development (IMD) and World Economic Forum (WEF) publish rankings every year. But result is different, because competitiveness may be defined in many ways. We define competitiveness as increase per capita gross domestic product (GDP). Growth rate tend to be high for developing countries because the starting point is low. If national income is high, high growth rate is not necessary. So, we conclude increase of GDP per capita is appropriate index of country's competitiveness. And we define potential competitiveness is its forecast about 10 years forward or so. It shows how much every nation and region will have competitiveness in the future. Potential competitiveness and realized competitiveness do not correspond completely because potential competitiveness indicators are based on data provided at the initial point in time of the period under measurement and we need to acknowledge the possibility of unforeseen events occurring over the next ten years.

We made the ranking of increase in GDP per capita among 50 countries. It indicate realized competitiveness. In 80's, Japan is in the 1st place, Norway is in the 1st place in 90's and Singapore is in the 1st place in 2000's. In 2010's, Ireland is in the 1st place, but it is result of exceptionally high growth in 2015 because of the transfers of the headquarters to Ireland. In Asian countries and economies, 2010's best 3 are Singapore, Hong Kong, and Korea.

In case of compiling potential competitiveness index, we use various economic and social indicators such as (1) education expenditure (% of GNI), (2) mobile cellular subscriptions (per 100 people), (3) life expectancy at birth, total (years), and (4) urban population (% of total). Selection of indicators for an item such as education or science and technology varies depending upon the characteristics of the item, but is based upon the endogenous growth theory. Each indicators show the factors of country's competitiveness. For developing countries, it is a clue for higher growth.

We developed the potential competitiveness on the basis of results from data in 2015. The ranking is based on data collected in the 2015 survey. Hong Kong is in 1st place. Singapore is in 2nd place.

JEL Classification O47

Keywords: competitiveness, Asian economy, economic growth, aggregate productivity

INTRODUCTION

Country's competitiveness is very important notion for companies and even government. Japanese government set up industrial competitiveness council from 2013 to 2016. Future investment council succeed it. Business people and government pay attention to the ranking of their country. But definition of competitiveness is unclear. We define the competitiveness from an economic point of view.

Competitiveness can be measured in different ways. This paper discusses "potential competitiveness", which is defined not as an outcome of economic growth, but as an ability to be competitive in future.

The measure primarily seeks to determine if a country is equipped with the necessary groundwork for future improvement in competitiveness. For example, High-level education and good infrastructure mean strong potential competitiveness.

Competitiveness ranking is published by Institute for Management Development (IMD) and World Economic Forum every year. But result is not equal. In 2017, Hong Kong is in 1st place in IMD, while Hong Kong is 6th place in WEF.

Table1 Competitiveness Rankings

	IMD	WEF	ΔGDPper capita
1	Hong Kong	Switzerland	Ireland
2	Switzerland	USA	Singapore
3	Singapore	Singapore	Sweden
4	USA	Netherland	Hong Kong
5	Netherland	Germany	United States
6	Ireland	Hong Kong	Australia
7	Denmark	Sweden	Germany
8	Luxembourg	United Kingdom	Turkey
9	Sweden	Japan	Korea, Rep.
10	UAE	Finland	New Zealand
	China(18) Japan(26)	China(27)	Japan(12) China(16)

IMD: International Institute for Management Development (2017)
 WEF: World Economic Forum (2017)
 ΔGDP per capita: Increase from 2010 to 2016 of GDP per capita(constant US\$)

1. EXISTING COMPETITIVENESS RANKINGS

IMD: World Competitiveness Yearbook

One of the existing, representative competitiveness indicators is provided by The World Competitiveness Yearbook, published by the IMD in Switzerland. The IMD develops rankings of competitiveness using a variety of different indicators. They use not only hard data such as GDP but also soft data such as questionnaire surveys. But they do not give reasons for its selection of such indicators.

IMD has published yearbook since 1990. In 1990, Japan is 1st place, but USA become first place after 1995 and Singapore and Hong Kong become in 1st place in 2010's.

Japan experienced very fast decline of the competitiveness. The rank fell to 30th place in 2002. Though rank of Japan rise in 2003, after that, it seems gradual decline continues.

Table2 Best 3 of IMD Ranking

	1st	2nd	3rd
1990	Japan	Switzerland	USA
1995	USA	Singapore	Hong Kong
2000	USA	Singapore	Finland
2005	USA	Hong Kong	Singapore
2010	Singapore	Hong Kong	USA
2011	Hong Kong	USA	Singapore
2012	Hong Kong	Singapore	Switzerland
2013	USA	Switzerland	Hong Kong
2014	USA	Switzerland	Singapore
2015	USA	Hong Kong	Singapore
2016	Hong Kong	Switzerland	USA
2017	Hong Kong	Switzerland	Singapore

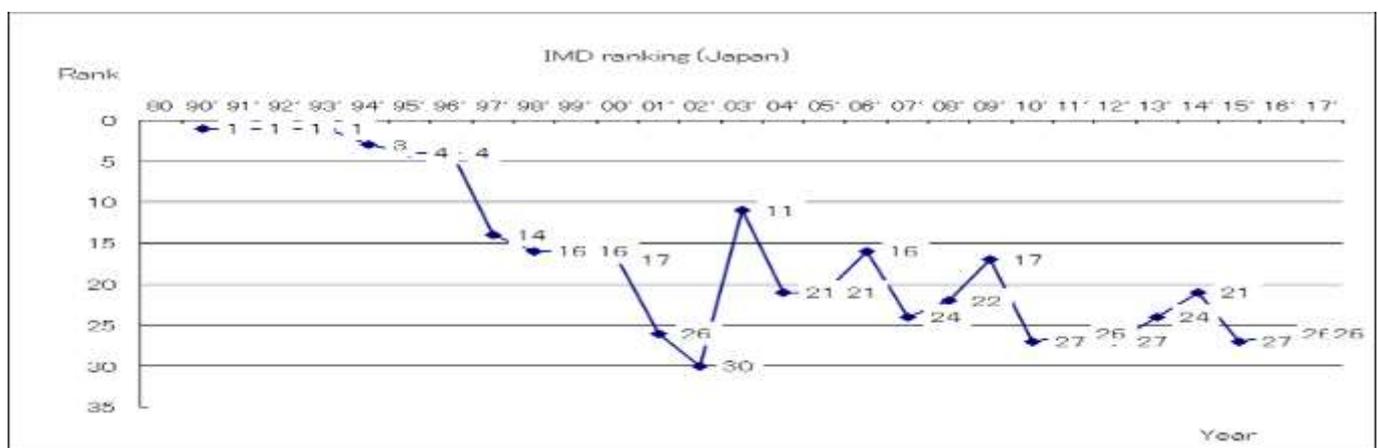


Figure1 IMD Ranking of Japan

WEF: The Global Competitiveness Report

Another famous competitiveness ranking is The Global Competitiveness Report by the World Economic Forum. The Global Competitiveness Report 2016-2017 assesses the competitiveness status of 138 economies. They define competitiveness as the set of institutions, policies, and factors that determine the level of productivity of an economy, which in turn sets the level of prosperity that the country can achieve. the Global Competitiveness Index (GCI) combines 114 indicators that capture concepts that matter for productivity and long-term prosperity

Compare to IMD, rank of Japan is relatively high. Japan is in 9th place in 2017, while IMD rank is 26th place.

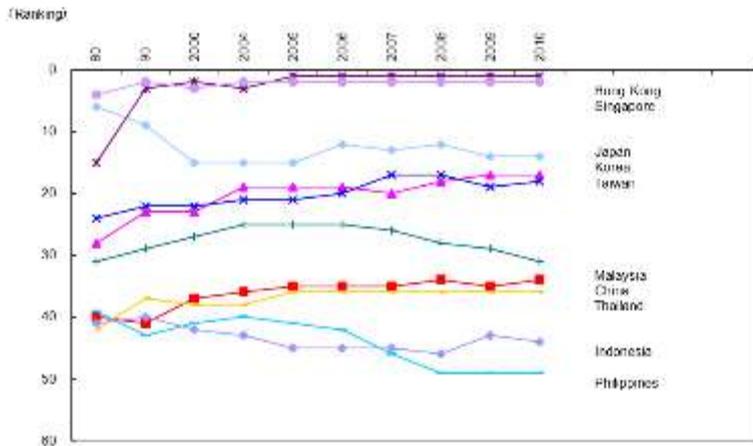
Table3 Ranking of Asian Countries and Economies (WEF)

	2009		2017	
1	Singapore	5.55	Singapore	5.71
2	Japan	5.37	Hong Kong	5.53
3	Hong Kong	5.22	Japan	5.49
4	Taiwan	5.20	Taiwan	5.33
5	Korea	5.00	Malaysia	5.17
6	Malaysia	4.87	Korea	5.07
7	China	4.74	China	5.00
8	Thailand	4.56	Thailand	4.72
9	Inodonesia	4.26	Inodonesia	4.68
10	Viet Nam	4.03	Viet Nam	4.36
11	Philipinnes	3.90	Philipinnes	4.35
12			Cambodia	3.93
13			Lao PDR	3.91

Source: The Global Competitiveness Report

JCER: Potential Competitiveness Report

Japan Center for Economic Research (JCER) published “Potential Competitiveness Report” from 2004 to 2010. We followed this methodology. While the IMD uses questionnaire surveys, JCER features quantitative analyses based on available socio-economic data.



Source: Potential Competitiveness Report 2010

Figure2 Ranking of Asian countries and economies (JCER)

2. THOUGHTS ON COMPETITIVENESS

What is competitiveness ?

Competitiveness may be defined in many ways. When an indicator is assumed to express competitiveness, it is important to determine if it represents the “cause” or the “effect” of competitiveness. For example, high-level education or labor productivity is a cause of a nation’s strong competitiveness, while an increase in income is an indicator that represents the effect of such competitiveness.

In this paper, we have used per-capita GDP as an overall competitiveness indicator. The greater the per-capita capital and the higher the productivity for a given period, the greater the growth of per-capita income. A competitive country is one that can provide products or services to domestic or foreign markets efficiently. An appropriate comprehensive indicator that measures such competitiveness should be based on per-capita output.

GDP growth rate

Needless to say, growth rate of GDP is very important. But, they tend to be high for developing countries. In 2016, Lao PDR recoded the highest growth rate, 7.0% among 13 countries and economies listed on the table. And 6% base growth

is shown in Cambodia, Philippines, China, Myanmar, and Vietnam. Growth rates of developed countries and economy are lower than developing countries.

Table4 Growth Rate of Asian Countries and Economies

Country Name	2010	2011	2012	2013	2014	2015	2016
Bangladesh	5.6	6.5	6.5	6.0	6.1	6.6	7.1
India	10.3	6.6	5.5	6.4	7.5	8.0	7.1
Lao PDR	8.5	8.0	8.0	8.0	7.6	7.3	7.0
Philippines	7.6	3.7	6.7	7.1	6.1	6.1	6.9
Cambodia	6.0	7.1	7.3	7.4	7.1	7.0	6.9
China	10.6	9.5	7.9	7.8	7.3	6.9	6.7
Myanmar	9.6	5.6	7.3	8.4	8.0	7.3	6.5
Vietnam	6.4	6.2	5.2	5.4	6.0	6.7	6.2
Pakistan	1.6	2.7	3.5	4.4	4.7	4.7	5.5
Indonesia	6.2	6.2	6.0	5.6	5.0	4.9	5.0
Sri Lanka	8.0	8.4	9.1	3.4	5.0	4.8	4.4
Malaysia	7.0	5.3	5.5	4.7	6.0	5.0	4.2
Thailand	7.5	0.8	7.2	2.7	0.9	2.9	3.2
Korea, Rep.	6.5	3.7	2.3	2.9	3.3	2.8	2.8
Hong Kong	6.8	4.8	1.7	3.1	2.8	2.4	2.0
Singapore	15.2	6.2	3.9	5.0	3.6	1.9	2.0
Japan	4.2	-0.1	1.5	2.0	0.3	1.2	1.0

Source: World Development Indicators, World Bank

GNI per capita

GNI per capita is used for analytical classification by IMF. They define that countries which GNI per capita is over 12235 US dollars are high income country and countries which GNI per capita is below 1005 US dollars are low income countries. It is useful for seeing the present conditions of the countries, but it does not tell us future conditions. It is a static indicator.

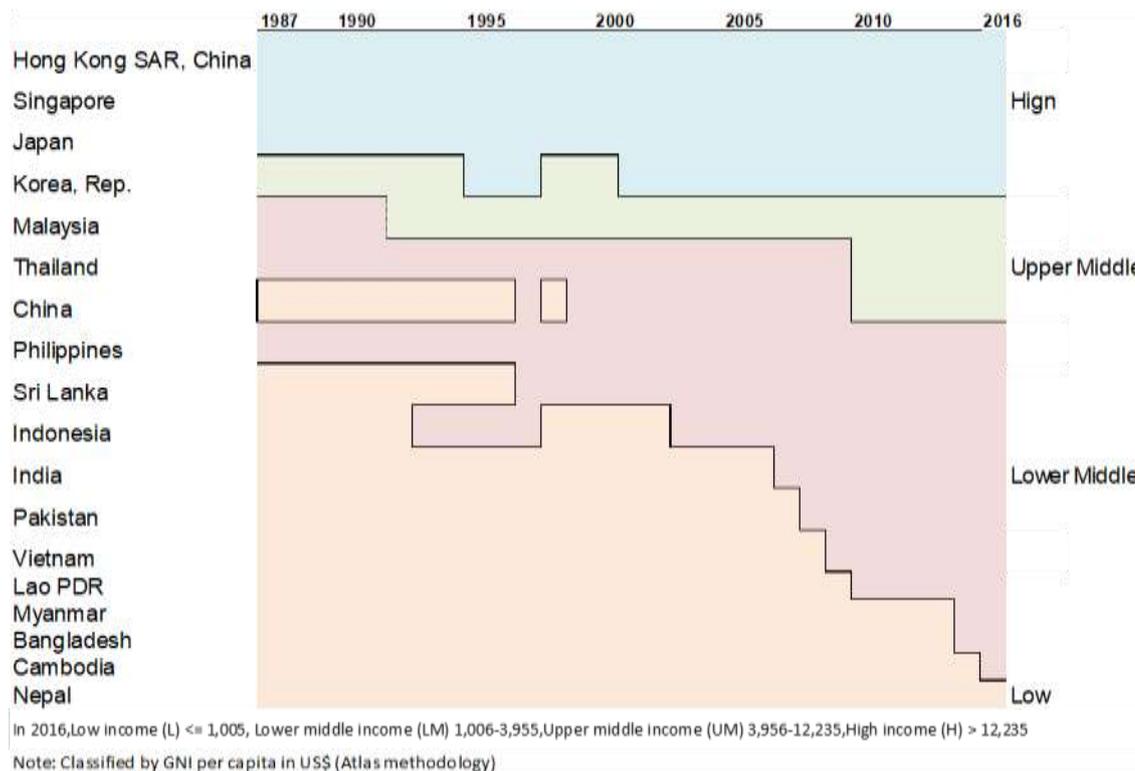


Figure3 World Bank Analytical Classifications

Increase in GDP per capita

The level of per capita GDP may be regarded as an indicator of the competitiveness of a country, but what is important is the per capita increase of GDP. For measurement of growth, the rate of change may be regarded as an indicator of competitiveness, in which case, generally, the lower the level of GDP, the higher the rate of growth. A currently highly competitive country should naturally be considered more competitive than a country without any existing competitiveness. So it is not appropriate to use the rate of change in the calculation of competitiveness. We have therefore

adopted the amount of change in per capita GDP as a competitiveness indicator that adds the level of GDP to the rate of change as follows:

Level × rate of change = amount of change

Potential competitiveness and per capita GDP increase

Potential competitiveness computed using various indicators shows the potential capabilities of a country at a given moment to compete over the next ten years. For instance, the potential competitiveness indicator as of 1980 indicates a country’s ability to increase per-capita GDP during the 1980s.

Potential competitiveness as of '80 → influential on competitiveness in the 1980s
 Potential competitiveness as of '90 → influential on competitiveness in the 1990s
 Potential competitiveness as of the latest period
 → will be influential on competitiveness over the next 10 years

Potential competitiveness and realized competitiveness do not correspond completely because potential competitiveness indicators are based on data provided at the initial point in time of the period under measurement and the possibility of unforeseen events occurring over the next ten years needs to be acknowledged.

3. EMPIRICAL RESULTS

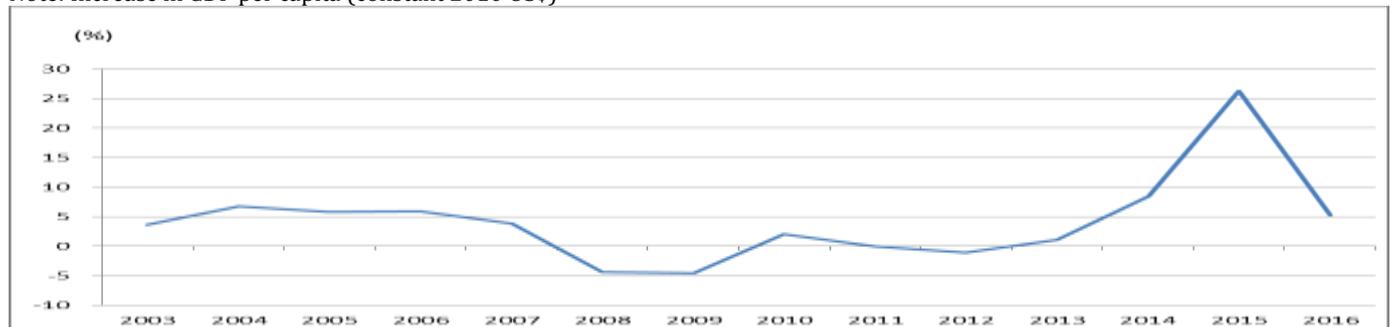
GDP per capita Ranking

Table is the ranking of increase in GDP per capita among 50 countries. In 80’s, Japan is in 1st place, Norway is in 1st place in 90’s and Singapore is in 1st place in 2000’s. In 2010’s, Ireland is in 1st place, but it is result of exceptionally high growth in 2015 because of the transfers of the headquarters to Ireland. In Asian countries and economies, 2010’s best 3 rankings are Singapore, Hong Kong, and Korea.

Table5 GDP per capita ranking

	1980-1990	1990-2000	2000-2010	2010-2016
1	Japan 12417	Norway 21447	Singapore 13180	Ireland 18249
2	Norway 11734	Ireland 19876	Hong Kong SAR, China 9534	Singapore 6031
3	Switzerland 9384	Denmark 11282	Australia 7650	Sweden 4243
4	Singapore 8869	Singapore 11212	Sweden 7383	Hong Kong SAR, China 4176
5	Denmark 8191	Netherlands 10650	Switzerland 6991	United States 3821
6	Finland 7854	United States 8743	Korea, Rep. 6982	Australia 3797
7	United States 7578	Australia 8396	Norway 5914	Germany 3766
8	Hong Kong SAR, China 7524	Austria 8155	Finland 5752	Turkey 3399
9	United Kingdom 6833	Sweden 7181	Ireland 5152	Korea, Rep. 3372
10	Ireland 6550	Canada 7149	Czech Republic 4997	New Zealand 3151

Note: Increase in GDP per capita (constant 2010 US\$)



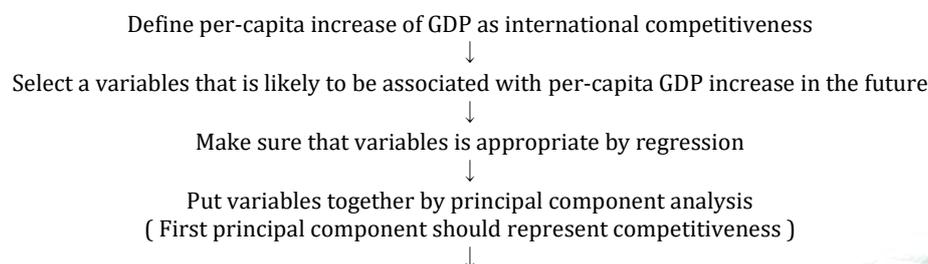
Source: World Development Indicators, World Bank

Figure4 Real GDP growth of Ireland

Potential competitiveness

Adopt the per-capita increase of GDP as a judgment criterion for international competitiveness, and then look for factors that increase this increase for each item.

We call the variables which influence over the next 10 years as potential competitiveness factor. If we find the variables, we forecast over the next 10 years competitiveness by using latest data.



Estimate potential competitive index
 ↓
 Determine potential competitiveness ranking

4. ESTIMATION

Variable selection

We intend to make rankings for not only ASEAN4 but LMCV (Lao PDR, Myanmar, Cambodia and Vietnam) and south Asia. In case of estimating competitiveness, there is constraint of data availability. JCER use 30 indicators to compile potential competitiveness but it is impossible to gather such numbers of indicators unless creating new data.

So we select variables in view of both correlation and availability. We use world development indicators which contain 1574 series. We start to check the correlation between variables in 1980, 1990 and 2000 and ΔGDP per capita in 1980-1990, 1990-2000, 2000-2010 respectively. And we calculate data availability rate. Which is the ratio number of available data to number of all possible data. Because we check three period, that is, 1980,1990,2000, if all data is available, it will be 651(=271 × 3) data.271 is the number of all the countries and 3 is the number of period.

We made index by correlations multiply availability rate. And we sort by the index.

We choose 14 series, but there are few data of Machinery and transport equipment, we basically use 13 series.

Table6 Variable selection

Series Name	Correlation Coefficient				No. of samples	Available Sample Rate	Index
	1980	1990	2000	average			
			①					②	$\frac{③-②}{651}$	$\frac{① \times ③}{③}$
1 Population density (people per sq. km of land area)	0.2	0.6	0.5	0.4	616	0.95	0.49
2 Population ages 40-44, female (% of female population)	0.4	0.4	0.5	0.4	580	0.89	0.44
3 Concessional debt (% of total external debt)	0.1	0.0	-0.6	0.2	376	0.58	0.35
4 Fixed telephone subscriptions (per 100 people)	0.4	0.2	0.4	0.3	567	0.87	0.34
5 Mobile cellular subscriptions (per 100 people)	0.1	0.2	0.3	0.2	611	0.94	0.32
6 Rural population growth (annual %)	-0.5	-0.4	-0.3	0.4	627	0.96	0.29
7 Life expectancy at birth, total (years)	0.3	0.5	0.3	0.3	589	0.90	0.28
8 Age dependency ratio (% of working-age population)	-0.2	-0.1	-0.3	0.2	502	0.77	0.26
9 Survival to age 65, male (% of cohort)	0.2	0.5	0.3	0.3	582	0.89	0.25
10 Physicians (per 1,000 people)	0.2	0.2	0.5	0.3	338	0.52	0.25
11 Machinery and transport equipment (% of value added in manufacturing)	0.7	0.1	0.4	0.4	366	0.56	0.24
12 Gross fixed capital formation, private sector (% of GDP)	0.2	0.2	0.5	0.3	291	0.45	0.24
13 School enrollment, secondary (% gross)	0.3	0.2	0.4	0.3	374	0.57	0.22
14 Mortality rate, infant (per 1,000 live births)	-0.3	-0.5	-0.3	0.3	557	0.86	0.22

Note:"Correlation coefficient 1980" means correlation between series in 1980 and ΔGDP per capita 1980-1990.651means all country number 271 multiply 3 terms.

Table7 Potential competitiveness factors by category

Demography		Telecommunication	
	Population ages 40-44, female		Fixed telephone subscriptions
(-)	Age dependency ratio		Mobile cellular subscriptions
Lifespan		Agglomeration	
	Survival to age 65, male		Population density
	Life expectancy at birth, total	(-)	Rural population growth
(-)	Mortality rate, infant	Science and Education	
Debt			Physicians
(-)	Concessional debt		School enrollment, secondary
Investment			
	Gross fixed capital formation, private sector(% of GDP)		

Classification

For the analysis of the result, we classify 13 series to 7 categories. For the demography, there are population ages 40-44 of female and age dependency ratio. For the lifespan, there are survival to 65 of male, life expectancy at birth and mortality rate of infant. For debt, there is concessional debt. Concessional debt is defined as loans with an original grant element of 25 percent or more. For the telecommunication, there are fixed telephone and mobile cellular subscriptions, For the agglomeration, there is population density and rural population growth. For the science and education, number of physicians and school enrollment of secondary school.

Some people think lifespan is not cause but result of GDP growth. But we check the correlation variables at initial point and future growth. Lifespan should be regarded as proxy of goodness of social insurance system.

Model

To make sure the variables are appropriately selected, we tested coefficients of the following formula. GDP_{it} is gross domestic product, POP_{it} is population, α and β is parameters, x_{it} is 1st principal component of potential competitiveness factors.

$$\Delta \left(\frac{GDP_{it}}{POP_{it}} \right) = \alpha + \beta x_{it-1} + \varepsilon_{it}$$

We use panel data. Cross section data is consist of ASEAN countries, South Asia countries, China, Hong Kong, Korea and Japan. Time series data is of 1980, 1990, 2000. We estimate with both fixed effect model and random effect model.

The formula is appropriate for the idea of potential competitiveness. x_{it} is in the initial point of increase in GDP over 10 years. Series x_{it} in 1980 will influence increase in per capita GDP from 1980 to 1990. Potential competitiveness in the latest period will be influential on competitiveness over the next 10 years.

Competitiveness related variables may correlate each other, there may be a multicollinearity problem. So we put 13 variables together by prime component analysis.

Estimation Result

Estimation Result is on the table. According to the table, Housman test does not reject the hypothesis that random effect is correct. So we use random effect's result.

Table8 Estimation Result (2)

Dependent Variable: Δ GDP per capita
Total pool (unbalanced) observations: 47

Variable	Fixed	Random
	Coefficient	Coefficient
C	2174.15 ***	2265.88 ***
PCA	1187.41 *	1015.55 ***
Adjusted R-squared	0.795	0.541
Houseman Test(P-Value) (random effect is correct)	0.7755	

Note: Δ GDP1:increase in GDP per capita(constant 2010US\$), C:constant coefficient, PCA: 1st principal component of 13 valuables.

Potential Competitiveness Ranking

We made potential competitiveness ranking. Potential ranking is estimation or forecast of increase in GDP per capita used by 1st component of 14 series.

Latest ranking means that the high ranking counties and economies will have more competitiveness in the future. Because present data affect the future GDP per capita. Hong Kong is 1st place and Singapore is 2nd place. CLMV countries show low competitiveness. Even the growth rate is high, it takes time to increase GDP per capita.

Table9 Potential Competitiveness Ranking

Country	1980	Country	1990	Country	2000	Country	2010	Country	2016
Vietnam	1053	Singapore	9745	Singapore	9820	Singapore	8919	Singapore	8746
Thailand	1180	Hong Kong	7864	Hong Kong	7312	Hong Kong	6921	Hong Kong	6837
Sri Lanka	1520	Japan	6566	Korea, Rep.	6714	Korea, Rep.	6432	Korea, Rep.	5976
Singapore	9174	Korea, Rep.	5535	Japan	5722	Japan	5106	Japan	4702
Philippines	1102	Malaysia	2311	Malaysia	2479	China	3395	China	3319
Pakistan	335	Thailand	2066	China	2332	Thailand	2351	Thailand	2857
Myanmar	287	China	1544	Thailand	1725	Malaysia	2181	Malaysia	2067
Malaysia	2167	Sri Lanka	1024	Vietnam	1472	Vietnam	2036	Vietnam	1908
Lao PDR	-163	Indonesia	915	Sri Lanka	1224	Sri Lanka	1082	Indonesia	1192
Korea, Rep.	4884	Philippines	588	Indonesia	920	Indonesia	1035	Sri Lanka	833
Japan	7033	India	419	India	292	India	418	Bangladesh	728
Indonesia	677	Vietnam	278	Bangladesh	231	Bangladesh	314	India	421
India	486	Pakistan	195	Philippines	189	Philippines	15	Lao PDR	403
Hong Kong	6376	Cambodia	-9	Myanmar	130	Cambodia	-75	Cambodia	164
China	2207	Myanmar	-74	Pakistan	-495	Lao PDR	-124	Myanmar	24
Cambodia	95	Bangladesh	-181	Lao PDR	-610	Myanmar	-467	Philippines	-299
Bangladesh	107	Lao PDR	-266	Cambodia	-937	Pakistan	-1021	Pakistan	-1358

Analysis of regional effect

We investigate the effect of spatial effect. First, we estimate by spatial model. We use weight matrix. It is designed that the country which have common border economically affect neighbor countries.

$$y_{it} = \rho \sum_{j=1}^n w_{ij} y_{jt} + \beta x_{it} + \varepsilon_{it}$$

IF ρ is significant spatial effect exist, But estimation result shows that special effect does not exist.

Table10 Estimation result

Dependent Variable: Δ GDP per capita
 Total pool (unbalanced) observations: 47

Variable	Random
	Coefficient
C	2157.22 ***
PCA	1001.56 ***
W Δ GDP per capita	0.12

Adjusted R-squared 0.518

Houseman Test(P-Value) 0.4772
 (random effect is correct)

In the second analysis, we use dummy variables. If coefficient is significant, reginal specific effect exist in terms of potential competitiveness factor to increase in GDP per capita.

$$\left(\frac{GDP_{it}}{POP_{it}}\right) - \left(\frac{GDP_{it-1}}{POP_{it-1}}\right) = \alpha + \beta x_{it-1} + \gamma D_i x_{it-1} + \varepsilon_{it}$$

Table11 Estimation result

Dependent Variable: Δ GDP per capita
 Total pool (unbalanced) observations: 47

Variable	Random	Random
	Coefficient	Coefficient
C	2166.21 ***	2174.15 **
PCA	1029.34 ***	1187.41 ***
PCA*ASEAN	55.77	
PCA*ASEAN4		-688.56
PCA*CLMV		-1126.15 ***
PCA*SOUTH	-279.77	-1024.90 ***
PCA*SGP		896.11 ***
Adjusted R-squared	0.518	0.841
Houseman Test(P-Value) (random effect is correct)	0.7803	0.8407

The first estimation we use dummy variables of ASEAN and South East. Base line is East Asia. It is not significant that the country group effect.

But if we divide ASEAN into ASEAN4 (Thailand, Malaysia, Philippine, Indonesia), CLMV (Cambodia, Lao, Myanmar, Vietnam) and Singapore, group effects of South East, CLMV and Singapore is significant. There are some evidence of country group effect.

Group effect of CLMV is significantly negative and group effect of South Asia is also significantly negative, while Singapore is significantly positive.

CONCLUSION

We defined competitiveness as increase in GDP per capita, and estimate the potential competitiveness. We select variables which relate to increase in GDP per capita over the next 10 years. We also take availability into consideration. We select 13 series and make categories such as demography, lifespan, and so on.

We estimate potential competitiveness indicators. This indicator show the competitiveness in the future.

According to the latest data, Singapore is the 1st place, Hong Kong is the second place, Korea is the 3rd place in the potential competitiveness ranking.

REFERENCES

World Economic Forum (WEF) (2016), The Global Competitiveness Report 2017-2018
 International Institute for Management Development (IMD) (2017), World Competitiveness Yearbook 2017.
 Japan Center for Economic Research (2011), Potential Competitiveness Ranking 2010
 Yamasawa, Nairyasu (2013),The Middle-Income Trap Verified by Data-The Exit Key is Developing Institutions, The ASEAN Economy and the Middle-Income Trap, Japan Center for Economic Research

APPENDIX1 RANKINS OF COMPETITIVENESS RELATED INDICATORS

Table 12

Population density (people per sq. km of land area)

Country	1980 Country	1990 Country	2000 Country	2010 Country	2016
HKG	5063.1 HKG	5762.1 HKG	6347.6 SGP	7231.8 SGP	7908.7
SGP	3602.9 SGP	4548.0 SGP	6011.8 HKG	6689.7 HKG	6987.2
BGD	625.9 BGD	815.8 BGD	1010.8 BGD	1168.8 BGD	1251.8
KOR	395.2 KOR	444.4 KOR	487.3 KOR	509.7 KOR	525.7
JPN	318.8 JPN	338.8 IND	354.2 IND	414.0 IND	445.4
LKA	239.8 IND	292.7 JPN	348.0 JPN	351.3 JPN	348.4
IND	234.4 LKA	276.3 LKA	299.5 LKA	322.1 PHL	346.5
VNM	167.0 VNM	209.6 PHL	261.6 PHL	314.3 LKA	338.1
PHL	159.0 PHL	207.8 VNM	258.1 VNM	285.3 VNM	305.0
CHN	104.5 PAK	139.7 PAK	179.7 PAK	221.3 PAK	250.6
PAK	101.3 CHN	120.9 CHN	134.5 CHN	142.5 CHN	146.9
THA	92.8 THA	110.8 THA	123.2 IDN	133.9 IDN	144.1
IDN	81.4 IDN	100.2 IDN	116.8 THA	131.6 THA	134.8
MMR	51.1 MMR	62.2 MYS	70.6 MYS	85.6 MYS	94.9
MYS	42.0 MYS	54.9 MMR	70.5 KHM	81.1 KHM	89.3
KHM	37.9 KHM	50.8 KHM	68.8 MMR	76.8 MMR	81.0
LAO	14.1 LAO	18.5 LAO	23.1 LAO	27.1 LAO	29.3

Population ages 40–44, female (% of female population)

Country	1980 Country	1990 Country	2000 Country	2010 Country	2016
JPN	7.0 JPN	8.4 HKG	9.8 CHN	9.4 HKG	8.5
SGP	5.5 SGP	7.3 SGP	9.5 HKG	8.9 THA	8.3
KOR	5.5 HKG	6.5 KOR	8.5 THA	8.8 SGP	8.3
IDN	5.0 KOR	5.7 THA	8.0 KOR	8.7 CHN	8.2
IND	5.0 LKA	5.7 LKA	7.0 SGP	8.2 KOR	8.1
THA	4.9 THA	5.6 CHN	6.6 IDN	6.9 JPN	7.5
LKA	4.8 CHN	5.4 MYS	6.3 VNM	6.8 VNM	7.1
HKG	4.8 MYS	5.2 VNM	6.2 LKA	6.6 IDN	7.1
MYS	4.7 IND	4.8 JPN	6.0 JPN	6.6 MMR	6.8
BGD	4.7 IDN	4.5 MMR	5.9 MMR	6.5 LKA	6.6
CHN	4.6 MMR	4.3 IDN	5.9 MYS	6.3 BGD	6.3
PAK	4.5 PHL	4.2 IND	5.6 BGD	6.2 IND	6.3
KHM	4.3 KHM	4.2 PHL	5.4 IND	5.9 MYS	6.2
LAO	4.2 BGD	4.2 KHM	5.0 PHL	5.9 PHL	5.8
MMR	4.1 PAK	4.2 PAK	4.6 KHM	5.6 LAO	5.5
PHL	4.0 LAO	3.9 BGD	4.5 PAK	5.1 PAK	5.2
VNM	4.0 VNM	3.7 LAO	4.2 LAO	4.9 KHM	5.0

Concessional debt (% of total external debt)

Country	1980 Country	1990 Country	2000 Country	2010 Country	2016
VNM	0.0 HKG	0.0 HKG	0.0 HKG	0.0 HKG	0.0
KHM	0.0 KOR	0.0 KOR	0.0 KOR	0.0 KOR	0.0
HKG	0.0 JPN	0.0 JPN	0.0 JPN	0.0 JPN	0.0
CHN	0.0 SGP	0.0 SGP	0.0 SGP	0.0 SGP	0.0
KOR	0.0 MYS	14.6 MYS	7.0 MYS	2.6 MYS	0.7
JPN	0.0 THA	15.2 THA	11.5 CHN	5.4 CHN	1.4
SGP	0.0 CHN	17.6 CHN	20.8 THA	6.3 THA	3.4
PHL	5.5 PHL	20.0 IDN	21.2 IND	17.5 IDN	8.2
MYS	8.6 IDN	26.4 PHL	21.4 IDN	23.1 IND	10.1
THA	10.0 KHM	44.8 IND	38.1 PHL	24.0 PHL	10.8
IDN	36.4 IND	48.0 PAK	54.7 PAK	53.8 LKA	32.7
LKA	56.2 PAK	58.5 VNM	62.0 VNM	55.5 VNM	40.3
PAK	71.6 LKA	71.9 MMR	71.4 LAO	55.9 LAO	42.1
MMR	73.4 VNM	85.2 LKA	73.4 LKA	57.2 PAK	48.1
IND	75.7 MMR	88.1 KHM	94.7 MMR	71.7 KHM	55.2
BGD	79.8 BGD	90.6 BGD	94.8 BGD	74.8 BGD	64.3
LAO	93.4 LAO	99.2 LAO	97.7 KHM	77.8 MMR	72.7

Fixed telephone subscriptions (per 100 people)

Country	1980 Country	1990 Country	2000 Country	2010 Country	2016
JPN	33.9 JPN	43.8 HKG	58.9 HKG	62.1 HKG	59.1
HKG	26.0 HKG	42.8 KOR	54.6 KOR	57.6 KOR	55.2
SGP	22.2 SGP	35.0 SGP	49.7 JPN	51.0 JPN	50.2
KOR	7.1 KOR	30.9 JPN	48.6 SGP	39.3 SGP	35.5
MYS	2.9 MYS	8.8 MYS	20.0 CHN	21.6 LAO	18.7
PHL	0.9 THA	2.3 CHN	11.3 LKA	17.7 MYS	15.5
THA	0.8 PHL	1.0 THA	8.9 IDN	16.9 CHN	14.7
PAK	0.4 PAK	0.8 LKA	4.1 MYS	16.4 LKA	11.9
LKA	0.4 LKA	0.7 PHL	3.9 VNM	16.2 THA	6.8
IND	0.3 IDN	0.6 VNM	3.2 THA	10.2 VNM	5.9
IDN	0.3 CHN	0.6 IDN	3.1 PAK	3.6 IDN	4.1
CHN	0.2 IND	0.6 IND	3.1 PHL	3.6 PHL	3.7
LAO	0.2 BGD	0.2 PAK	2.2 IND	2.9 IND	1.8
BGD	0.1 MMR	0.2 LAO	0.8 KHM	2.5 PAK	1.6
VNM	0.1 LAO	0.2 MMR	0.6 LAO	1.7 KHM	1.4
MMR	0.1 VNM	0.1 BGD	0.4 MMR	1.0 MMR	1.0
KHM	0.0 KHM	0.0 KHM	0.3 BGD	0.8 BGD	0.5

Mobile cellular subscriptions (per 100 people)

Country	1980 Country	1990 Country	2000 Country	2010 Country	2016
LAO	0.0 HKG	2.3 HKG	81.7 HKG	196.3 HKG	240.8
VNM	0.0 SGP	1.7 SGP	70.2 SGP	145.5 THA	173.8
KHM	0.0 JPN	0.7 KOR	56.6 VNM	126.1 SGP	150.5
MMR	0.0 MYS	0.5 JPN	52.4 MYS	120.4 IDN	147.7
THA	0.0 KOR	0.2 MYS	22.1 THA	106.7 MYS	140.8
MYS	0.0 THA	0.1 PHL	8.3 KOR	102.5 JPN	130.6
PHL	0.0 IDN	0.0 CHN	6.6 JPN	95.9 VNM	127.5
IDN	0.0 LKA	0.0 THA	4.9 PHL	88.7 KHM	126.3
HKG	0.0 PAK	0.0 LKA	2.3 IDN	87.1 LKA	124.0
CHN	0.0 CHN	0.0 IDN	1.7 LKA	85.9 KOR	120.7
KOR	0.0 LAO	0.0 KHM	1.1 LAO	64.1 PHL	109.4
JPN	0.0 VNM	0.0 VNM	1.0 CHN	63.2 CHN	97.3
SGP	0.0 KHM	0.0 IND	0.3 IND	61.1 MMR	95.7
IND	0.0 MMR	0.0 LAO	0.2 PAK	58.2 IND	85.2
PAK	0.0 PHL	0.0 PAK	0.2 KHM	57.0 BGD	83.4
BGD	0.0 IND	0.0 BGD	0.2 BGD	44.6 PAK	70.6
LKA	0.0 BGD	0.0 MMR	0.0 MMR	1.2 LAO	58.6

Rural population growth (annual %)

Country	1980 Country	1990 Country	2000 Country	2010 Country	2016
KHM	-5.4 HKG	-62.6 MYS	-0.9 JPN	-7.9 JPN	-7.0
KOR	-2.4 KOR	-5.3 CHN	-0.8 CHN	-2.1 CHN	-2.1
HKG	-1.2 JPN	-0.2 IDN	-0.7 THA	-1.9 THA	-2.1
SGP	0.0 SGP	0.0 JPN	-0.4 MYS	-1.0 MYS	-1.2
CHN	0.3 IDN	0.4 KOR	-0.3 IDN	-0.3 IDN	-0.4
JPN	0.5 CHN	0.5 HKG	0.0 LAO	-0.2 LAO	-0.3
MYS	1.0 PHL	0.7 SGP	0.0 KOR	-0.1 KOR	-0.2
LAO	1.3 THA	1.0 VNM	0.4 MMR	-0.1 BGD	-0.1
THA	1.3 MYS	1.3 LAO	0.4 HKG	0.0 HKG	0.0
BGD	1.4 LKA	1.3 THA	0.4 SGP	0.0 SGP	0.0
IDN	1.6 MMR	1.3 LKA	0.6 BGD	0.0 MMR	0.1
LKA	1.8 VNM	1.7 MMR	0.8 VNM	0.1 VNM	0.1
IND	1.8 IND	1.7 BGD	1.5 LKA	0.6 IND	0.6
PHL	2.0 BGD	1.9 IND	1.5 IND	0.9 LKA	1.1
VNM	2.1 LAO	2.5 PAK	1.9 KHM	1.4 PAK	1.2
MMR	2.3 PAK	2.6 KHM	2.1 PAK	1.5 KHM	1.3
PAK	2.8 KHM	2.8 PHL	2.3 PHL	2.1 PHL	1.7

Life expectancy at birth, total (years)

Country	1980 Country	1990 Country	2000 Country	2010 Country	2016
JPN	76.1 JPN	78.8 JPN	81.1 HKG	83.0 HKG	84.2
HKG	74.7 HKG	77.4 HKG	80.9 JPN	82.8 JPN	84.0
SGP	72.2 SGP	75.3 SGP	78.0 SGP	81.5 SGP	82.8
LKA	68.2 KOR	71.6 KOR	75.9 KOR	80.1 KOR	82.0
MYS	68.0 MYS	70.7 VNM	73.3 CHN	75.2 VNM	76.3
VNM	67.6 VNM	70.5 MYS	72.8 VNM	75.1 CHN	76.3
CHN	66.8 THA	70.3 CHN	72.0 LKA	74.4 THA	75.3
KOR	66.0 LKA	69.5 LKA	71.0 MYS	74.2 MYS	75.3
THA	64.4 CHN	69.3 THA	70.6 THA	73.9 LKA	75.3
PHL	62.2 PHL	65.3 PHL	67.2 BGD	70.2 BGD	72.5
IDN	59.6 IDN	63.3 IDN	66.3 PHL	68.3 IDN	69.2
PAK	57.0 PAK	60.1 BGD	65.3 IDN	68.2 PHL	69.1
MMR	55.0 MMR	58.7 PAK	62.7 IND	66.6 KHM	69.0
IND	53.8 BGD	58.4 IND	62.6 KHM	66.6 IND	68.6
BGD	53.5 IND	57.9 MMR	62.1 MMR	65.2 LAO	66.7
LAO	49.1 KHM	53.6 LAO	58.9 PAK	65.1 MMR	66.6
KHM	27.5 LAO	53.6 KHM	58.4 LAO	64.4 PAK	66.5

Age dependency ratio (% of working-age population)

Country	1980 Country	1990 Country	2000 Country	2010 Country	2016
HKG	46.3 SGP	37.1 KOR	38.5 HKG	33.2 HKG	36.9
SGP	46.6 HKG	42.0 HKG	38.6 CHN	35.6 KOR	37.1
JPN	48.1 JPN	43.6 SGP	40.5 SGP	35.8 SGP	38.0
KOR	61.3 KOR	44.2 THA	43.9 KOR	36.6 CHN	38.5
LKA	67.4 CHN	52.5 CHN	46.1 THA	39.1 THA	40.1
CHN	67.8 THA	53.2 JPN	46.6 VNM	43.3 VNM	42.9
IND	75.0 LKA	60.2 LKA	49.2 LKA	48.7 MYS	44.3
MYS	75.7 IDN	67.3 IDN	54.8 MYS	49.0 IDN	48.9
THA	76.0 MYS	68.7 MMR	58.6 IDN	51.1 MMR	49.0
KHM	77.9 IND	71.7 MYS	59.4 MMR	53.6 BGD	51.5
IDN	80.7 MMR	72.2 VNM	61.5 JPN	55.9 LKA	51.5
MMR	81.4 VNM	75.8 IND	64.3 IND	56.3 IND	51.5
VNM	85.8 PHL	78.8 BGD	69.2 BGD	58.2 KHM	55.4
PHL	86.3 BGD	83.3 PHL	71.6 KHM	58.9 PHL	57.9
PAK	87.8 PAK	88.4 KHM	80.7 PHL	61.4 LAO	59.3
BGD	91.9 KHM	89.3 PAK	82.4 LAO	66.6 PAK	65.0
LAO	92.0 LAO	91.5 LAO	88.5 PAK	68.4 JPN	65.3

Survival to age 65, male (% of cohort)

Country	1980 Country	1990 Country	2000 Country	2010 Country	2016
JPN	79.6 JPN	82.6 HKG	85.5 HKG	88.2 SGP	89.6
HKG	74.9 HKG	80.7 JPN	84.8 SGP	87.8 HKG	89.3
SGP	70.7 SGP	78.2 SGP	83.4 JPN	87.2 JPN	88.3
CHN	67.8 CHN	72.1 CHN	77.2 KOR	84.2 KOR	87.0
MYS	66.2 MYS	70.4 KOR	75.8 CHN	82.0 CHN	83.5
LKA	66.0 VNM	66.7 MYS	73.8 MYS	75.1 MYS	76.5
VNM	62.0 THA	66.2 VNM	69.2 LKA	71.9 VNM	73.1
IDN	57.5 KOR	65.7 BGD	66.3 VNM	71.1 LKA	73.1
THA	57.4 LKA	63.6 LKA	65.9 THA	70.6 BGD	73.0
PAK	55.6 IDN	61.5 THA	65.6 BGD	70.5 THA	72.6
PHL	54.9 PAK	59.4 IDN	64.0 PAK	66.0 PAK	67.6
KOR	54.9 BGD	59.2 PAK	62.6 IDN	65.5 KHM	67.3
BGD	52.6 PHL	57.6 PHL	59.6 IND	64.4 IDN	67.1
IND	47.1 IND	52.3 IND	58.8 KHM	63.7 IND	66.8
MMR	45.1 MMR	51.0 MMR	56.6 MMR	61.4 LAO	65.0
LAO	38.2 LAO	44.7 LAO	52.8 LAO	61.3 MMR	63.3
KHM	19.9 KHM	42.1 KHM	52.5 PHL	60.5 PHL	61.6

Physicians (per 1,000 people)

Country	1980 Country	1990 Country	2000 Country	2010 Country	2016
JPN	1.3 JPN	1.7 JPN	2.0 JPN	2.2 CHN	3.6
CHN	1.2 SGP	1.3 SGP	1.4 KOR	2.0 JPN	2.4
SGP	0.9 CHN	1.1 HKG	1.3 SGP	1.7 KOR	2.3
HKG	0.8 HKG	1.1 KOR	1.3 HKG	1.6 SGP	2.3
KOR	0.5 KOR	0.8 CHN	1.3 CHN	1.5 HKG	2.2
IND	0.4 PAK	0.5 MYS	0.7 MYS	1.2 MYS	1.5
PAK	0.3 IND	0.4 PAK	0.7 PHL	1.1 PHL	1.1
MYS	0.3 VNM	0.4 PHL	0.6 PAK	0.9 PAK	1.0
VNM	0.2 MYS	0.4 IND	0.5 LKA	0.7 LKA	0.9
MMR	0.2 LAO	0.2 VNM	0.5 VNM	0.7 VNM	0.8
THA	0.1 THA	0.2 LKA	0.4 IND	0.7 IND	0.8
LKA	0.1 BGD	0.2 THA	0.4 MMR	0.5 MMR	0.6
PHL	0.1 IDN	0.1 MMR	0.3 THA	0.4 LAO	0.5
BGD	0.1 LKA	0.1 LAO	0.3 BGD	0.4 BGD	0.5
IDN	0.1 PHL	0.1 BGD	0.2 LAO	0.3 THA	0.5
KHM	0.1 KHM	0.1 KHM	0.2 KHM	0.2 IDN	0.2
LAO	0.1 MMR	0.1 IDN	0.2 IDN	0.1 KHM	0.1

Machinery and transport equipment (% of value added in manufacturing)

Country	1980 Country	1990 Country	2000 Country	2010 Country	2016
JPN	21.2 SGP	30.4 SGP	56.9 SGP	54.6 LAO	..
SGP	20.5 KOR	30.2 KOR	41.3 KOR	50.1 VNM	..
CHN	18.5 JPN	24.9 MYS	37.8 JPN	37.5 KHM	..
IND	16.9 IND	17.5 JPN	33.9 HKG	31.5 MMR	..
KOR	9.3 CHN	15.5 THA	25.9 PHL	30.5 THA	..
IDN	8.0 HKG	11.7 PHL	24.9 MYS	27.8 MYS	..
MYS	7.5 THA	10.0 IDN	20.2 IDN	22.4 PHL	..
PHL	6.8 MYS	9.3 IND	15.6 IND	19.1 IDN	..
PAK	5.8 IDN	8.8 CHN	14.1 VNM	14.7 HKG	..
HKG	5.0 PAK	5.2 VNM	11.8 LKA	2.3 CHN	..
THA	3.7 PHL	3.9 HKG	11.7 LAO	..	KOR ..
LKA	2.5 BGD	3.6 LAO	8.0 KHM	..	JPN ..
BGD	1.8 LKA	3.3 PAK	4.6 MMR	..	SGP ..
LAO	0.0 LAO	0.0 LKA	4.0 THA	..	IND ..
VNM	0.0 VNM	0.0 BGD	3.3 CHN	..	PAK ..
KHM	0.0 KHM	0.0 KHM	0.1 PAK	..	BGD ..
MMR	0.0 MMR	0.0 MMR	..	BGD ..	LKA ..

Gross fixed capital formation, private sector (% of GDP)

Country	1980 Country	1990 Country	2000 Country	2010 Country	2016
SGP	34.5 THA	34.2 SGP	27.0 CHN	35.0 CHN	32.9
HKG	27.4 KOR	28.7 LKA	24.8 VNM	26.6 MMR	26.3
LKA	24.3 SGP	26.7 CHN	23.4 IND	25.3 BGD	23.0
KOR	24.0 JPN	24.4 KOR	22.6 BGD	21.6 IDN	22.6
JPN	24.0 HKG	22.8 HKG	21.6 KOR	21.5 LKA	21.6
PHL	21.8 MYS	21.9 VNM	21.6 SGP	21.1 PHL	21.3
MYS	20.5 LKA	18.0 JPN	19.8 IDN	21.0 LAO	21.2
CHN	19.3 PHL	17.7 IND	17.6 HKG	18.1 KOR	20.7
THA	18.9 IDN	16.7 BGD	17.3 THA	17.9 SGP	19.9
BGD	12.1 IND	15.2 PHL	15.9 LAO	17.7 IND	19.7
IND	9.9 CHN	14.6 THA	13.5 LKA	17.6 JPN	18.1
IDN	9.6 LAO	10.5 MYS	13.4 PHL	17.2 THA	17.8
MMR	8.0 BGD	9.5 KHM	11.9 JPN	16.2 VNM	17.7
VNM	7.2 PAK	8.9 PAK	10.3 MMR	14.9 MYS	17.2
PAK	6.4 MMR	8.0 IDN	8.6 MYS	12.3 HKG	16.6
KHM	6.0 VNM	7.2 MMR	8.0 PAK	10.5 KHM	14.1
LAO	3.2 KHM	6.0 LAO	6.3 KHM	9.7 PAK	10.2

School enrollment, secondary (% gross)

Country	1980 Country	1990 Country	2000 Country	2010 Country	2016
VNM	43.4 JPN	94.7 JPN	99.4 JPN	100.4 THA	120.6
THA	27.8 KOR	92.9 KOR	96.0 LKA	96.9 VNM	117.6
SGP	61.1 HKG	73.8 HKG	79.4 KOR	96.3 HKG	102.7
PHL	65.5 SGP	73.8 SGP	79.4 CHN	88.0 SGP	102.7
PAK	17.0 PHL	72.0 LKA	76.5 HKG	87.3 JPN	102.1
MYS	54.7 LKA	72.0 PHL	74.5 SGP	87.3 KOR	100.2
MMR	21.4 MYS	63.4 MYS	69.8 PHL	84.1 LKA	97.7
LKA	53.6 IDN	46.6 THA	62.8 THA	82.4 CHN	95.0
LAO	18.4 CHN	37.4 CHN	59.7 MYS	80.2 PHL	88.3
KOR	75.6 IND	37.3 VNM	57.8 VNM	79.4 IDN	86.0
KHM	18.4 VNM	34.8 IDN	55.1 IDN	74.5 MYS	85.2
JPN	91.6 THA	28.5 BGD	48.0 IND	63.3 IND	75.2
IND	29.0 KHM	27.9 IND	45.1 BGD	50.0 BGD	69.0
IDN	28.3 LAO	23.2 MMR	37.4 MMR	49.5 LAO	66.5
HKG	61.1 PAK	22.0 LAO	34.1 LAO	46.8 MMR	60.5
CHN	43.0 BGD	20.4 PAK	22.8 KHM	45.2 PAK	46.1
BGD	18.5 MMR	20.0 KHM	17.3 PAK	35.8 KHM	45.2

Mortality rate, infant (per 1,000 live births)

Country	1980 Country	1990 Country	2000 Country	2010 Country	2016
JPN	7.4 JPN	4.6 HKG	3.0 HKG	2.2 JPN	2.0
HKG	11.9 HKG	6.2 SGP	3.0 SGP	2.2 HKG	2.2
SGP	11.9 SGP	6.2 JPN	3.3 JPN	2.4 SGP	2.2
MYS	25.7 KOR	13.5 KOR	6.4 KOR	3.5 KOR	2.9
KOR	29.7 MYS	14.3 MYS	8.7 MYS	6.8 MYS	7.1
LKA	39.7 LKA	17.9 LKA	14.1 LKA	9.7 LKA	8.0
VNM	46.4 THA	30.9 THA	19.6 THA	12.8 CHN	8.5
THA	47.3 VNM	36.7 VNM	23.6 CHN	13.5 THA	10.5
CHN	48.2 PHL	40.8 PHL	30.0 VNM	18.6 VNM	17.3
PHL	53.4 CHN	42.2 CHN	30.1 PHL	24.9 PHL	21.5
IDN	85.0 IDN	62.0 IDN	41.1 IDN	27.5 IDN	22.2
MMR	97.8 MMR	81.8 BGD	64.0 KHM	37.8 KHM	26.3
IND	114.3 KHM	84.8 MMR	65.6 BGD	39.1 BGD	28.2
KHM	116.2 IND	88.4 IND	66.6 IND	45.5 IND	34.6
PAK	124.0 BGD	99.7 KHM	79.6 MMR	49.3 MMR	40.1
BGD	133.6 PAK	106.2 LAO	82.5 LAO	58.5 LAO	48.9
LAO	135.5 LAO	110.7 PAK	88.1 PAK	73.6 PAK	64.2

APPENDIX2 VARIATION OF GDP STATISTICS

There are many kinds of GDP related statistics. GDP is domestic product and GNI is national income. For the discussion of middle income trap, some people use GDP and other people use GNI (Yamasawa 2013). If we focus on multinational companies, GNI is appropriate, but it will be difficult to distinguish between competitiveness of countries and competitiveness of companies. GDP is appropriate measure of competitiveness of countries.

There are nominal or current price GDP and real or constant price GDP. Because nominal value is fluctuated by the domestic price, constant price GDP is appropriate. Current US dollar basis GDP is influenced by not only domestic price but exchange rate. PPP basis GDP is influenced by domestic/foreign price difference in addition.

International comparison requires a unified unit, which may be dollar-based or purchasing power parity (PPP)-based. We have adopted the dollar as a measure that is exchangeable via trade. A PPP-based measurement indicates the strength of a country's domestic purchasing power, but for international comparison a measurement that is based on the internationally arbitrated dollar value is more appropriate.

Note that for the constant price basis, the growth rate are the same among PPP basis, US dollar basis and local currency basis.

We conclude that increase in GDP per capita measured by constant US dollar is the best for the ranking of competitiveness.

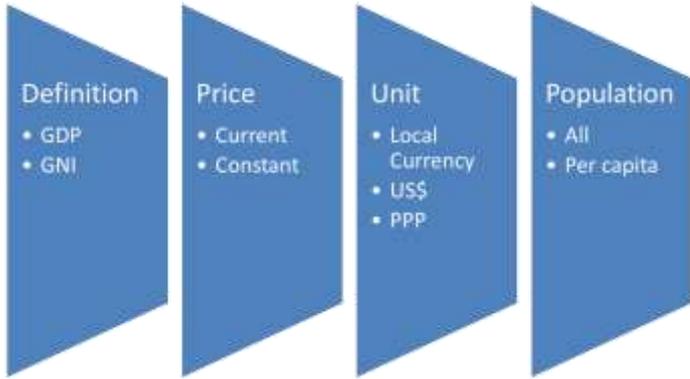


Figure5 GDP related Statistics

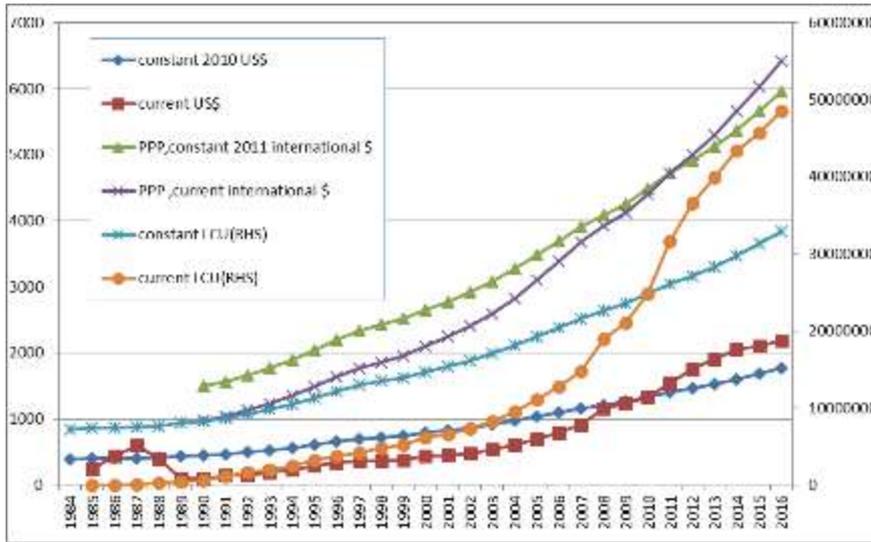


Figure6 GDP per capita

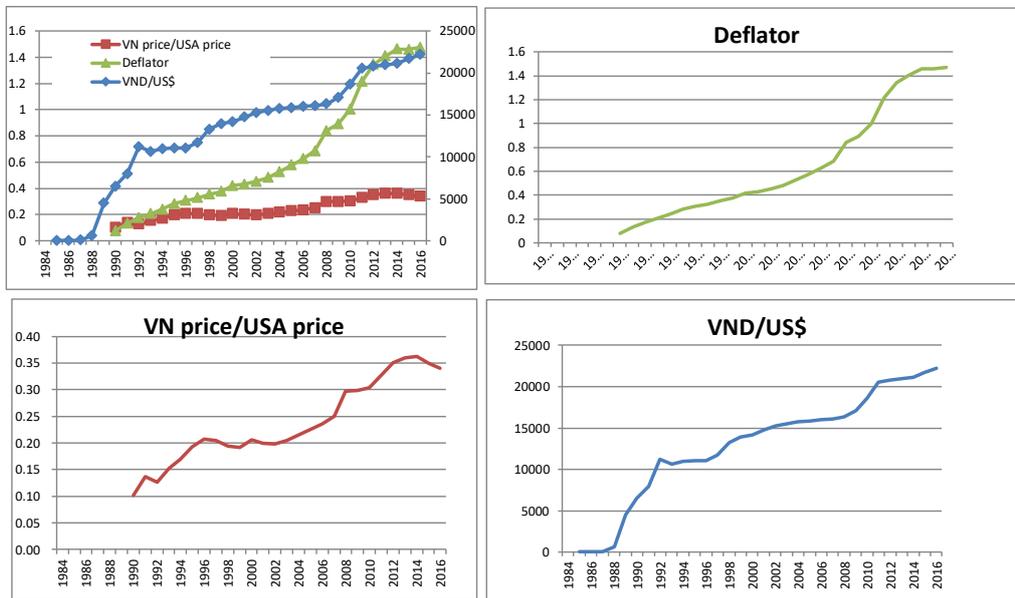


Figure7 Factors that affect nominal GDP

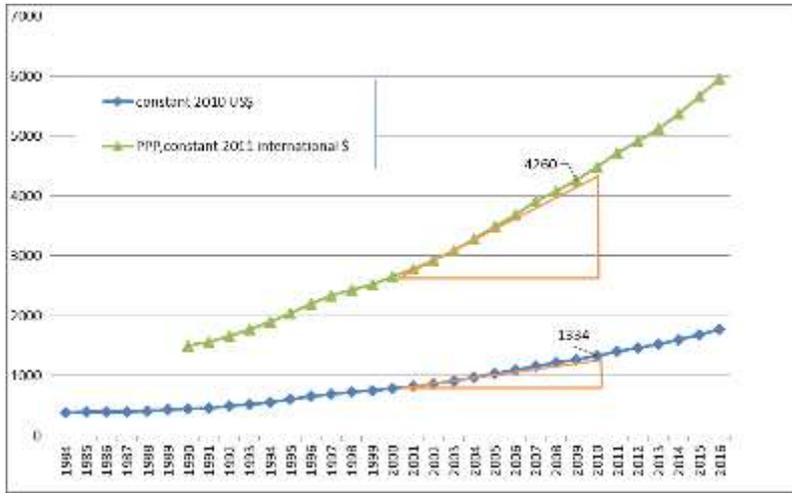
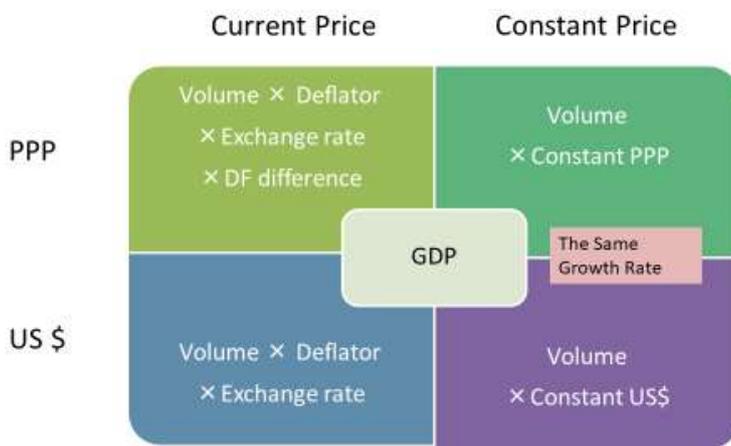


Figure8 US\$ basis VS PPP basis



DF difference : Domestic/foreign price difference

Figure9 Variations of GDP

1750 WASTE OF WOODEN FURNISHING INDUSTRY: STRATEGIES TO IMPLEMENT SUSTAINABILITY AND SOCIAL RESPONSIBILITY – THE CASE STUDY OF THE JOINERIES IN UBERLÂNDIA, BRAZIL

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ABSTRACT

In Brazil, the wooden furnishings industry is comprised of approximately 16,000 companies of various sizes. It is estimated that most furniture companies (84%), consist of MSEs - Micro and Small Enterprises, are cabinetmakers performing customized work. Currently, these companies use MDF - Medium-Density Fibreboard as their main raw material. Brazil is the world's seventh largest producer of reconstituted wood panels in the world; in 2016, the production was 7.98 million cubic meters. A large part of this production (95%) goes to the domestic market. This paper presents partial results of a research project, from the diagnosis phase performed in joineries, small furniture companies in the city of Uberlândia, Minas Gerais State, Brazil. The production process of these joineries is not sustainable and results in a large volume of discarded waste on the outskirts of the city. In July 2016, there were 99 points of irregular disposal of waste of various types. This practice occurs, mainly, due to the low social and environmental awareness of cabinetmakers, and due to the lack of proper management of industrial waste by the municipality. The insertion of a set of ecodesign strategies in the MSEs can promote greater competitiveness for companies generating new business opportunities, creating more favourable conditions of competition among companies of the sector, improving their income while simultaneously promoting commitment and the sharing of responsibility (social, environmental, cultural) by all stakeholders. In this case, it is noted that the progress of these furniture MSEs depends fundamentally on minimising the generated waste of materials and this can only be achieved by the implementation of new practices and cultural/mentality changes; also by greater cooperation among small companies and designers, aiming a sustainable development, innovation and entrepreneurship; to focus on the human beings to establish regional and urban policies. To obtain more efficient results, we have to face the problem of the waste generated by these small familiar joineries focusing on people, integrating them in the system and not only by producing laws and guidelines. The project we have been developing with some of these joineries and the local furniture unions shows that with some specific changes and the use of a language that the cabinetmakers understand, we can achieve our goals for a more sustainable regional development and social integration.

Keywords: Cooperation and Development, Environmental Issues, Innovation and Entrepreneurship, Social integration, regional development, sustainability.

1- INTRODUCTION



Source: Adapted from IBGE (2008)

Fig. 1 - Mesoregion of the Triângulo Mineiro and Alto Paranaíba located in the western region of Minas Gerais - Brazil.

In the Triângulo Mineiro region, located in the west of Minas Gerais, Brazil, there are about eight hundred Micro and Small Enterprises – MSEs of furniture whose production is essentially tailor-made, guided by personalized projects. However, professional practices, as well as manufacturing processes, are not driven by sustainable production, a situation that has generated a large volume of waste discarded irregularly on the outskirts of cities.

The waste from the furniture sector in the region consists mainly of remnants of reconstituted wood (sawdust and flakes from particle boards and Medium Density Fiberboard - MDF) and generates approximately 20,000 m³ of waste annually (Nunes, 2013). The large number of furniture MSEs, sprayed over a vast territory and the small size of these productive structures, make it difficult to raise awareness. However, the problems caused by this circumstance are not limited to the large volume of waste; one should also consider the health risks of woodworking workers due to inhalation of small particles of wood containing a toxic and carcinogenic substance called formaldehyde which is used in the production of reconstituted wood plaques. In addition, the accumulation of residual dust, if neglected, can create fire hazards due to its flammable characteristic. Studies show that, in order to solve this problem, only environmentally adequate waste generated by the industries is not enough. In this sense, "it is fundamental to reduce the source of the consumption of resources, fundamentally aiming at reducing waste and, consequently, reducing the impact on the environment." (Pereira, Carvalho & Pinto, 2010: np)

The inclusion of design as a strategy for sustainability is considered by several authors as fundamental for minimizing environmental impacts at all stages of the product life cycle. The bottleneck of the issue is that most of the existing tools are directed to the design and production of large-scale products. In addition, given the geographic, economic, social and cultural differences of each region, it is understood that the insertion of sustainable design in local contexts and/or non-industrial production scales is indispensable to enhance the specificities of the region's carpenters, minimizing solid waste, waste of materials and environmental damage caused by the lack of management of waste generated by the furniture industry.

In view of the above, this research intends to develop a sustainable strategic design model for furniture MSEs in the Triângulo Mineiro region. The model will involve a set of interdependent variables with the objective of aligning different aspects of design that will have sustainability as main pillar. We hope the model will be developed in a participatory way, involving the various interested stakeholders (carpenters, manufacturers, designers, unions, universities, and local public authorities). It is therefore important that trade unions and trade associations, manufacturers, carpenters and designers contribute with important information for this research and the generation of ideas for the management of design solutions. The involvement of the communities most affected by the irregular disposal of waste and the support of local public authorities will also be of great importance. In this way, it is intended to integrate the theoretical knowledge to the practices of sustainability favoring the exchange of knowledge and the transfer of innovation to the personalized (or customized) furniture sector.

The important consumer market for residential furniture on demand in the Triângulo Mineiro region has subsidized a significant number of furniture manufacturers, around eight hundred companies, formal or informal. According to the diagnosis made by Senai (2006), the segment of residential furniture by order accounts for 84% of the turnover of the sector of the region. However, most of these micro-enterprises have no knowledge on how to use sustainability practices in their business. An example of this is that the MSEs in the region have not only generated great quantities of waste per year, but also have been disposing it in the outlying areas of the cities of the state of Minas Gerais (Nunes, 2013). This situation has contributed to aggravate the living conditions of the populations that live in the cities peripheries of the State.

Residues from the furniture sector in the region are mainly composed of remnants of reconstituted wood (sawdust and flakes from particle board and MDF). However, the problems caused by the abandonment of debris without any treatment and outside the places previously prepared to receive them are not limited to their volume: it is a public health problem. This is because it should be considered that the practice of irregular dumping of these wastes in the periphery of cities and the burning of fire as a way to clean the land emits toxic substances in the atmosphere and increases the risk of uncontrolled fire due to high flammability of sawdust. This makes this factor very significant for the worsening of the living conditions of populations that subsist on the poverty line or below that threshold, both from the symbolic point of view (treating them as garbage) and from the social point of view (encouraging degradation of public space, cause and effect of risky or socially deviant behavior).

2- FURNITURE INDUSTRY: INTERNATIONAL AND NATIONAL SCENARIO

The world furniture industry is characterized as a sector composed mostly of small and medium-sized enterprises, with a high degree of specialization and that demand intense labor and can therefore have a positive or negative impact on the employment rate of an economy (Crocco & Horácio, 2001). The sector is formed by large productive chains, which are able to offer important gains of scale and agility in the stages of the productive process. Generally, smaller firms manufacture and supply components and accessories for larger companies, allowing greater efficiency and flexibility of production with the horizontality and agility of the productive processes.

The introduction of new automated equipment, business management techniques and increased horizontal production contributed to productivity in the furniture industry, made processes more flexible with the production of several types of products on the same production line, and reduced industrial costs. All these transformations, combined with the introduction of a wide variety of raw materials and finishes made possible by the introduction of MDF, MDP and other materials, contributed to the mass consumption of furniture, especially the standardized rectilinear furniture that compete in a market determined by the lowest price. These furniture pieces are designed so that the assembly could be carried out by the user, eliminating the figure of the assembler. At the other end are the furniture pieces that seek to distinguish themselves through design, pursuing the strategy of differentiation and exclusivity, as in the case of Italian companies. Therefore, the competitiveness of furniture companies is due to the high degree of specialization and employed technology, the application of new materials, the development of commercial and distribution strategies and, above all, the introduction of design (Gorini, 1998).

At National level, despite the diversification, the production chain of the furniture industry has a historical specialization in the production of articles made from wood, due to the abundance of inputs of forest origin in the country (Galinari et al, 2013). However, due to environmental and legal restrictions for obtaining solid wood, the manufacture of wood panels (agglomerate, MDF, MDP, etc.) produced from reforested pine and eucalyptus has been expanded in Brazil. According to information from the Brazilian Tree Industry - IBÁ, the production of reconstituted wood panels (MDF, MDP, etc.) in Brazil in 2015 was 7.98 million m³, of which 95% was destined to the domestic market. Brazil is the seventh largest producer of reconstituted wood panels in the world (IBÁ, 2015).

The follow-up of wooden furniture in Brazil consists of approximately 16 thousand companies of various sizes (Movergs, 2014) that produced 476.2 million pieces in 2013 (IEMI apud Capistrano, 2014) and are sprayed all over the national

territory (Galinari et al, 2013; Leão, 2009). However, most of these companies are concentrated mainly in the South and Southeast regions. In these regions are also located the main furniture poles that produced a total of 282 million pieces in 2013: Bento Gonçalves -RS (17.7%), São Paulo metropolitan region (9.1%), Araçuaia-PR (8, (5.8%), Greater São Paulo - SP (6.6%), Ubá - MG (5.9%), Curitiba - PR (3.8%), São Bento do Sul - SC -ES (2.4%), Belo Horizonte - MG (1.5%), Lagoa Vermelha - RS (0.8%), Rio de Janeiro - RJ (0.2%). These data refer to the percentage of pieces produced on the total of the poles (IEMI apud Capistrano, 2014).

It is estimated that around 13,500 furniture companies are predominantly made up of formal micro and small enterprises with vertical and unskilled production processes. (FIEMG, 2002; Garcia, 2005)

The number of large establishments with more than 500 employees would be almost irrelevant. These companies have carried out the gradual introduction of high technology, but most of them still use outdated equipment and production systems (FIEMG, 2002). Even large companies are basically servicing the domestic market, due in part to the high prices of wood panels in the domestic market (Leão, 2009); the low technology employed; and the lack of product differentiation due to the lack of investment in design, with the predominance of imitation products (Castro & Cardoso, 2010; Crocco & Horácio, 2010; Galinari et al, 2013; IEL, 2002). One of the main obstacles to the development of Brazilian companies concerns the lack of insertion of the design to support the conquest of new markets and the creation of a Brazilian design.

Between 2009 and 2013, there was a 23.3% increase in the number of companies involved in the follow-up of wood furniture in operation in the country and production growth was 28.7%. In 2013, the furniture sector showed a 3.4% increase in the number of pieces produced compared to 2012. Between 2009 and 2013, the average production growth was 6.5% per year (IEMI apud Capistrano, 2014). The product lines that presented the greatest growth of production in the period were furniture for living room with 40.5%, furniture for kitchen and others with 35.3% (MOVERGS, 2014). This growth can be explained by the stabilization of the Brazilian economy in the period and by the expressive migration of consumers from class D to C. Residential furniture accounts for approximately 73% of the total production of the sector, with the remainder composed of office furniture (18 %) and institutional furniture, for swimming pools, terraces, gardens, etc. (9%). According to Galinari et al (2013), the expressive participation of the national furniture industry in the employment levels and the dissemination of the furniture production chain throughout the country demonstrate the importance of the sector to the Brazilian economy.

IEMI estimates that approximately 76% of furniture companies in Brazil in 2011 manufactured standardized products (produced in series and without the possibility of personalization by customers). However, since then there have been changes in the Brazilian real estate market with the reduction of useful areas of the real estate, valuing the solutions offered by the furniture made to measure that maximize the use of space (GALINARI et al, 2013). Due to the spraying of these companies across the national territory and the large number of microenterprises that work in informality, it is believed that the manufacture of furniture under measure is much more expressive.

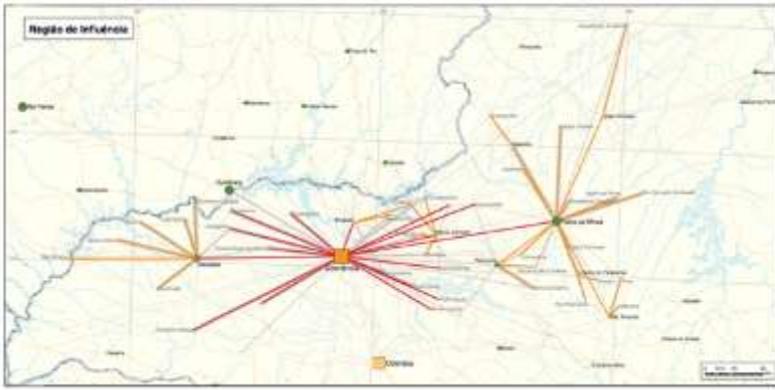
The growth of the furniture sector in recent years, between 2009 and 2013, was driven by the increase in the income of Brazilians; the temporary reduction of the IPI - Tax on industrialized products; the growth of civil construction - especially with the contribution of the *My Home My Life* program of the Federal Government, leveraging the real estate market and the consumption of durable goods. With the adverse political and economic scenario faced by Brazilians since the beginning of 2015, there is a slowdown in the national furniture production.

3- THE SCENARIO OF THE TRIÂNGULO MINEIRO AND ALTO PARANAÍBA

3.1 Characterization of the region

An expressive amount of furniture MSEs is located in Minas Gerais, in the region of Triângulo Mineiro and Alto Paranaíba - TMAP. The Triângulo Mineiro region is located in the western region and the Alto Paranaíba in the eastern region. The mesoregion is made up of sixty-six municipalities, seven of which are considered microregions, due to their different production, distribution, exchange and consumption structures, namely: Uberlândia (662,362 inhabitants), Uberaba (332,126 inhabitants), Araguari (116,267 inhabitants) , Patos de Minas (148,762 inhabitants), Araxá (102,238 inhabitants), Ituiutaba (103,333 inhabitants), and Patrocínio (88,648 inhabitants). The region of the Triângulo Mineiro and Alto Paranaíba, with its 66 municipalities, totals an estimated population of two million inhabitants, and has an area equivalent to 53,719 km² (IBGE, 2015).

According to IBGE (2008), Uberlândia is the second largest municipality in the state of Minas Gerais, with the third highest HDI (0.789) in the state and is the most influential city in the Triângulo Mineiro and Alto Paranaíba region. The city is considered a regional capital due to the intensity of flows of consumers who are going to the city in search of goods and services. The municipality is referred by a large number of neighboring cities as being the main destination for the realization of a diverse set of activities in the areas of health, education, commerce, services, entertainment, among others. Therefore, Uberlândia became an attractive pole of migration of populations of increasingly diverse regions (IBGE, 2008; SMPU, 2013), housing a contingent of people mainly from other regions like Minas Gerais, São Paulo, Goiás and Bahia (Guimarães, 2013).



Source: Adapted from IBGE (2008).

Fig. 2 - Region of influence of the city of Uberlândia-MG in the Triângulo Mineiro region.

Uberlândia consolidated its regional centrality, mainly due to its strategic geographical position in the regional and national context, as the city is served by a road and rail network and an Intermodal Cargo Terminal that links the city to the main markets of the country and the world (SMPU, 2013). Its position as a junction of several highways easily interconnects the city to the three main Brazilian urban centers - Belo Horizonte, São Paulo and Rio de Janeiro.

The region of the Triângulo Mineiro and Alto Paranaíba presents a relevant economic and social performance in the national, state and regional scenario. In 2010, thirty-seven cities in the region had per capita values above the national average. Its diversified activities make the municipality capable of attracting great migration and investments. Its economy is mainly driven by a network of commerce, services, industries (agroindustrial, food, sugar, alcohol and tobacco), telecommunications, education, health and the modernization of commercial agriculture. An excellent communication infrastructure (radio, television and press) and event reception (congresses, festivals, sports games) also help in its capacity to influence, disseminate products, ideas and events. This diversity of economic activities act as centripetal and centrifugal forces in their region of influence that attract investment and trade flows (Guimarães, 2013).

3.2 Furniture MSEs (Medium and Small Enterprises) in the region

The region of the Triângulo Mineiro and Alto Paranaíba groups an expressive amount of furniture EPEs. The SINDMOB - Furniture Industry Union of the Triângulo Mineiro and Alto Paranaíba has about eighty associated companies and seeks to promote, mainly, lectures, exhibitions and trips for companies in the sector. In 2006 SINDMOB in partnership with SENAI and SEBRAE carried out a diagnosis of the furniture industries of the region. Estimates made by SINDMOB indicate the existence of approximately 200 formal furniture MPEs. However, as presented by the national furniture scenario, it is estimated that the number of furniture companies is much larger, around eight hundred MEPS, due to the informality of most of the industries in the sector (verbal information). The sector is characterized by the predominance of micro and small enterprises, 96% are micro enterprises (up to 19 employees) and 4% are small (from 20 to 99 employees), and by the small number of employees - an average of 6.2 employees per (SENAI, 2006).

The production of MSEs is essentially made-to-order and custom-made furniture. The diagnosis carried out by SENAI (2006) confirms the predominance, in the region, of companies that produce custom furniture and on order 94%. Of the other companies, 3% produce in series on demand and another 3% produce furniture in series with its own product line.

Tailor-made furniture producers consist mainly of small and micro-sized family-owned enterprises with a very small number of employees, with a low degree of specialization and low-tech production, a high level of technical qualification, and the flexibility to meet the specific needs of each client (Dal Piva, 2006; SENAI 2006). Its structure is also essentially characterized by verticality and low technological level. The process of production of the joinery is practically semi-handmade, resulting in a customized final product that fits the defined functions and spaces. They usually result in quality furniture and therefore high cost but still compete with the high-tech companies that produce modular furniture (Dal Piva, 2006).

It is important to consider that production systems have a low degree of specialization, production of low technological level and occur vertically, that is, different production processes are carried out by the same company. This process requires a series of steps that begins: with the analysis of the project, which is prepared by a professional (usually a designer or architect) or by the carpenter himself; then cost calculations are performed; the individual negotiation of each piece of furniture; visit at the customer's house for measurements; calculation and purchase of raw material; accompaniment of all the production until the transport and the assembly - that often is finalized in the residence of the own client. Generally, all this process is carried out by the owner of the joinery that participates in the entire production chain.

Dal Piva (2006, p. 17), points out some advantages of the custom-made manufacturing process:

- The customer finances the manufacturing making part of the advance payment;
- The furniture is personalized (customized);
- The furniture occupies better the space of the residence;
- There is greater profitability per unit of manufactured product;
- The administrative structure of the company is lean;

- There is polyvalence of the joiner.

However, the exclusivity of the products and the low use of technology do not allow for the standardization (reduction of the variety of parts economically) and the interchangeability (ability to use parts for use in the same product or in different products) economical way. The advantages of standardization are that it allows loss reduction, rationalization of production, reduction of costs and quantity of items in production. On the other hand, standardization does not allow the fulfillment of all customers' wishes, limiting the diversification that is a major trend in the current market.

Tailor-made manufacturing requires a large number of operations and specialized labor, which increases the cost of the product and makes small carpenters unable to compete with large manufacturers. In this sense, the main disadvantages of the custom-made furniture manufacturing process are highlighted (Dal Piva, 2006, p. 18):

- There is an excess of manual operations;
- Lack of productive machinery;
- The acquisition of raw material and inputs is done by means of small quantities acquired from intermediaries, whose price is always higher;
- Specialized workforce is rare;
- There is low productivity;
- The product has an excess of raw material, making it inaccessible to most people;
- There is a need for professionals to design special projects.

The main raw material used by carpenters is the panels of reconstituted wood, mainly the MDF due to characteristics such as: ease of machining, which allows the manufacture of pieces with profiled edges or cushioned doors; dimensional stability; versatility of colors, diversity of finishes and textures; ease of finishing as painting, among other advantages (Dal Piva, 2006; SENAI, 2006; SENAI, FIEMG & Masisa, 1997). The MDF is mainly used for the manufacture of cabinet doors or furniture in general, drawer fronts, and tops that need machining of the profiles. Despite the existence of a plate factory in the city of Uberaba, most companies, around 80%, acquire panels of local reseller companies due to the small volume of purchases made to each customer (Oliveira et al, 2012).

Most carpenters in the region (86%) produce residential furniture (furniture for dormitories, kitchen and residential furniture in general), 2% manufacture office furniture, 1% work on furniture remodeling, and 11% produce other product types (pool table, lay boxes, among others). These products are mainly destined for the local market, in a fierce competition based on prices - 66% of sales are made in the city where the company operates, 26% in other cities in Minas Gerais, and 8% of sales are for other states (SENAI, 2006).

The sector also depends on a support structure for the production process involving: machinery and equipment; third party services such as equipment maintenance, transportation, graphics, accounting, computer and design; raw materials and accessories such as varnish, paints and various wood panels. Among these services, industries mainly consume accounting (73%), maintenance of machinery and equipment (32%), transportation of goods (30%), and design (23%) (Oliveira et al, 2012).

Regarding design, 72% of the furniture companies in the region claimed to make use of furniture development, however, design is still not perceived as a key factor for the success of the activity (SENAI, 2006). However, it was not clear from the research that these firms employ design, and therefore this requires further investigation. What is observed as the most common practice in the region is: (i) the development of custom designs by the designers and subsequent indication of the services of the carpenters; (ii) carpenters who outsource the design projects to assist customers who directly seek the joinery; (iii) carpenters who develop their own projects, through trainees with training in design; (iv) carpenters who develop their own projects, through a designer without design training.

Therefore, the furniture sector of the Triângulo Mineiro and Alto Paranaíba region is characterized by the predominance of micro and small companies that produce furniture under measure, production of low technological level, and lack of investment in design. All these facts reduce the productivity and competitiveness of these companies and make most of the production go to the market of the region itself, in a fierce competition based on prices.

4- FURNITURE WASTE

If on one hand the furniture sector generates a large number of jobs, on the other, it is also considered a major consumer of raw materials and waste generator. The industry makes integrated use of materials that, due to their distinct nature and lack of an adequate management plan, end up hampering reuse, recycling and other forms of appropriate final disposal. The most commonly used materials are wood derivatives (solid wood, wood veneers, plywood or particle board, reconstituted wood panels such as MDF and veneers); metals used in handles, hinges and slides; chemicals (paints and varnishes, glues and resins); plastics (edge ribbons, laminates, handles, etc.) and textile fabrics and leathers (natural and synthetic). (Nahuz, Figueroa & Lelo, 2002; Kozak et al, 2008)

In addition to the diversity of materials, the production of customized furniture requires a number of productive processes such as machining (cutting, drilling, milling,); sanding; assembly (fixing and gluing); transport; and cleaning. These processes generate a large volume of waste of various types (sawdust, dust, panel patches, edge ribbons, packaging debris, bolts, glues and taws).

The estimated annual volume of waste from the furniture sector of Uberlândia and region corresponds to approximately 22,000 m³, of which a significant part is composed of residues of wood (dust, sawdust and MDF flaps). The presence of

urea-formaldehyde or phenol-formaldehyde used in the composition of reconstituted wood panels, requires special attention due to the fact that this resin is part of the International Agency for Research on Cancer (IARC) list of carcinogenic products.

For all this, the joineries of the Triângulo Mineiro and Alto Paranaíba have an expressive environmental liability, mainly due to the irregular disposal of residues on periphery lands of the cities of the region. This practice stems from factors such as: municipal policy, not sensitive to environmental issues; the lack of municipal management aimed at the adequate disposal of this type of waste; the resignation of the most needy people who live in the neighborhood of these ditches; the reduced or no interest in assuming the share of environmental responsibility on the part of the entrepreneurs of MSEs in the region and the weak social and environmental awareness of designers about the environmental impacts of their projects.



Source: The author

Fig. 3 - Locations in the outskirts of the city of Uberlândia, used for irregular waste disposal.

According to the diagnosis made by SENAI (2006), 90.8% of the furniture manufacturers in the region rest industrial waste, 3.7% sell them and only 5.5% recycle. In July 2015 the municipality had ninety-nine critical points of irregular dumping of indistinct waste, distributed mainly in public areas of the city. It is understood that these facts do not exhaust a very complex conjuncture, difficult to transform. Targeting the generated waste in an environmentally sound way is not enough to solve the problems dealt with: "reducing the source of resource consumption is fundamental, aiming, fundamentally, to reduce waste and, consequently, reduce the environmental impact". (Pereira, Carvalho & Pinto, 2010)

However, in the specific case of the Triângulo Mineiro region, few actions have been taken to combat the advance of environmental degradation. In addition, there is a lack of tools to train, educate, guide and foster a new local culture that favors responsible positions on the part of professionals and micro and small industries, regardless of the sectors of activity.

4.1 Consequences of poor management of woodworking waste: social, environmental and economic impacts

However, the problems caused by the abandonment of debris without any treatment and out of places previously prepared to receive them are not limited to their volume. The consequences of the poor management of woodworking waste also cause social, environmental and economic impacts as described above. With regard to social impacts, it is also important to consider public health risks from the toxicity of substances used in the production of reconstituted wood plaques. Formaldehyde, for example, is a carcinogenic solution used as an adhesive resin in the production process of this type of material (Pereira, 2013). Due to the use of formaldehyde-containing resins, the formaldehyde emission occurs both through the manufacturing environment and through the plates produced with these resins. (Maloney, 1993)

Special control and concern should also be devoted to the health of joineries' workers due to the risk of inhalation of small particles of reconstituted wood containing formaldehyde. In addition, the accumulation of residual dust generates fire hazards, if neglected, due to its flammable characteristic. Santos and Dias (2012, p.8) affirm that "the existence of a significant contingent of people who extract from their residues their main source of survival, adds to the problem of waste a socio-cultural and anthropological dimension, which, together with environmental and sanitary impacts, requires strict consideration".

Joineries also suffer financial losses due to the lack of adequate management of their waste and, mainly, the waste of raw material caused by the lack of optimization of the wood panel cuts, inadequate separation and storage of the parts that can be reused.

Environmental, economic and social issues must be considered when analyzing the consequences of the practice of irregular waste disposal by the woodworkers on the outskirts of cities aggravated by the common practice in the region of firing with the intention of carrying out land cleaning. The problem of the conjugation of these practices consists in the emission of particulates and GHGs in the atmosphere that increases the risks of uncontrolled fire due to the high flammability of the waste in the form of sawdust. This makes this factor very significant for the worsening of the populations' living conditions that subsist on the poverty line or below that threshold.

5- STRATEGIC THINKING

The term strategy has been used differently over the years, and in different fields (administration, marketing, military, design) but there is no universally accepted definition. In recent works, Mintzberg, Ahlstrand and Lampel (2008) and Mintzberg et al (2002) investigated the origins of the strategy and the views of different currents of thinking from five definitions: strategy as a plan, as a pretext, a standard, a position or a perspective. The first and most traditionally used definition is strategy as a plan, understood as an intention, a guideline, or a set of guidelines designed to deal with a specific situation. Strategies are formulated consciously, before the actions to which they will be applied. Therefore, they are also considered as future plans of the organizations, ie, intended strategies (Mintzberg et al, 2002). The definition presented by Glueck (1980), from the administration point of view, reinforces this vision. For the author, strategy is a unified, broad and integrated plan that can determine, through a normative model, which actions and / or human and material resources are needed to ensure that the company's goals are achieved. This vision is also strengthened in the field of design. For Best (2010), the strategy is a plan that describes how the company intends to fulfill its mission and vision vis-à-vis different parts of the organization. Bruce and Langdon also understand the strategy from a plan:

A strategy is a declaration of intent, defining where you want to be in the long-term. (...) Without a strategy, decisions made today could have a negative impact on future results. (...) Strategy concerns itself with what is ahead, looking at where you are going, and how to get there. (Bruce & Langdon, 2000, pp. 6-7)

However, Mintzberg, Ahlstrand and Lampel (2008) and Mintzberg et al (2002) criticize this point of view because they consider that the desired strategies are not always realized. In this sense, they believe that, in practice, strategies are composed of a combination of "deliberate strategies" (characterized by fully implemented guidelines), "unrealized strategies" (characterized by unfulfilled directives) and "emerging strategies" (irrespective of the guidelines, and it was not provided for in the guidelines). Most of the implemented strategies involve both deliberate and emerging issues. Zurlo (2012) shares this position by stating that in practice there is often a gap between a strategic decision and its achievement.

The progressive formulation of the strategy is more useful for the incorporation of design in the company in the long term, because the emerging strategies allow the insertion of design ideas in a collective process of consensus building among stakeholders. For Mozota (2003), strategic design is a factor of competitiveness and differentiation for companies, it means contributing to the organizational culture of companies, seeking opportunities for innovation and identity, offering a unique combination of value. According to Zurlo (2012), strategies are interpreted in different ways and can be associated with a plan or set of followed actions and precise results; as a model, where entrepreneurs seek a reference in other organizations that represent the best in certain areas; and as positioning, where companies must find a place in the market and differentiate themselves from competitors, in line with Porter's (2008) competitiveness vision. However, when the strategy is associated with a plan, it reiterates the necessity of adapting the guidelines, since the conception of strategies does not always coincide with reality, and in this case, it is necessary to change direction.

Strategic design is seen as an interdisciplinary field that can interact on various business activities with the purpose of generating value, allowing companies to enter a new market or increasing their participation in it and, for this reason, plays an important role in the transition process towards sustainability (Mozota, 2003). According to Best (2010), design acts in an integrated way with other disciplines and professions and provides an integrative and holistic approach on the cultural, environmental, political and social impact of the organizations. In addition, strategic design can generate eco-projects that are technically and economically viable, reorienting production and consumption systems to the formation of a more sustainable mindset. (Manzini & Vezzoli, 2008)

Based on studies of European design-oriented MSEs, Mozota (2006) presents a Design value model as differentiator, integrator and transformer, called the four powers of design: 1. Design as differentiator - design as a source of competitive advantage in market by creating value for the brand, higher price, loyalty or customer orientation; 2. Design as an integrator - design as a resource to improve product / process development, developed to favor modular design, to develop user-driven innovation models and project management; 3. Design as transformer - design as a resource to create new business opportunities, to improve the company's ability to face changes, or as expertise to better interpret business and the market; 4. Design as good business - design as a source of sales increasing, better profit margins, greater value for the brand, greater market share, better investment return; design as a resource for society (inclusive design, sustainable design).

6 CHALLENGES AND OPPORTUNITIES IN THE INSERTION OF THE STRATEGIC DESIGN IN THE FURNITURE MSEs

In Brazil there is a very complex and difficult situation to transform and overcome for the implementation of strategic design in the business sector. This is due to facts such as lack of interest and commitment from relevant partners (local public leaders, associations, NGOs). In addition, in the specific case of the furniture sector of the city of Uberlândia and region, it was possible to identify some of the main obstacles presented by the MSEs themselves: 1. Lack of interest of the stakeholders to dedicate a coordinated effort to solve common problems together; 2. Lack of motivation induced by poor understanding of sustainability aspects or lack of recognition of the importance of design for their business; 3. Difficulty in continually taking on the proposed practices, modifying internal policies and assuming co-responsibility with others; 4. Low confidence, transparency and belief in mutual efforts to achieve group goals; 5. Cultural and behavioral resistance to organize and carry out changes in productive processes; 6. Lack of understanding about the value or need to invest time and financial resources in the design process.

However, it is important to consider that these companies, mainly composed of MSEs of family origin, with low degree of specialization and production of low technological level, most of them face many difficulties to remain in the market. There is still a dichotomy between the perspectives of design application in the business sector and its implementation, and a general lack of conviction about the application of design as a tool for business management and as a factor of innovation. The fact is that the importance of design for organizations is still little recognized by corporate managers (Mozota, 2006). One of the biggest problems hindering the insertion of the design in the companies "resides in the lack of knowledge on the part of the entrepreneurs, of the design meaning and what can be changed in the company, besides some prejudices, as, for example, that the design is expensive" (Santos & Menezes, 2009, p.97).

6.1 Strategies for the development of sustainable products

The insertion of sustainable design strategies in local contexts and non-industrial production scales is very relevant for companies and indispensable for reducing the generation of solid waste, material waste, pollution and environmental damage caused by production of customized furniture. According to Fiksel (2009), sustainable design practices not only represent ethical behavior and good citizenship but, above all, a business value strategy. This principle of generating value and economic benefits for companies is known as eco-efficiency - doing more with less. It is part of this perspective to reduce the consumption of resources (energy, materials); to reduce environmental impact (reduce emissions, waste and use of renewable resources); and to create value (providing better products, additional services, offering benefits to customers). Several corporations around the world already recognize sustainability as a way of developing, growing and surviving businesses and their ability to stimulate new business opportunities, improve competitiveness, increase customer confidence, and motivate employees, local communities, partners, etc.

Organizational changes for the implementation of eco-efficient design strategies also favor innovation and can offer a greater capacity to attract customers, as it improves the image of the organization and allows them greater profitability through the reduction of environmental impacts, among other issues. All these benefits obtained by adopting the principles of design and sustainability need to be integrated at a strategic level so that they can act more effectively. (Bhamra, 2007)

Ecodesign strategies aimed at a systemic approach involving all stages of product life should be considered during product design. In this sense, whenever possible, designers should apply a set of ecodesign strategies involving the entire product life cycle, i.e., considering the stages of pre-production, production, distribution, use and disposal.

According to strategies presented by several authors (Barbero & Cozzo, 2009; Behrendt et al, 1997; Bhamra, 2007; Brezet & Hemel, 1998; Fiksel, 2009; Gilsbert & Garcia, 2004; Manzini & Vezzoli, 2008), it was possible to identify seven key strategies and their tactics for the development of sustainable products: 1- the choice of low impact materials; 2- reduction in the consumption of materials (raw materials and energy); 3- optimization of production; 4- optimization of the distribution; 5- optimization during use; 6- extension of product life; 7- product end-of-life optimization.

Despite the potential benefits of sustainable design strategies, Braungart and McDonough (2002) strongly criticize these practices that aim to make products or systems less destructive. According to the authors, these strategies are fatally limited and advocate the cradle to cradle approach - from cradle to cradle, where materials and products must be developed as biological nutrients (which can be consumed by micro-organisms or other animals) or as nutrients (free of toxic materials that can return to the industrial cycle from which it comes unlimited). In this approach, the materials can be reused, no residue is produced or they can be fully recycled, so there would be no negative impacts due to the closed cycle of the materials.

However, we need to consider that the cradle to cradle approach will certainly have a long way to go and in the meantime we need to deal with a large amount of existing materials and products that cannot return to biological systems because of their toxicity. Therefore, it is necessary to minimize the environmental impacts, mainly from this type of product and therefore, according to Manzini and Vezzoli (2008), recycling is seen as an unavoidable operation, where both the producer and consumers are expected to pay not only for the product but also by its final disposal.

With regard to recycling, technological solutions are being improved with the objective of increasing environmental gains, as in the case of transforming urban waste into electricity. The first plant of this type installed in Brazil, which does the waste treatment, has entirely national technology, developed by the company *Usinaverde*, headquartered in the city of Rio de Janeiro. The pilot project has the capacity to process 30 tons of non-recyclable municipal waste per day, with enough power generation to serve 20,000 inhabitants. It is important to add that the gases extracted from the boiler are neutralized by a filtering process before they are released into the atmosphere. The remaining solid residue is transported to a decanter and can be reused by the construction industry, ensuring control of the emission of pollutants (Varanda, 2008). On the other hand, the development and improvement of new technologies for the incineration of waste as a way of generating energy is already a resource provided for in Law 12,305 of August 2, 2010, which establishes the National Solid Waste Policy - PRNS (BRASIL, 2012).

The establishment of efficient systems for collection of materials, separation at source and final disposal environmentally appropriate should encompass shared responsibilities throughout the product life cycle. These initiatives require collective participation involving all generators - community, manufacturers, importers, distributors, traders and public authorities - and the latter should stimulate others, both through fiscal incentives, the valorization of recycled raw materials, education campaigns, but also through stricter legislation, oversight, or even penalties. In this regard, it should be remembered that according to Article 9 of Law 12305/2010, "in the management and management of solid waste, the

following order of priority must be observed: non-generation, reduction, reuse, recycling, waste treatment and environmentally sound final disposal of tailings ". According to Brown (1991) this would alleviate the problems of waste disposal as storage areas are becoming increasingly scarce. A serious problem already faced, mainly, by the big urban centers.

Therefore, according to the order of priorities established by the National Solid Waste Policy (PNRS) recycling should not be seen as the ideal solution for the final destination of the products, as it is also a polluting process, as it requires trucks to collect and transport to the processing industry, a process that also consumes energy and causes waste emissions. Hence, the correct final destination should be used as one of the last resources for the objects.

Above all, we should avoid discarding objects, producing smarter goods that minimize the resources necessary for their production, that are durable, lightweight, foldable, stackable, and use materials from renewable sources, can be reconfigurable, adaptable, can be standardized, dismountable, upgradable, reformed, repaired, reused, more energy-efficient, water-efficient and have more compact, reusable or biodegradable packaging. Of course, in most cases, it is not possible to adopt all these strategies for the same product, because these characteristics will be determined according to the function for which the object is intended. The fact is that only with a deeper awareness of the impacts linked to the product life cycle, and with the interference of political forces aimed at the global management of resources, society will be able to reduce its impacts considerably. To do so, it must act preventively, in a systemic and strategic way, even before the first stage of a product's life cycle, encompassing the principles of ecodesign even during project activity. These principles should also consider the geographic, economic, social and cultural differences of each locality, implementing in the companies requirements of sustainability from the environmental, social and economic as well as the cultural point of view, respecting the specificities and characteristics of each region.

7 IMPLEMENTATION OF THE CACO PROJECT

The production process of the joinery is not sustainable and results in a large volume of discarded waste on the outskirts of the city. In July 2015, there were ninety-nine points of irregular disposal of waste of various types (verbal information). This practice occurs, mainly, due to the low social and environmental awareness of cabinetmakers, and due to the lack of proper management of industrial waste by the municipality. To obtain more efficient results, we have to face the problem of the waste generated by these small familiar joineries focusing on people, integrating them in the system and not only by producing laws and guidelines.

This paper presents partial results of CACO research project, from the diagnosis phase developed in 15 customized furniture companies in the city of Uberlândia, Minas Gerais State, Brazil.

The word "CACO" (shard) was proposed due to its meaning: a piece, small fraction, part or remainder of something. The use of this term is meant to represent, symbolically, the need to connect the different areas necessary for the development of the proposed project and integrate "fragmented" knowledge in favour of more sustainable actions for the furniture sector.

It is believed that the insertion of a set of ecodesign strategies in MSEs can generate greater competitiveness for companies generating new business opportunities, creating more favourable conditions of competition among companies of the sector in the region, improving their income while simultaneously promoting commitment and the sharing of responsibility (social, environmental, cultural) by all stakeholders. In this case, it is noted that the progress of furniture MSEs depends fundamentally on minimising the waste generated and the wastage of materials.

The project we have been developing with the joineries and the local furniture unions shows that with some specific changes and the use of a language that the cabinetmakers understand, we can achieve our goals for a more sustainable regional development and social integration.

The CACO research project involves the development of a sustainable strategic design model aiming to minimise the waste produced by furniture manufacturers in the city of Uberlândia.

Strategic design proposals should generate direct and indirect benefits for companies. With the reduction of waste, it is expected that there will be an increase in the firm's profitability. Therefore, environmental and economic progress, if achieved, can also generate social and cultural benefits through the maintenance of jobs, the preservation of this millenarian craft (know-how), and the permanence of some cabinetmakers in the market.

The model will be comprised of a set of ecodesign strategies that will be implemented systemically in all phases of the product's life cycle (pre-production, distribution, use and disposal). The strategies are being defined from the conclusion of the diagnosis phase.

The model intends to supply, firstly, the needs and collective problems – already diagnosed as being common issues among the companies in the sector. However, according to Freitas e Merino (2011), it must also be considered that each company has individual needs and, therefore, the implementation process must meet the geographic, economic, social and cultural characteristics of each one of them.

The project diagnosis phase was implemented in fifteen MSEs (with a minimum number of 06 and a maximum of 20 employees) who produce customised furniture and use MDF as the main raw material. The data was collected through: (i) semi-structured interviews; (ii) direct observation with mechanical support; (iii) documentary research; and (iv) data collection (toolkit) on the volume of waste generated during the production process.

According to Rampersad and Hubert (2007), waste is usually hidden by the workers because it is considered as a normal symptom in the workplace. Therefore, the diagnosis was made to detect the main causes of waste generation in the joineries by analysing all phases of the customised furniture life cycle. In order to evaluate the generation of residues during the production of furniture, a toolkit was created with the objective of detecting the amount of used material (material input). In this sense, the employees were guided and monitored during the use of the toolkit, which aimed to register: (i) the form used for the planning of the cut; (ii) and the consumption of material (new and reused MDF sheets). In addition, during the furniture production process, the generated waste was separated, identified, weighed and measured in order to identify the percentage of material loss during the production process waste.

The joineries' owners declared that in general each of them uses an average of 110 MDF sheets monthly (white and coloured), which are purchased from resellers. According to the carpenters, the MDF is responsible for approximately 42% of the furniture manufacturing costs. This data demonstrates the importance of MDF in economic spending and reinforce the need for optimisation and better use of MDF sheets even for the financial health of the companies.

The diagnosis phase allowed us to already identify several common causes for MDF waste:

a) Pre-production: All the companies work with approximately five different MDF brands. The wide colours and brands variety has increased losses, reduced the possibilities of reuse, and contributed to the generation of a large volume of waste.

b) Production: lack of concentration of employees due to the use of the cell phone while working; lack of employees' commitment; absence of verification protocols (of material, tools and procedures) for assembling the product. It was also verified that all the owners of the studied companies accumulate a significant amount of activities (elaboration of the budget, negotiation with clients, surveying of measures, the realisation of production order, production of furniture and, when necessary, administrative activities). The accumulation of functions also contributes in part to reworking caused by measurement error and communication problems between management and production. 80% of the furniture companies have a production process per project, being each joiner responsible for the complete execution of the furniture. The practice of production by the project is causing a lot of waste due to the lack of planning, especially during the cutting stage of the sheets. In 100% of cases, MSEs cut the material without performing at least surface calculations or analyse the best way to make good use of the sheet. Only one of the companies uses software for sheet optimisation. Although employees are systematically advised to reuse MDF scraps to produce smaller items (drawers, shoe racks, slats, etc.), MDF leftovers accumulate very quickly. Due to overlapping MDF scraps, disorganisation, dust accumulation, and lack of inventory control, the workers prefer to use new sheets, even to make smaller objects. In all studied companies there are no spaces or shelves organised to receive leftovers. The most common practice consists of stacking pieces that are pressed against the walls of carpentry (taller pieces are placed on the bottom and lower ones on the front). However, the arrangement of pieces without any classification by size, thickness, or colour makes it difficult and doesn't encourage reuse, since it prevents the quick identification of the desired piece. Added to this the leftovers accumulate a large amount of dust.

c) Distribution: The transportation of goods, in 80% of cases, is carried out by own truck. The finished products are packed with blankets, cardboard and/or bubble wrap. With the exception of the blankets, the other packaging materials are usually used once or twice and then are sent to the municipal landfill. These packages do not always protect furniture sufficiently during transport, causing havoc and rework. In addition, recyclable packaging is usually mixed with other non-recyclable ones (such as MDF), making it impossible to dispose correctly the final product.

d) Use: The companies do not offer guidance to the users on the correct ways of maintenance and cleaning of the furniture. This is done verbally, and only when asked by users. In addition, the studied companies do not offer maintenance or repair services for furniture. This type of service is only provided, in special cases, to established clients. It is concluded that the lack of information on the correct maintenance of furniture and the lack of repair services can lead to a reduced shelf life.

e) Disposal and/or recycling: Among the fifteen studied companies, four joineries carry out the final destination of the waste in the municipal landfill. The other companies dispose their waste irregularly. These practices cause public health risks arising from the toxicity of urea-formaldehyde or phenol-formaldehyde additives used in the production of reconstituted wooden boards, these substances are on the list of carcinogens issued by the International Agency for Research on Cancer (IARC). The companies don't carry out the separation of residues (MDF, plastic, cardboard, screws, etc.). There is also no suitable place to receive recyclable materials in the municipal landfill for recycling. Therefore, in general, companies have been using this fact to justify the lack of separation of furniture residues.

8 CONCLUSIONS

After the diagnosis phase of the CACO project, and to encourage the non-generation, reduction and reuse of waste, some preliminary strategies have already been proposed to the joineries' owners, a set of measures of sustainable strategic design in the furniture MSEs of the region, encouraging the change of culture with the objective of reducing the consumption of resources and to minimise the waste: i) in partnership with designers from the region, to develop annual catalogues of colour trends and MDF standards, with the objective to reduce significantly the number of colours recommended by the woodworking shops to users and, consequently, increasing the possibilities of reuse of raw materials; ii) to improve the layout of the company and the organisation of workbenches in order to reduce production time, increase worker concentration, and reduce material losses caused by errors; iii) to create a checklist for measures

surveying in order to minimise errors that occur during the measurement conference; *iv*) to designate a single employee to perform the sheet cutting, facilitating the flow optimisation and control of new and/or reusable raw materials; *v*) to provide training on cutting planning to optimise the use of MDF panels, or even using software to reduce losses and waste; *vi*) to encourage the use of software which enables wood panel planning and optimisation of cut-outs, reducing waste and the cost of purchase of equipment and material; *vii*) to carry out the planning of cutting of the furniture from a modular approach (when possible) aiming a greater use of the sheet; *viii*) to create a suitable shelf for facilitating reuses with stock organisation and classification of the MDF pieces according to the dimensions and colour of the pieces of panels; *ix*) to replace disposable packaging, used during transport, with reusable packaging; *x*) to create a checklist of delivery and assembly of the furniture in order to avoid errors and rework, reducing unnecessary travel, fuel consumption, CO₂ emission and delays in delivery; *xi*) to create an instruction manual with the purpose of informing users about the correct maintenance of the furniture (optimising life span); *xii*) to indicate the collection system (environmentally correct final disposal), reuse and/or recycling (donation and/or renovation) of the furniture after use; *xiii*) to guide companies on disposal methods for environmentally sound waste; *xiv*) to provide repair services; *xv*) to promote the recycling of materials such as plastic, cardboard, aluminium and others; *xvi*) to create a communication platform for buying, selling and exchanging material between manufacturers.

The platform will be developed and made available to MSEs in order to sell debris material with potential for reuse, for example, medium or large indentations reconstituted wood plates. This communication channel intends to confirm the reduction of waste, encouraging the separation and proper storage of materials, while demonstrating the value of products that are commonly disposed of by such factors as reduced demand for very specific colour panels, and improper storage. The entrepreneurs are motivated to implement the strategies proposed by CACO Project in the joineries because we could prove them that they are losing a lot of money (at least 1/3 of the profit) without the implementation of basic measures. The insertion of a set of ecodesign strategies in the MSEs can promote greater competitiveness for companies generating new business opportunities, creating more favourable conditions of competition among companies of the sector, improving their income while simultaneously promoting commitment and the sharing of responsibility (social, environmental, cultural) by all stakeholders.

There is still a long way to accomplish the objectives of this research project, but we already see some benefits in the process used by the joineries in Uberlândia, due to the direct involvement of all the stakeholders in the project, mainly joineries' owners and workers and the unions, the incorporation of our guidelines and the awareness that we can only achieve sustainable processes using a "simple language" that all can understand.

REFERENCES

- Barbero, S. & Cozzo, B. *Ecodesign*. Barcelona: HF ULLMANN, 2009.
- Behrendt, S., Jasch, C., Peneda, M. C. & Weenen, H. *Life cycle design: a manual for small and medium sized companies*. NY: Springer, 1997.
- Best, K. *The Fundamentals of Design Management*. Lausanne: AVA Publishing, 2010.
- Bhamra, T. *Design for sustainability: a practical approach*. Aldershot, England : Ashgate Pub, 2007.
- Braungart, M. & McDonough, W. *Cradle to cradle: remaking the way we make things*. 1st edition ed. NY: North Point Press, 2002.
- BRASIL. Lei no 12.305 de 02 de agosto de 2010. Política Nacional de Resíduos Sólidos. Brasília, 2012.
- Brezet, H. & Hemel, C. van (1998). *Ecodesign: a promising approach to sustainable production and consumption*. Paris: UNEP.
- Brown, L.R. *A construção da sociedade auto-sustentável*. São Paulo: Metodista, 1991.
- Bruce, A. & Langdon, K. *Essential Managers: Strategic Thinking*. 1st edition. NY: DK, 2000
- Capistrano, M.W. *Iemi abre ciclo de palestras do 5º Congresso Moveleiro eMobile*, set 2014. Disponível em: <<http://www.emobile.com.br/site/noticias/congresso-moveleiro-inicia-com-palestra-iemi/>>. Acesso em: 21 set. 2015
- Castro, M.L.A.C. & Cardoso, J. Technological innovation and narrative innovation: paths for design in the furniture industry of Ubá. *Interações* (Campo Grande), v. 11, n. 2, pp. 205–213, dez. 2010.
- Crocco, M. & Horácio, F. *Industrialização descentralizada: sistemas industriais locais o arranjo produtivo moveleiro de Ubá*. Rio de Janeiro: IE/UFRJ, 2010.
- Dal Piva, R. *Processo de fabricação dos móveis sob medida*. Porto Alegre: SENAI-RS, 2006.
- FIEMG. *Diagnóstico do pólo moveleiro de Ubá e região*. Belo Horizonte: IEL/MG, 2002.
- Fiksel, J. R. *Design for environment a guide to sustainable product development*. NY: McGraw-Hill, 2009.
- Freitas, R. F. & Merino, E.A.D. *A gestão de design como estratégia organizacional*. Rio de Janeiro: Rio Books, 2011.
- Galinari, R., Júnior, T., Rodrigues, J. & Morgado, R.R. A competitividade da indústria de móveis do Brasil: situação atual e perspectivas, *BNDES Setorial*, 37 (mar.), pp. 227 – 272, 2013.
- Garcia, A. *Estudo de mercado e pesquisa de benchmarking para o setor moveleiro DF*. Brasília- DF: SEBRAE, 2005.
- Gilbert, P.F. & Garcia, R.L. Las estratégias de diseño respetuoso com el medio ambiente. In: RIZO, T. G. N. E. S. C. (Ed.). *Ecodiseno: Ingeniería del ciclo de vida para el desarrollo de productos sostenibles*. Valencia: Ed. Univ. Politéc. Valencia, 2004.
- Glueck, W.F. *Business Policy and Strategic Management*. NY: McGraw-Hill, 1980.
- Gorini, A.P.F. *Panorama do setor moveleiro no Brasil, com ênfase na competitividade externa a partir do desenvolvimento da cadeia industrial de produtos sólidos de madeira*. Rio de Janeiro: BNDES, 1998.
- Guimarães, E.N. (ed.). *Estudo de viabilidade técnica, econômica, financeira e social da aglomeração urbana do Triângulo Mineiro e Alto Paranaíba e seu colar de influência regional com vistas à implantação da região metropolitana IE - UFU, Uberlândia*, 2013.
- IBÁ (Ed.). *Cenários Ibá: Estatísticas da indústria Brasileira de Árvores*. Renata Coltro, 2015.
- IBGE. *Cidades*. 2015. Available from: <http://cidades.ibge.gov.br/xtras/perfil.php?lang=&codmun=317020> [Accessed 22 September 2015].
- Kozak, P. et al. Identificação, quantificação e classificação dos resíduos sólidos de uma Fábrica de Móveis. Ver. *Acad., Ciênc. Agrár. Ambient.*, Curitiba, v. 6, n. 2, pp. 203–212, 2008.
- Leão, M.S. Fatores de competitividade da indústria de móveis de madeira no Brasil, *Revista da madeira*. n. 119, Ago 2009.
- Maloney, T.M. *Modern Particle Board and Dry Process Fiberboard Manufacturing*. Updated edition. San Francisco: Paperloop.Com, 1993.

- Manzini, E. & Vezzoli, C. *Desenvolvimento de produtos sustentáveis: os requisitos ambientais dos produtos industriais*. São Paulo: EDUSP, 2008.
- Mintzberg, H. et al. *The strategy process: concepts, context, cases*. Upper Saddle River, NJ: Prentice Hall, 2002.
- Mintzberg, H., Ahlstrand, B. & Lampel, J. *Strategy Safari: The complete guide through the wilds of strategic management*. 2 edition ed. Harlow, UK: Pearson Education Canada, 2008.
- MOVERGS. *Relatório setorial 2014 polo moveleiro do Rio Grande do Sul*. IMEI, 2014.
- Mozota, B.B. The four powers of design: A value model in design management. *Design Management Review*, v. 17, n. 2, pp. 44–53, 2006.
- Mozota, B.B. *Design Management: Using Design to Build Brand Value and Corporate Innovation*. 1 edition. New York: Allworth Press, 2003.
- Nahuz, M.A.R., Figueroa, F.M.Z. & Lelo, P.K.Y. *Perspectiva tecnológica da cadeia produtiva: madeira e móveis*. São Paulo: IPT - Divisão de produtos florestais, 2002.
- Nunes, V.G.A. *Design pilot project as a boundary object: a strategy to foster sustainable design policies for Brazilian MSEs*. Tese (doutorado em design), Milan: Polytechnic of Milan, 2013.
- Oliveira, P.R.S. et al. *Cadeia produtiva da movelaria: o polo moveleiro do Triângulo Mineiro*. EPAMIG, 2012. Disponível em: <<http://bibliotecaflorestal.ufv.br/handle/123456789/3938>>. Acesso em: 20 fev. 2015
- Pereira, A.F. *Madeiras brasileiras: guia de combinação e substituição*. São Paulo: Blucher, 2013.
- Pereira, A.F., Carvalho, L.S.C. & Pinto, A.C. Resíduo de madeira: limites e possibilidades de seu uso como matéria-prima alternativa. In: *Anais do 9º Congresso Brasileiro de Pesquisa e Desenvolvimento em Design*. São Paulo, 2010.
- Porter, M.E. The Five Competitive Forces That Shape Strategy. *Harvard Business Review*, v. 86, n. 1, pp. 78–93, jan. 2008.
- Rampersad, H.K. & El-Homsi, A. (eds.). *Tps-Lean Six Sigma: Linking Human Capital to Lean Six Sigma - A New Blueprint for Creating High Performance Companies*. Charlotte, N.C: Information Age Publishing, 2007.
- Santos, M.C.L. & Dias, S.L.F.G. (eds.). *Resíduos sólidos urbanos e seus impactos socioambientais*. São Paulo: IEE-USP, 2012.
- Santos, C. & Menezes, M.S. Design para micro e pequena empresa: o desenho como abordagem do projeto. In: Menezes, M.S.; Paschoarelli, L.C. (eds.). *Design e planejamento: aspectos tecnológicos*. São Paulo: Cultura Acadêmica, 2009.
- SEBRAE (ed.). *Anuário do Trabalho na micro e pequena empresa*. Brasília- DF: DIEESE, 2013.
- SENAI. *Diagnóstico empresarial das indústrias moveleiras de Uberlândia e região*. Uberlândia: Sistema FIEMG, 2006.
- SENAI, FIEMG & MASISA (eds.). *MDF fibro fácil: usos e aplicações para a indústria moveleira brasileira*. Bento Gonçalves: SENAI/FIERGS, 1997.
- SMPU. *Banco de Dados Integrados de Uberlândia*, SEPLAN, 2013.
- ZURLO, F. Le strategie del design. *Disegnare il valore oltre il prodotto*. Milano: Libraccio Editore, 2012.

RS03.1. Environmental Issues

1245 PORTRAYAL OF CLIMATE CHANGE NEWS IN THE NEWSPAPERS OF BANGLADESH

ABSTRACT

Climate change has emerged as a new threat to the existence of the mankind and Bangladesh is recognized worldwide as one of the most vulnerable countries to the impacts of global warming and climate change due to its' unique geographical location, dominance of floodplains, low elevation from the sea, high population density, high levels of poverty, and overwhelming dependency on nature, its' resources and services. Bangladesh is already recognized as one of the most vulnerable and disaster-prone countries of the world due to climate change. Floods, droughts and tropical cyclones are common phenomenon. Temperature rise due to climate change hampers the production of food grains, and also exacerbates saline intrusion, which in turn will threaten human health by increasing the risk of vector-borne infection. Where communities are often threatened by different problems, it is necessary to take some steps to limit the adverse impact of climate change. Along with steps taken by government and non-government organizations, mass media as agenda setter can play a prominent role in building awareness about all types of hazards, disasters and risks caused by climate change. While a number of initiatives have been taken by the government and non-government organizations, ways to fight against the hazards of nature and disasters caused by climate change should also be addressed. Mass media can be used to disseminate appropriate messages to the target groups in this regard since they are perceived as gatekeepers of information and their prominent role in building awareness about different issues including environment, health, climate change etc. is well established. Considering the influence that mass media can exert in building awareness on climate change, the present study is an attempt to explore the portrayal of climate change news in the newspapers of Bangladesh. Alongside, the study seeks to answer how and in what capacity newspapers cover climate change news, how much importance climate change news get, the treatment of news, their sources and styles, as well as the issues covered. Content analysis in the form of both qualitative and quantitative has been used in the present study to examine the portrayal of climate change news in the mainstream newspapers of Bangladesh. The findings of the study reveal that although newspapers are paying attention to cover different aspects of climate change, however, most of the news still do not get appropriate treatment. Most of the published news are straight jacket in nature without having details elaboration of the facts. Although a few interpretative reports are published in the newspapers of Bangladesh but the number is scanty. The study therefore, suggests to publish more interpretative and investigative news so that people become aware of the issue and can take appropriate actions to limit the damage caused by climate change.

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1272 SOCIAL WORKERS' ROLES IN CLIMATE CHANGE ADAPTATION - A CASE STUDY OF ADAPTATION TO "EXTREME HEAVY SNOWFALL" IN JAPANESE SOCIETY

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ABSTRACT

This study contributes to build sustainable society adapting to global climate change. Japanese society is exposed to various kinds of disaster risk caused by extreme climate, landslide, earthquake, volcano activity, and so on. In addition, it is said that disaster risk of "extreme heavy snowfall" will be remaining even if the amount of snowfall in the year decrease by global warming. Japanese society, especially in heavy snowfall area, had adapted to snowfall to maintain their social and economic activities, and to sustain their own well-being. However, Japanese society also confront the problems which derive from aging society and population declining. Adaptation system to heavy snowfall should also be established strategically to correspond to aging society.

This work focuses on social workers' role in adaptation to heavy snowfall in Japanese society. The existing researches are saying that there are three discussion focuses for snowfall adaptation- planning of snow shoveling, keeping social work, and human resource development. About the viewpoint of social work, health condition check for the high medical independents is essential mission even if it is in heavy snowfall, but snow cover is preventing social workers from conducting it. This implies the importance of collaboration system among social workers, community leaders, and the local government in extreme snowfall condition.

The authors conducted interview surveys and questionnaire surveys in Takashima city, one of the extreme snowfall area in Japan, to clarify the collaboration system especially network for social work operation. The interview surveys were conducted to the public health nurses in the local government and some welfare commissioners in the local communities authorized by the local government. Next, the questionnaire survey was held to all welfare commissioners in Takashima city to ask their reaction to extreme heavy snowfall in January 2017, collaboration among the stakeholders in previous snowfall, and their problem consciousness to social workers system in snowfall condition.

From the interview surveys, the public health nurses have the problem consciousness of health check process. They have the enormous data about the health, mental, and social condition of high medical dependents, and they make the decision of health check process in heavy snow condition. They make "triage" about emergency degree and decide whether a certain citizen is needed to patrol or it is sufficient to call telephone only. However, if a high medical dependent cannot be assisted by his/her family, social worker should patrol for him/her even if the emergency degree of health check is not high. They pointed the importance family level or community level collaboration about social work.

Through the interviews and questionnaires, the lack of community collaboration has been pointed but the authors also found the limitation of community collaboration in social worker in the current system.

Keywords: Climate Change, Adaptation, Social Worker, Snowfall, Community Welfare Commissioner

INTRODUCTION: ADAPTATION TO CLIMATE CHANGE IN JAPANESE SNOWFALL DISTRICT'S CONTEXT

Climate change adaptation has been essential problem not only in national decision-making level but also community level. Rain, droughts, and heat are especially well-known disaster caused by climate change and the governments have been investing to safety against these threats. However, the problem caused by snowfall disaster is remaining and haven't been regarded as the essential disaster sufficiently. Kawase et al. (2016) is pointing that the amount of snowfall will decrease in these decades, but the risk of heavy snowfall will be remaining.

On the other hand, a major part of Japanese snowfall district is encountering the needs to adapt to future population declining and aging society problem. It means adaptation to snowfall disaster should be planned as the comprehensive program based on the future prediction of population, human resource, and collaboration system. There are the existing researches about snowfall as the risk factor of social/economical activities (for example Kamimura, 2003; Numano, 2013) and about decision making method for climate change adaptation in municipal/community level (for example Baba et al., 2011; Ichihashi et al., 2015), however the existing research of snowfall adaptation seem to be insufficient.

The authors' research group have conducted the fieldwork in Japanese mountainous area in Takashima city and described stakeholders network for snowfall adaptation (Ono et al., 2017). In the previous research, the social workers' activities were observed especially in health issues in snowfall situation. Considering the future prediction that aging society is proceeding in alarming rate and social workers will decrease due to population declining, the collaboration system for health issue in snowfall situation should be reconsidered based on current situation understanding.

This research especially focuses on the Community Welfare Commissioners (CWC), who are elected from the community members recommended by the mayor based on the law, and who work for the citizens' health and welfare especially handicapped people and elderly. CWC system have 70 years history in Japan, but there are some problems pointed out, therefore the discussion of the CWCs' role is important to develop the collaboration system for climate change adaptation.

This research includes mainly three sections. The first is structuralization of snowfall problem in Japanese mountainous area and the questionnaire survey will be designed building the research questions (Chapter 1). Next, the result of the survey will be summarized focusing on information gathering activity (Chapter 2). After that, the trend of the relationship between attribution and information gathering activities through logit model regression analysis (Chapter 3).

1 PROBLEM STRUCTURALIZATION OF SNOWFALL AND CWC'S ROLES IN DISASTER

1.1 Problem Formulation from the Existing Research

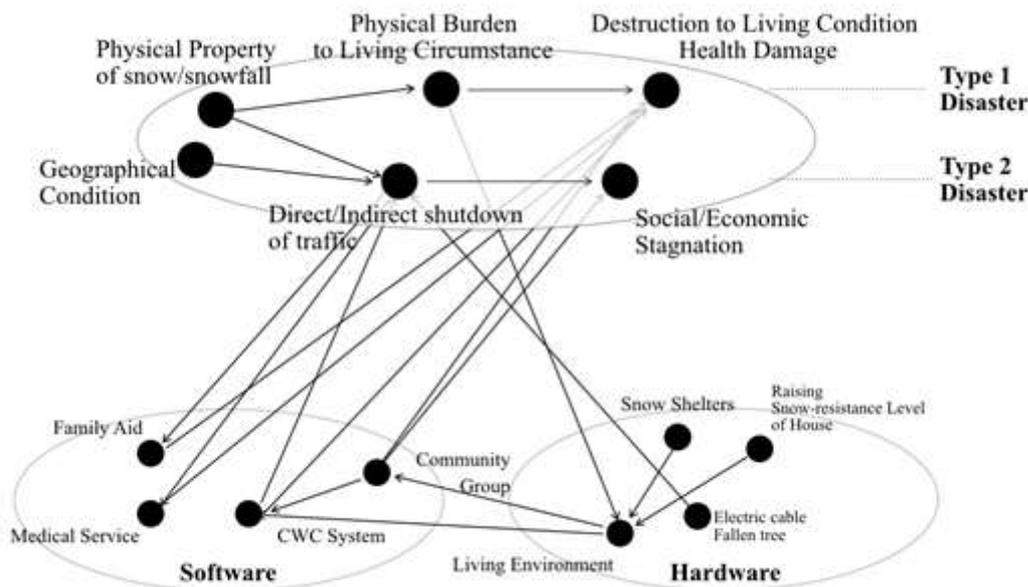


Fig. 1 Hypothetical Problem Structure of Snowfall Disasters

A lot of literatures have attempted quantitative research of snowfall risks, but there is few research to formulate snowfall problem in rural area. Kuriyama (1982) attempted description the overall picture of snowfall disaster's problem structure. Kuriyama's work classified snowfall disaster into two types from the physical property of snow/snowfall. The first is destruction to living condition and human health damage which derive from snow's high weight and low temperature. High weight of snow often causes not only house collapse but also stagnation of snow removal, that avoid the elderly persons daily activity and communication. The second is social/economic stagnation which derive traffic risk, stagnation and accident. Traffic stagnation avoids resource distribution and human traffic which causes restraint of daily activity, commutation, and medical care. In addition, Kuriyama's work seemed not to be careful to it, snowfall disaster's impact in local community include less deviation because snow falls equally in local area and stagnate in a long/short time on the landing place. It can cause community collaboration difficulty that the community members, even if they are sufficiently young and healthy, should spare their time for keeping safety around their/their families' living place and the time for mutual aid in snowfall situation will be limited. Snow's physical property directly/indirectly affects to human and social activities.

On the other hand, snow disaster's risk factor is living not only physical property of snow/snowfall but also geographical condition, hardware and software. It means it should seriously affect to human health and safety from snowfall; whether there are efficient system to collaborate for snow removal, health care watching, and snow discharging or not; whether there is sufficient snow shelter, highly snow-resistant house, and melting system or not, and whether there is efficient management system of voluntary human resource. (The detailed discussion of snowfall disaster formulation will be held in Ono, et al. (2018).)

1.2 Hypothesis and Research Questions of CWCs' Activities

Fig. 1 shows the hypothetical model of causal relationship among snowfall disasters' risk factors and CWC's activities according to the existing researches and preliminary investigations. CWCs are responsible to keep the community members health and safety, therefore they communicate thickly with the elderly, the highly medical dependents, and the handicapped people in their communities (called "Jichi-kai", "Chonai-kai", or "Ku"). Through the daily communication to them, and sometimes to the government officers, the other social workers, they accumulate the information to their usable media (brain, memorandum, or offline PC). In the emergent case, for example snowfall situation, they should conduct additional information gathering about the situation-specific issues about families' support, medical condition, and so on. However, the existing research described that there are difficulties for information gathering which derive from "relationship of mutual trust" and "privacy". Matsuzaki (2014) observed the CWCs activities in a city and explained of the activity difficulty that some community members deny to give information even if CWCs are living in the community for a long time because of their pride, anxiety, privacy. Clarification of information gathering difficulty should be essential survey theme to gain the knowledge to develop the adaptation system in Japanese rural communities. It indicates the CWC's experience and contribution in the community affect to the degree of information gathering.

Table 1 The Contents of Questionnaire Survey

Question	Format
Attribution	
Sex	Male or Female
Age	Natural Number
Occupation / Residential District	Multiple-choice
Duration of Residence	Multiple-choice
History as a CWC	Multiple-choice
Other Activity	Multiple-choice
Information Gathering in Snowfall Situation in January, 2017	
Necessity Recognition of Information Gathering (about 4types)	Yes or No
Achievement Evaluation of Information Gathering (about 4types)	Yes or No

Table 2 Survey Result (Attribution)

Question	Frequency
Sex (n = 151)	
Male	96
Female	55
Age (n = 139)	
50-60	7
60-65	41
65-70	53
70-75	26
75-80	12
Residential District (n = 152)	
A	23
B	35
C	28
D	30
E	24
F	12
Occupation (n = 148)	
House husband/ wife	31
Employer in the city	25
Employee in the city	24
Employer out of the city	4
Employee out of the city	6
Unemployed	58
History as a CWC (n = 151)	
1st period	75
2nd period	44
3rd period	17
4+th period	15

According to Fig. 1, this study classified the information gathered by CWCs into four types: 1) Health condition, this is about whether there are any negative health impact of the elderly and so on caused by snow's physical properties; 2) Living Condition, this is about whether there are any destruction or anxieties in the living environment; 3) Medical Condition, this is about whether there is sufficient medical service or medical advisory opportunities especially about dialysis; and 4) Families' assistance, it is about whether there is sufficient aids by families to keep health and safety. In this paper, the result of case study based on questionnaire survey about current situation of information gathering by CWCs in snowfall situation will be expressed, and the difficulty structure of CWCs activities will be discussed based on the explanatory analysis of causal relationship between the attribution (community experience and contribution) and information gathering (necessity and achievement).

1.3 Research Method: Questionnaire Survey in Takashima city, Shiga, Japan

Table 1 is displaying the questionnaire contents distributed to the all CWCs in Takashima city. In Chapter 3, this paper attempts regression analysis between attribution and information gathering. Then, because the respondents answered the necessity and achievement of information gathering by 0-1 pre-coded numbers, logit model will be applied in regression analysis.

The questionnaire sheets were distributed through the all-members conference (2017/12/7~12/28) and n = 153 sheets/163 have been received (efficiency rate: 93.9%). Takashima city experienced extremely heavy snowfall January 2017, and all respondents encountered this snowfall as the CWCs.

2. RESULT OF SURVEY: CURRENT SITUATION OF CWCS AND INFORMATION GATHERING

2.1 Attribution

Table 2 summarize the result of survey about the respondents' attribution. According to it, the 60+% of respondents are male people and this ratio have statistically significant difference with population ratio in Takashima city (by chi-squared test, $p < .05$). Next, the obvious tendency can be observed in "Age". The arithmetic mean is 66.9 years old and standard deviation is 4.94. There are 6 main districts in Takashima city, and significant bias of the number of respondents have not be observed. The question about occupation is asked with the respect to the job location, and the approximately same number of respondents answered, "work for something" or "unemployed". As the job location, 80% of employee or employer respondents answered Takashima city. After that, about history as a CWC, the half number of respondents answered that they were 1st period as CWCs. It means 50% of respondents encountered heavy snowfall situation in January 2017 after only a month preparation.

2.2 Information Gathering

In addition, the result about information gathering activities in snowfall situation in 2017 January have been described in Table 3. This displays that the 60-70% of respondents recognized the needs of the four types of information in the past snowfall situation. On the other hand, about 70-80% of them are not considering the information gathering activities as high standard. Especially, 80+% respondents are considering that they couldn't gather the medial condition information of the elderly and highly medical dependents. It means the greater number of CWCs encountered difficulty to access the kinds of information in snowfall situation.

Table 3 Survey Result (Information Gathering)

Question	Frequency of Yes
Recognition of Information Needs	
Health Condition ($n = 145$)	105
Living Condition ($n = 144$)	96
Medical Condition ($n = 143$)	87
Families' Assistance ($n = 142$)	89
Achievement Evaluation of Information Gathering	
Health Condition ($n = 105$)	37
Living Condition ($n = 96$)	29
Medical Condition ($n = 87$)	16
Families' Assistance ($n = 89$)	23

3. LOGIT MODEL REGRESSION: RELATIONSHIP BETWEEN INFORMATION GATHERING AND ATTRIBUTE ITEMS

3.1 Method

As explained in Chapter 1, logit model is applied to analyze the relationship among attribute items and information gathering. The variables were coded as below:

- 1) Response variables (necessity and achievement of information gathering) were defined 0 (No) and 1 (Yes).
- 2) Explanatory variables (all attribute items) were set 0 (Not applicable) and 1 (Applicable) converting into category variables.

Regression analysis was conducted by R, statistical analysis application, and the explanatory variables were selected to optimize (minimize) AIC, Akaike's Information Criteria.

3.2 Result and Discussion

The result of regression analysis has been described in Table 4. There are two major trends in needs recognition of information. The first is the difference of information needs between the generations. The regression result says that respondents between 70 and 75 tend to recognize more needs of living information than the other generations, but the generation are less interested in the medical information than 50-60 and 75-80. It indicates the generation gap of problem understanding of snowfall as CWCs.

The second trend of information needs recognition is the difference caused by participation to the community. According to Table 4, the information needs about living, medical, and family assistance condition is negatively affected by "House husband/wife", and "NPO activity". On the other hand, they are also positively affected by "Community Salon". It would mean that the respondents who continuously participate the social activity can gather the information the living information and medical information through their activities. However, community salon activity managers tend to answer weakly positive recognition to health and family assistance condition. It will indicate that the daily activity in the

community give the information to CWCs. In addition, the CWCs who participate community salon activities are motivated by the activity to gather the information to health and family assistance condition.

Table 4 also shows the result of regression analysis of achievement evaluation and two major trends can be observed about this topic. The first trend is, it is also observed in information needs, about the generation gap. As explained in the previous chapter, the trend of achievement evaluation is totally negative. However, the result indicates the younger generation tend to recognize higher evaluation of living and family assistance information. It means that the patrol activity in snowfall situation would take the great part of information gathering. The patrol activity need the great energy because there is uncertainty whether they can use the automobile, and if not, whether they can walk safely to the destination.

The second is the district gaps of information sharing system. The districts A, B, and C are not designated as “Heavy Snow District” by the law, and they are regarded as the area where there is not heavy snow. Then, the statistically significant negative coefficients have been detected about family assistance information. It means there is the information sharing system gap between the snowfall area(DEF) and ABC.

Table 4 Result of Logit Model Regression

AIC	Recognition of Information Needs				Achievement Evaluation			
	Health	Living	Medical	Family	Health	Living	Medical	Family
Constant: β	-2.36	-5.54	-1.31	-0.65	-2.77	-8.69	-0.32	-3.81
Partial Regression Coefficient α_x								
Sex: Male	1.33							-2.78
Age: 50-60			2.87			3.17		5.86
: 60-65		3.39				1.64		
: 65-70		3.21	1.12		1.50		0.83	2.73
: 70-75		4.28	1.26	0.96				
: 75-80		2.86	2.79				-1.26	
Occupation: House husband/wife		-1.28		-1.35				
: Employer out of the city			1.89					
: Employee out of the city	1.99	2.36	1.74	1.75		-2.00	-0.97	-4.44
Other Activities: Nothing		-0.90		-1.33				
: Community Administration					0.89			
: Community Salon	1.25			1.01	1.19		1.53	
: Event Manager					3.12			
: Festival Manager	-2.02							
: NPO Activity		-3.03	-2.09	-2.55				
: The Other Voluntary Act				-1.18	-1.32			
Residential District: A					1.40			-3.47
: B								-5.06
: C								-2.81
: D					1.51			
History as a CWC: 1st Period		1.68						
: 2nd Period		1.86						
: 3rd Period		2.68						-1.65

* The blank grids: Removed variables in logit model regression

* The grey-backed grids: Partial regression coefficients without statistically significance ($p > .05$)

CONCLUSION AND FUTURE RESEARCH

Through the summary of the survey and logit model regression, the trend of information gathering has been extracted. This is the exploratory analysis about the relationship between attribution of CWCs and information gathering behavior. For the future research, the understanding of causal relationship among the information gathering behavior and the explanatory factors including attribution is essential. Especially, from this research, identification of the CWCs’ information source to decide their behavior is the interesting future research question.

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REFERENCES

Kenshi BABA (2011) Relation between the Awareness of the Effects of Climate Change and Actions Concerning Mitigation/Adaptation - An Analysis of Iida City Residents -. Journal of JSCE 67 (6), II_405-II_413
 Arata ICHIHASHI (2015) Challenges and Solutions of Implementing Climate Change Adaptation Measures in Local Government - Verifying an Interactive Approach and Practice of a Workshop -, Environmental Science, 28(1), 27-36

- Seiji KAMIMURA (2003) Risk Analysis on Snow-related Casualty Cases in Niigata Prefecture, *Bulletin of Glaciological Research*, 65 (2), 135-144
- Hiroaki KAWASE et al (2016) Enhancement of heavy daily snowfall in central Japan due to global warming as projected by large ensemble of regional climate simulations: *Climatic Change*, 139(2), 265-278
- Hiroshi KURIYAMA (1982) Casualties in the 1980/81 heavy snowfalls: *Bulletin of Glaciological Research*, 44 (2), 83-91
- Kichinosuke MATSUZAKI (2014) Process of finding the role as Minsei-iin – analysis by modified grounded theory approach –
- Natsuki NUMANO (2013) A Consideration on the Factors of Accidents Related to Roof Snow - Using the Data for Recent 3 Winter Seasons in Yamagata Prefecture -, *JSSI & JSSE Joint Conference – 2013*
- Satoru ONO, Michinori KIMURA (2018) Problem Formulation for Climate Change Adaptation in Japanese Heavy Snowfall Districts for Gaming-based Consensus Building: 49th ISAGA Conference, the proceedings published

1293 MAHATMA GANDHI'S RELEVANCE IN CONTEMPORARY ENVIRONMENTAL ISSUES

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The concept of environmentalism emerged after industrialisation. Before industrialisation there existed elements on environmental sensibility. While some tribes pursued a species to extinction other tribe prudently preserved it. There were peasants who haphazardly tilled the lands and others who carefully designed new systems of water and soil management. Classical literature of both the East and the West reflect a love for nature. These may constitute pre-history of environmentalism but not environmentalism. The peasant or the poet never crossed the threshold of their locality or offered an alternative view of reorganising nature. "That needed the Industrial Revolution, widespread industrial degradation and the response we term "environmentalism".¹²⁴ The first historian to speak about this connection was the Cambridge scholar G.M. Trevelyan in a lecture in 1931.

Industrial Revolution never took place in India as it did in the West. However, the British government in order to maintain its superiority over the colonized nation introduced certain economical and technological advancement. Industrialization, pursued in India, however limited, by the British was not palatable to Mahatma Gandhi. Gandhi was not an environmentalist in the modern sense yet he is often described as the 'apostle of applied human ecology.'¹²⁵ Environmental concerns were minimal in his time yet Gandhi evolved his own views of environmentalism.

GANDHI CRITIQUING MODERN CIVILIZATION WITHIN THE DISCOURSE OF NATIONALISM

On his return from South America where he spent 21 years as a lawyer and political campaigner, Gandhi began to acquaint himself with the economic and social condition of rural India. He travelled extensively in the Indian countryside and also during organising the peasant movements in Champaran and Kheda in the second decade of twentieth century he felt the pulse of the country. He realised that colonialism represented a system of economic and political exploitation. In order to combat that, he realised that the method of Satyagraha and non violence that he had evolved and adopted in South Africa was India's best hope. From the deeper understanding of colonialism Gandhi had the realization that it was not possible for India to imitate western patterns of industrial development. Perhaps he also felt that by talking about development of rural India he could foster unity among the Indians and prepare them to fight British colonialism. Gandhi himself renounced western dress and western mode of living and began to dress and live like an ordinary Indian villager. He identified himself with the poor Indian. Systematic denouncement of western civilization was also a technique to criticise the British imperialism. Gandhi writes in Young India, "God forbid that India should take to industrialization after the manner of the West. The economic imperialism of a single tiny island kingdom (England) is today keeping the world in chains. If an entire nation of 300 millions took to similar economic exploitation, it would strip the world bare like locusts."¹²⁶ India would never follow such a sinful path.

Food and clothing are the bare necessities of human existence. Under the British colonial rule the impoverished villagers were in need of these two things. Gandhi intelligently picks up these issues. In an interview with Charlie Chaplin in London, Gandhi said that every nation should be self contained. India was once self contained and he wanted that to happen again. He said England with her large scale production had to look for a market elsewhere. England was exploiting India. According to Gandhi, "An exploiting England is a danger to the world, but if that is so, how much more so would be an exploiting India, if she took to machinery and produced cloth many times in excess of its requirements."¹²⁷ He categorically stated that for food and clothing he would be dead against industrialisation.¹²⁸ In an interview in London Gandhi said, "These nations (Europe and America) are able to exploit the so called weaker or unorganised races of the world. Once these races get elementary knowledge and decide they are not going to be exploited they will simply be satisfied with what they can provide themselves. Mass production then at least, where the vital necessities are concerned will disappear"¹²⁹ Gandhi felt that if production became localised then the temptation to speed up production indefinitely and at any price disappeared.¹³⁰

Gandhi's writings are replete with this kind of attack on western nation specially England. In the same interview with Charlie Chaplin in London Gandhi emphasised the fact that machinery in the past had made the Indians dependent on England and the only way we could rid ourselves of the dependence was to boycott all goods made by machinery. "That is why we made it the patriotic duty of every Indian to spin our own cloth. This is our form of attacking a very powerful nation like England...."¹³¹

It is a well known concept that Gandhi was a harsh critique of modern civilization and gave an alternative solution to it i.e., rural development. I would argue that Gandhi's concept of environmentalism was an offshoot of his attack on British

124 Ramchandra Guha, HOW MUCH SHOULD A PERSON CONSUME? Thinking through the Environment, Permanent Black and University of California Press, 2016, Pp, 7-8

125 T.N.Khoshoo, Mahatma Gandhi: an apostle of human ecology, Tata Energy Research Institute, 2002.

126 Ramchandra Guha, Mahatma Gandhi and the Environmental Movement in India, in CNS6(3), 1995. P, 49

127 Collected Works of Mahatma Gandhi, Voloume 26,(September1931-January 1932), P47

128 Ibid, P, 385

129 Ibid, P 164

130 Ibid

131 Ibid, P48

colonialism or imperialism in general within the broader framework of Indian nationalism. His criticisms of the selfishness and competitiveness of the modern society had ecological undertones. Gandhi was not perhaps consciously propagating environmental protection though we cannot deny that Gandhian philosophy had deep interrelation between man, nature and environment.

Gandhi realised that in order to fight colonial imperialism it was important to revitalise Indian villages as self reliant units. He himself began to dress and live like an ordinary villager. Being a prolific writer he began to portray idealised and romanticised Indian village where the poor villagers would not be exploited and would have a supplementary industry along with agriculture. Spinning wheel and handloom were his answer. He wanted concentration of wealth not in the hands of few but in the hands of all. "I hate privilege and monopoly. Whatever cannot be shared with masses is taboo to me."¹³²

PATRONISING RURAL DEVELOPEMNT

In *Hind Swaraj* Gandhi perceived modern civilization as a curse that destabilised man's oneness with nature and environment and also undermined stable and long established communities. This modern civilization, according to Gandhi, was fundamentally flawed and it was aggressive, violent, exploitative, imperialist, brutal, unhappy, restless and devoid of sense of direction and purpose Gandhi believed that for this simple reason our ancestors dissuaded us from luxuries and pleasures. India had had its thousand year old plough, mud cottages and indigenous education bereft of any life corroding competition. It was not that Indians did not know how to invent machineries but our forefathers realised that they concentrated on that then they would slaves and lose their moral fibre. To our forefathers cities were a snare and a useless encumbrance where people were never happy because there would be gangs of thieves and robbers and prostitution.¹³³ He was perhaps trying to uphold the fact that village was the real place for the Indians from where they could fight an uneven battle with British imperialism. In this fight self discipline and moral regulation of desire that formed the very essence of human dignity was extremely important¹³⁴ which modern civilisation denied. Modern civilization gave utmost importance to consumption and accumulation of wealth in the possession of a handful of capitalists. This minuscule group propagated nothing but a craving for wealth and a hunger for worldly pursuits.¹³⁵

Gandhi took up village reconstruction programme as a "concrete expression" of truth and non-violence.¹³⁶ What was his concept of village? In 1937 when he moved to Wardha to devote himself to rural reconstruction he defined his ideal village, "It will have cottages with sufficient light and ventilation, built of a material obtainable within a radius of five miles of it. The cottages will have courtyards enabling householders to plant vegetables for domestic use and use of their cattle. The village lanes and streets will be free of all avoidable dust. It will have wells according to its needs and accessible to all. It will have houses of worship for all, also a common meeting place, a village common for grazing its cattle, a co operative diary, primary and secondary schools in which industrial [i.e., vocational] education will be the centre fact, and that it will have panchayat for settling disputes. It will produce its own grains vegetables and fruit, and its own khadi. This is roughly my idea of a model village"¹³⁷

In this self reliant villages as envisaged by him, Gandhi wanted the villagers to stand erect and not be tempted by the allurements of machine age; rather he wanted them to make their body machines perfect and efficient of work and to get the best out of it. He wanted dues for every Indian villager so that they could sustain themselves. The development of village industries was intended to help the poor in the villages, guarantee them gainful work and arrest migration to the cities. In this context spinning wheel becomes very important for Gandhi. Gandhi was almost obsessed with spinning wheel. Spinning Khadi was seen as a supplementary means of income for the villagers in addition to cultivation. He did not want the villagers to be idle and go hungry when there was no agricultural season. Very consciously, I would argue, he wanted to bridge the gap between the urban and rural life.

Gandhi was not against modern technology as propagated by many. He wanted decentralization of political and economic so that villagers could have control over their own affairs. He said that if the country could have electricity in every village home, he would not mind plying their implements and tools with the help of electricity. In that case he suggested that village communities or state would have own power houses just as they have grazing pastures.¹³⁸ Machinery could only be used for philanthropic needs. He says that if America would share the technology of bridge building and built bridges in India free of cost he would willingly accept. But he knew that when machinery would be used for mass production then distribution would be localised in urban areas denying the villagers a right to it.

To Gandhi law of human being was not killing competition but life giving cooperation. To put up a resistance to British colonialism it was not the good of the few, not even the good of the many but the good of all was required. Without including the rural population the national movement against the British would fall flat

RELEVANCE OF GANDHI IN THE LATER NON VIOLENT MOVEMENTS IN NDIA: CHIPKOO MOVEMENT.

Mahatma had considerable influence on the contemporary environmental movements in India. From Chipkoo to Save the Narmada of the present time, environmental activists have heavily relied upon the Gandhian values of ecological

132 Ibid, P 167.

133 Anthony J.Parel (ed), M.K.Gandhi, 'Hind Swara', and other writings ,Cambridge University Press, New Delhi , 2003, Pp66-67

134 Bhikhu Parekh, Gandhi, A Very Short Introduction, OUP, New Delhi, 1993, P 80

135 Ibid

136 Collected Works of Mahatma Gandhi, Voloume 62,P 228

137 Ramchandra Guha, Mahatma Gandhi and the Environmental Movement in India, in CNS6(3), 1995. P, 50

138 Ibid

prudence and frugality and followed the Gandhian model of decentralized democracy and village *Swaraj*. Some of the important figures of these movements like Sunderlal Bahuguna or Baba Amte or Medha Patkar have repetitively underlined their own debt to Gandhi.

The Chipkoo movement was started by the local villagers for safeguarding their own local ethnic and marginal identity that faced extinction along with forest, river and mother earth that sustained them. The movement proved the M.I.T economist Lester Thurow wrong who had said in as late as 1980 that poor countries and poor individuals were simply not interested in environmentalism. It was only the rich who were interested in environmentalism. Inspired by Gandhian ideals Sunderlal Bahuguna and Chandi Prasad Bhatt played a very vital role by involving the poor people into the domain of environmentalism.¹³⁹ Chandi Prasad Bhatt claimed that the movement was not against science or technology but against the misuse of science where nature used for accruing profit only. The Chipkoo Movement is an ecological movement, concerned with the preservation of forests and thereby with the maintenance of the traditional ecological balance in the sub-Himalayan region, where hill people have traditionally enjoyed a positive relationship with their environment.

On 3rd March 1973, in a remote Himalayan village named Mandal, high in the upper Gangetic valley group of peasants prevented a group of loggers from felling a strand of hornbeam trees. The trees were on a ground owned by State Forest Department. Previously the peasants were not allowed to have access to these trees which they sought to use in order to make farm implements. But the peasants were outraged when they found that a company in distant Allahabad had got a contract from the government to use the same trees for making badminton racquets. The villagers protested against this unfairness by threatening to hug the trees. As Ram Chandra Guha says, "Behind their action lay the claims of justice and tradition, the legitimate subsistence requirements of local villages against commercial outsiders."¹⁴⁰ The Mandal episode led to a series of protests throughout the 1970's where the local people prevented the felling of trees. It is collectively called the Chipkoo movement. The Chipkoo movement marked the beginning of environmental protest by the local people. The movement was totally endogenous movement and was based on non violent techniques which 'recalled freedom and Mahatma Gandhi'.¹⁴¹ Vandana Shiva makes a categorical statement that Chipkoo movement which took place in the post independence India "is historically, philosophically and organisationally an extension of traditional Gandhian Satyagraha."¹⁴² Bahuguna thought of Chipkoo movement as a humble effort to materialise the messages of Indian culture as revived by Gandhi. The tactics involved in the movement were non violent strategies like Satyagraha, fasts, rallies of protest and persuasion. Bahuguna organised several Chipkoo protests and gave wider publicity to Chipkoo cause by his foot marches, fasts, writings and lecture tours. He used popular idioms and Gandhian aphorisms in all his narratives and public meeting.

Ram Chandra Guha makes an interesting comparison between the two Chipkoo leaders Sunderlal Bahuguna and Chandi Prasad Bhatt. While Bahuguna passionately followed the Gandhi of the Hind Swaraj with his uncompromising denunciation of industrial society, Bhatt and his group worked to convey a new ecological meaning to Gandhi's ideal of gram swaraj, or village self reliance.¹⁴³ Bahuguna works in a 'prophetic mode' with his wide teaching tours, whereas Bhatt gives importance to localized reconstruction efforts and appropriate technology.

The movement's major success came in 1980, when an appeal from Bahuguna to Indian Prime Minister Indira Gandhi resulted in a 15-year ban on commercial felling in the Uttarakhand Himalayas. As the movement continued, protests became more project-oriented and expanded to include the entire ecology of the region, ultimately becoming the "Save Himalaya" movement. Between 1981 and 1983, Bahuguna marched 5,000 km (3,100 miles) across the Himalayas to bring the movement to prominence.

Chipkoo Movement came to be a signal victory for the environmental movements, providing new directions and impetus to people's movements and concerns. As a shining symbol of grassroots level activism, Chipkoo provides a blueprint for environmental movements. The leaders and the participants at the grassroots have set an example of nonviolent Gandhian resistance for indigenous and marginalized people across the world. The Chipkoo Movement has been instrumental in forming a new national forest policy which reflects more responsiveness to the needs of indigenous people and ecologically sensitive development.

ECO FEMINISM OF CHIPKOO MOVEMENT

Another very important feature of environmental movements in modern India has been the crucial role played by the women. Shiva paints the Chipkoo struggle as "explicitly an ecological and feminist movement".¹⁴⁴ Paul Routledge, however, views that even though most of the Chipkoo activists were women, they did not have a major share in the ideological leadership of the movement.¹⁴⁵ But the strongest local supporters of the movement were women. They took to streets to protest tree felling, irregular mining, and displacement and over fishing. Ram Chandra Guha has argued that women's' participation in the environmental movement may be explained by the fact that women and girls were more

139 Ramchandra Guha, HOW MUCH SHOULD A PERSON CONSUME? Thinking through the Environment, Pp 1-3.,

140 Ibid , p 70

141 Ibid P, 71

142 Vandana Shiva and Jayanto Bandyopadhyay, Chipko: India's Civilisational Response to the Forest Crisis : INTACH, New Delhi 1986,P, 9.

143 Ramachandra Guha, Mahatma Gandhi and the Environmental Movement. The Parisar Annual Lecture 1993 (Pune: Parisar, 1993), Pp3-4.

144 Vandana Shiva, Staying Alive: Women, Ecology and Survival in India , Kali for Women, New Delhi 1988,P 66.

145 Paul Routledge, Terrains of Resistance: Nonviolent Social Movements and the Contestation of Place in India, Praeger Publishers, West Port Connecticut: 1993, P,79.

involved acquiring fuel, fodder and water.¹⁴⁶ Women of all rural cultures were affected, specially the poor, marginal and small farming families. Women were more affected by paucity and shortage and hence more keen to combat and triumph over it. In this connection the role of Gauda Devi in the Chipkoo movement may be mentioned. She was the unsung heroine of Chipkoo movement.

Gandhiji's clarion call to the Indian women to take active participation in the nationalist movement had perhaps prepared the ground. According to Bahuguna, the establishment of ashrams by Gandhi's English disciples Mira Behn and Sarala Behn in the early 1950s paved the way for a new awakening among the women in the Himalayan districts. Mira Behn realized that the sporadic floods in the Indo-Gangetic plains were because of deforestation caused by replacement of oak forests with pine, a species which retains less water in the soil.¹⁴⁷ Sarala Behn trained women for social work and chose Vimla Behn who later married Bahuguna. Vimla And Sunderlal Bahuguna together continued the struggles in keeping with Gandhian ideology. In the 1960s Mira Behn and Sarala Behn established the Uttarakhand Sarvodya Mandal, which played a crucial role in organizing and empowering women to resist alcohol consumption by the adult male population¹⁴⁸. They also dealt with issues like protection of forest rights and establishment of local forest-based small industries. The women's prohibition movement, which turned successful, provided a legitimate platform for organizing women and thus it became a forerunner of the Chipkoo agitation in the 1970s.¹⁴⁹ The empowered rural women did not dither to fight non-violently for preserving their immediate environment for their survival

GANDHI AND SUSTAINABLE DEVELOPEMENT

Gandhi becomes very relevant today's world when the threat of climate change looms large and natural resources are fast depleting. Gandhi always spoke about sustainable use of resources and the least damage to the environment for the sake of future generation. He did not favour a divided world of *haves and have nots*.

But with full scale industrialisation we have a world with 6 billion people, where 1.1 billion have no access to drinking water, 2 billion have no electricity, 2.4 billion live without sound waste water disposal system. Today we realise the greater implication of Gandhi's ideology that 'there is enough in this world for everyone's need, but not for everyone's greed.'¹⁵⁰ Gandhi may be hailed as the first advocate of the doctrine of sustainable development. He said, "Nature produces enough for our wants and if everyone took enough for himself and nothing more there would no pauperism and consumerism"¹⁵¹ While advocating the thesis of sustainable development Gandhi raised the question that how much a person can consume and how much a person should consume when natural resources are limited. In Gandhian model a sustainable village

Today ironically the thesis of sustainable development is being debated globally. Today unbridled consumption and globalisation has led to the concentration of wealth in the hands of few. Jean-Pierre Lehmann has mentioned that in the early 21st century, some 20 percent of the world's population consumed 85 percent of the world's goods and services. It has also created a global elite who tend to be totally on the same page whether in Shanghai, Mumbai, Cape Town, São Paulo, Paris or Chicago, but are seen as distant and aloof by their own more local compatriots. John Kenneth Galbraith in his *The Affluent Society*, termed 1950's America, the affluent society "so dedicated to affluence that the possession and consumption of material goods was its exclusive standard of individual and collective achievement."¹⁵²

Galbraith quotes Anthropologist Geoffrey Gorcer's remarks that in modern America "any device or regulation which interfered, or can be conceived as interfering, with [the] supply of more and better things is resisted with unreasoning horror, as the religious resist blasphemy, or the warlike pacifism" While speaking to his fellow Americans that "we have not yet learned the difference between yield and loot."¹⁵³ Berkeley geographer Carl Sauer, shares Gandhian concern for an immoral and sinful development and what Gandhiji would condemn as the satanic mode of development, 'when happiness of the one is defined in terms of the suffering of the other'¹⁵⁴.

There has been a growing realization in national governments and multilateral institutions that it is impossible to separate economic development issues from environment issues; many forms of development erode the environmental resources upon which they must be based, and environmental degradation can undermine economic development. Public concern grew rapidly and forced a broad debate on environment conservation and economic growth. The possibility that the process of industrial growth would run into material resource constraints became an important theme in this debate. In the Report of World Commission on Environment and Development (1987) the concepts of sustainability and sustainable development was laid out. Sustainable Development was defined for the first time by Gro Harlem Bruntland the former Prime minister of Norway and the World Health Organisation for the first time. Bruntland defined Sustainable Development as, "Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own

146 Ibid, P 74

147 Sunderlal Bahuguna, "Chipko: The People's Movement with a Hope for the Survival of Humankind" in Sunderlal Bahuguna, Vandana Shiva and M.N. Buch, ed. Environment Crisis & Sustainable Development, Natraj Publishers and Third World Network, Dehra Doon and Malaysia, 1992, P 769.

148 Rajiv Rawat, "Chipko and the Women of Uttarakhand," May '96, <http://bostonglobalaction.net/UK/chipko.html> (accessed June 27, 2005).

149 Vandana Shiva, *Staying Alive: Women, Ecology and Survival in India*, Kali for Women, New Delhi 1988, P 72

150 Archana Barua, *Towards a Philosophy Of Sustainability: The Gandhian Way*. in *Sociology and Anthropology*, 3(2): 136-143, 2015 DOI: 0.13189/sa.2015.030208 <http://www.hrpub.org>, P, 137

151 Ibid

152 Ibid,

153 Ibid

154 Ibid

needs."Here we find an echo of Gandhian thought. Gandhi had always professed that a miniscule part of the world population amassed wealth by exploiting the natural resources of the world. According to Gandhi, it meant nothing but a hunger of greedy pursuit of worldly pleasure.

Today we are realising that uncontrolled exploitation of natural resources could spell disaster for the future generations. Gandhi becomes extremely relevant in this context in the world today.

1356 IMPACT OF CLIMATE CHANGE ON REGIONAL ECONOMIES UNDER RAPID POPULATION DECLINE THROUGH FLUCTUATIONS IN JAPAN'S RICE PRODUCTION: USING MULTI-REGIONAL CGE MODELS

ABSTRACT

Based on the assumption that only rice is affected by global warming under a depopulating society, this paper presented the impact of global warming on regional economies through spillover effects from other agricultural products and the industrial section having an input-output relationship with agriculture. As a result, our study found that global warming-induced climate change causes different impacts in each region and creates regional economic disparities. For example, global warming has a positive impact on regional economies in Hokkaido and Tohoku (in the case of minimum value). In addition to increasing rice production, gaps in rice prices in Kanto and the region west of Kanto will increase outflow, which in turn further increases such production. Meanwhile, global warming will reduce production in Kanto and the region west of Kanto, which will have a negative impact on regional economies. Moreover, other agricultural products will be negatively affected in all regions due to changes in rice production, and production in the food and beverage industries will be also negatively affected in Kanto and the region west of Kanto. However, when the impact of global warming becomes greater, production in the food and beverage industries will increase in Hokkaido.

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RS03.2. Environmental Issues

1072 A PATHWAY TO DELIVER HEALTHY CITIES IN INDIA- A CASE OF UJJAIN CITY, MADHYA PRADESH, INDIA**N. R. Mandal, Kakoli Saha****ABSTRACT**

Indian cities are the growth engines of the Indian economy. Nearly 31% of India's current population lives in urban areas and contributes a major share of India's GDP. However, haphazard urbanization has caused severe deterioration of air and water quality of most of the major cities of India resulting to rises in vector borne, water borne and respiratory diseases. This paper aims to identify the nexus between disease occurrences and quality of built-environment in Indian cities. For the purpose of the study, Ujjain City of Madhya Pradesh has been considered as case study area. Since Ujjain is one of the identified cities for development as a Smart City under Smart City Mission launched by Government of India in 2015, substantial major urban investment in Ujjain City will happen through the Smart City Mission. Further the city will be ranked for city livability index, a first ever exercise in India. As a result, built environment interventions that promote health and well-being identified through this research may inform the development proposals under consideration.

For the study, first issues related to environment and sanitation were identified such as mode of transport used for daily commute, garbage disposal, frequency of pest control, problem of rain water drainage & water-logging, types of diseases, frequency of visits to nearest health facility etc. Information related to each such issue was collected through either primary or secondary sources and the data was transferred to GIS (Geographical Information System) platform. Disease occurrence was divided into four major categories such as water borne, vector borne, respiratory & lifestyle diseases and spatially represented through choropleth maps. In this research, built environment is represented through physical infrastructure which includes road and drainage network, garbage disposal infrastructure, open space, water bodies etc. Maps of physical infrastructure were prepared and nexus between disease occurrences and built-environment in Ujjain City was identified through overlay technique in GIS. The analysis would further help to identify built environment interventions that promote health and well-being and define a specific improvement framework to link performance determinants leading to 'healthy and sustainable communities' as inputs to physical planning and related land development processes.

Key words: Healthy city, Urban Planning, Ujjain, GIS

1. INTRODUCTION: INDIAN URBANIZATION AND POLICY

According to the 2011 Census, 31% of India's population lived in urban areas which is forecasted to increase to 40% by 2030. The Central Statistical Organisation (CSO) of India estimated in 2004-5 that 52% of GDP was produced by urban areas. MGI (McKinsey Global Institute) estimates that by 2030, urban India would produce more than 70 percent of Indian GDP (Sankhe 2010)¹⁵⁵. In the context of this kind of growing urbanization and growing economic contribution, urban areas in India have began to attract more attention while earlier, policy focus was on rural areas. Urban India should play a pivotal role in steering the transition towards a low-carbon society as well as in promoting and protecting health and well-being, but policies need to be in place to ensure that urban services function adequately, and the settlement built-environment provide an aspired quality of life. Indian urban planning faces multi-pronged challenges to deliver services and address the inadequacies of basic amenities. As a consequence, a revised policy was adopted in 2007 called the 'National Urban Housing and Habitat Policy'. The same is currently under consideration for revision. In 2011, a National mission on sustainable habitat was also launched.

2 URBAN DEVELOPMENT MISSIONS

As a national policy response, Jawaharlal Nehru National Urban Renewal Mission (JNNURM) was launched in 2005, the largest initiative since Independence to initiate urban governance reforms and fund infrastructure and service provision. Since 2014, a number of new schemes and missions have been launched to transform urban India, for example, SBM (Swachh Bharat Mission - Urban), AMRUT (Atal Mission for Rejuvenation and Urban Transformation), HRIDAY (Heritage City Development and Augmentation Yojana), HFA (Housing for All -Urban) and the Smart City Mission. While SBM focuses on urban sanitation, AMRUT lays focus on water supply, sewerage, and urban transport. The mission statement of AMRUT indicates the purpose to be threefold: (i) assure supply of water and sewerage connection; (ii) increase the amenity value by developing greenery and well maintained open spaces, and (iii) reduce pollution by switching to public transport or non-motorized movement (e.g. walking and cycling). Smart City Mission, presently targeting 98 cities, was launched in 2015 with an objective of providing core infrastructure and a decent quality of life to urban dwellers through a clean and sustainable environment. The Mission emphasized on comprehensive development of physical, institutional, social and economic infrastructure to improve the quality of life and attracting people and investments to the Cities, setting in motion a virtuous cycle of growth and development (Smart City Mission Statement & Guidelines 2015)¹⁵⁶.

3 LIVEABILITY STANDARDS IN INDIAN CITIES

In January 2018, it was announced that The Housing and Urban Affairs Ministry has decided to assess the liveability standard of 116 Indian cities, which include the identified Smart Cities and few more cities with a population of over 1

¹⁵⁵ Sankhe, S. et. al. (2010). India's urban awakening: Building inclusive cities, sustaining economic growth, McKinsey Global Institute

¹⁵⁶ Smart City: Mission Statement & Guidelines (2015). Ministry of Urban Development, Government of India

million. The concept of the 'liveability standard' is based on four main pillars of development: (i) institutional, (ii) social, (iii) economic and (iv) physical. These four pillars are subdivided into fifteen categories of indicators for preparing sub-indexes (Liveability Standards in Cities 2017)¹⁵⁷. These 15 categories are based on the features contained in the Smart City Proposals (SCPs). Of these fifteen categories, one each relate to Institutional and economic pillars, four of the categories relate to social pillar and the rest nine categories relate to physical pillar of development. A total of 79 Indicators (57 Core Indicators and 22 Supporting Indicators) for these 15 categories have been prescribed in the document for computation of the liveability index of cities. These indicators are also linked to eleven of the seventeen SDGs (Sustainable Development Goals) of UN; i.e., barring the goals numbered 2, 9, 10, 13, 14 and 15 which do not come under the purview of the Urban Development or Housing and Urban Affairs Ministry of India.

4 HEALTH AND WELL-BEING IN CONTEXT OF LIVEABILITY

Amongst the four pillars of development mentioned in the context of 'liveability standard' of cities, the social pillar includes a category of health with five indicators. Recently a National Health Policy (NHP 2017)¹⁵⁸ has been launched with the objective to achieve the highest possible level of good health and well-being, through a preventive and promotive health-care orientation in all developmental policies, and to achieve universal access to good quality health care services without anyone having to face financial hardship as a consequence.

This NHP focuses upon health service delivery, mainstreaming alternative healthcare practices but does not talk about physical planning and built-environment either in urban or rural context. However, research indicates a close link between majority of the categories included in 'physical pillar' of development [Liveability Standards] and 'health' which also is a category in 'social pillar' of development. The nine categories of indicators included in 'physical pillar' of development are for example, (i) Housing and Inclusiveness, (ii) Public Open Space, (iii) Mixed Land Use and Compactness, (iv) Power Supply, (v) Transportation and Mobility, (vi) Assured Water Supply, (vii) Waste Water Management, (viii) Solid Waste Management, (ix) Reduced Pollution.

While the Ministry of Housing and Urban Affairs will prepare city a liveability index considering, inter alia, health outcomes, related plan of actions for development will be implemented by Ministry [centrally] and Department [at state level] of Health and Family Welfare. These activities will happen in silos without adequate coordination amongst the concerned ministries or the departments.

Master plans or physical Development plans including its various statutory or non-statutory forms such as vision plans, perspective plans, sanitation plans, mobility plans are prepared under the aegis of Department of Urban development in each of the states which is also responsible implementation for all the central government missions and schemes mentioned earlier other than the NHM. These plans do not as a practice objectivise health outcomes presently. However, as existing research suggests, it is possible to identify built environment interventions that promote health and well-being and define a specific improvement framework to link performance determinants leading to 'healthy and sustainable communities' as inputs to physical planning and related land development processes.

To achieve this goal, it is imperative that nexus between key health indicators and built-environment parameters are established in the context of Indian cities.

5 BACKGROUND STUDY ON THE CONCEPT OF HEALTHY CITIES

The unprecedented growth of India's urban population exerts a great strain on an already overburdened infrastructure and for the purpose; schemes and missions are being implemented by successive governments. For the purpose of improving city-based public health and environmental hygiene, World Health Organization (WHO) evolved the concept of "Healthy Cities". The "Healthy Cities Project" was launched in Europe in 1986 and extended to India in 1990 (Goli et al., 2011)¹⁵⁹. Goli et al., (2011) identified and prioritized urban health and environmental challenges in eight selected cities in India. According to the healthy city strategy, the foundation and framework for focusing on public health in cities and towns is to overcome the environmental deterioration caused by rapid urbanization. From this perspective, it is understood that health in cities does not imply merely the absence of disease; it symbolizes harmony between humans and their environment (Goldstein, 1998¹⁶⁰; Goumans & Springett, 1997¹⁶¹; Harpham & Stephens, 1991¹⁶²). Researchers, for example, Agarwal et al., (2007), Chattopadhyay & Roy (2005), Swaminathan,(1995), Yesudian (1988) attempted to identify urban health and environmental problems unique to urban areas in India. Bardhan et al.(2015)¹⁶³ researched on the relationship between compact urban form and urban quality of life.

Till date, not much research has been done linking the concept of Healthy Cities and physical planning in India. Since substantial major urban investment in India will happen through the various missions and schemes mentioned earlier,

¹⁵⁷ Liveability Standards in Cities (2017). Ministry of Urban Development, Government of India

¹⁵⁸ National Health Policy (2017). Ministry of Health and family Welfare

¹⁵⁹ Goli, S., Arokiasamy, P., Chattopadhyay, A. (2011). Living and health conditions of selected cities in India: Setting priorities for the National Urban Health Mission. *Cities*, 28, 461 - 469. www.elsevier.com/locate/cities

¹⁶⁰ Goldstein, G. (1998). *Towards an evaluation of healthy cities programmes*. Geneva: WHO.

¹⁶¹ Goumans, M., & Springett, J. (1997). From projects to policy: 'Healthy Cities' as a mechanism for policy change for health. *Health Promotion International*, 12, 311-322.

¹⁶² Harpham, T., Stephens, C. (1991). Urbanization and health in developing countries. *World Health Statistics Quarterly*, 14 (4), 62-69.

¹⁶³ Bardhan, R., Kurisu, K., Hanaki K. (2015). Does compact urban forms relate to good quality of life in high density cities of India? Case of Kolkata. *Cities*, 48, 55-65

this research focuses on impact of built environment on public health to inform and influence objectives of future urban physical development planning in India.

6 STUDY AREA AND DATA USED:

Ujjain city of Madhya Pradesh (fig. 1) is selected as case study area because Ujjain is one of the identified cities for development as a Smart City under Smart City Mission launched by Government of India in 2015 and will be assessed and ranked in 2018 for City Liveability Index. For this study, data is collected through both primary and secondary sources. Primary sources include household level questionnaire survey. Secondary sources include census data, maps and information from various line departments and information provided by consultants engaged by the Ujjain Smart City Limited, an entity formed to help plan and roll out smart city proposals in Ujjain.

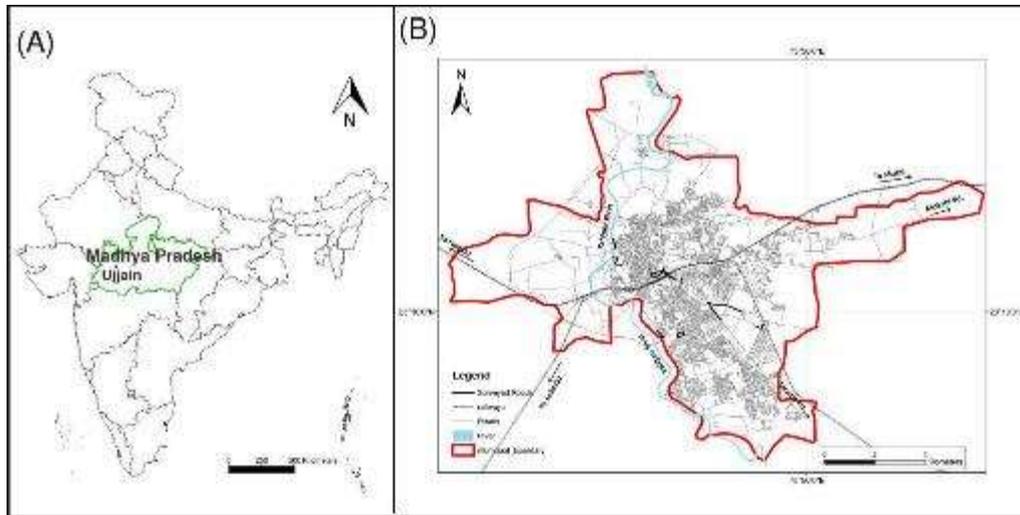


Figure 1: A. location of Ujjain city in India, B. Ujjain Municipal Boundary representing Ujjain city

7. METHODOLOGY

The Healthy Cities approach recognizes the determinants of health and the need to work in collaboration across public, private, voluntary and community sector organizations. This research has been carried out as a part of an academic exercise on preparation of physical Development Plan of Ujjain city in the third semester studio project of a PG programme (Master of Urban and Regional planning) at SPA Bhopal in 2017. The aspect of 'healthy city' is attempted to be linked as public health scenario (in terms of occurrence of diseases) with two aspects, e.g., infrastructure scenario and environmental scenario. The methodology for assessing urban health included three steps: (i) Preparation of detailed questionnaire, (ii) Conducting survey, and (iii) Spatial analysis in GIS platform.

(i) Preparation of detailed questionnaire

A detailed questionnaire was prepared to identify issues related to environment and sanitation. The questionnaire, inter alia, focused upon mode of transport used for daily commute, garbage disposal, frequency of pest control, problem of rain water drainage & water-logging, types of diseases, frequency of visits to the nearest health facility.

(ii) Survey

After preparing the questionnaire, a household survey has been conducted in a span of 10 days in August 2017 with a sample size of 550 households distributed in 54 wards of Ujjain city. Apart from answering questions, the respondents were also requested to indicate and rate health related issues resulting from physical environment in their respective wards. The issues that were frequently highlighted include un-cleaned Drains, mosquito breeding, water-logging, power supply issues, water supply service, stray animals and safety / street lighting scenario. In majority of wards, issues of un-cleaned drains, water supply service and water-logging came to the fore as causing health issues. Though not a common issue, but some wards highlighted issue of street lighting. It was also observed that the three most highly ranked issues physically coincide with the location of slums.

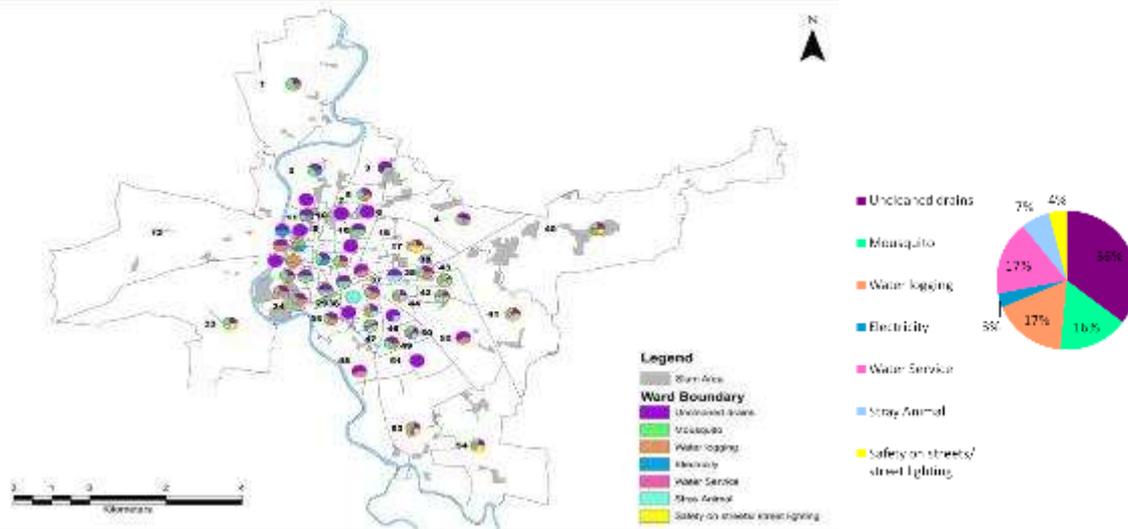


Figure 2: Percent distribution of responses by households on issues of physical environment affecting health in different Wards of Ujjain city¹⁶⁴

(iii) Spatial analysis in GIS platform

All the information collected through primary and secondary sources were mapped in GIS. Mapping was done in two steps: (a) mapping of physical infrastructure, (b) mapping of diseases and opinion responses (as in figure 2).

8. MAPPING AND ANALYSIS

a) Mapping of infrastructure related to health and sanitation

Household survey revealed that 17% of the surveyed population have to traverse more than 1.5 km to reach a dustbin. Large part of the city is not covered by any planned and systematic network for storm water drainage. 29% households of surveyed population do not have septic tanks and they discharge waste water directly into drains which catalyzes the pollution of the surroundings and spread diseases. To understand the relation between diseases and infrastructure, the first step was to map distribution of toilets, dustbins, natural & constructed drains and open spaces (fig. 3).

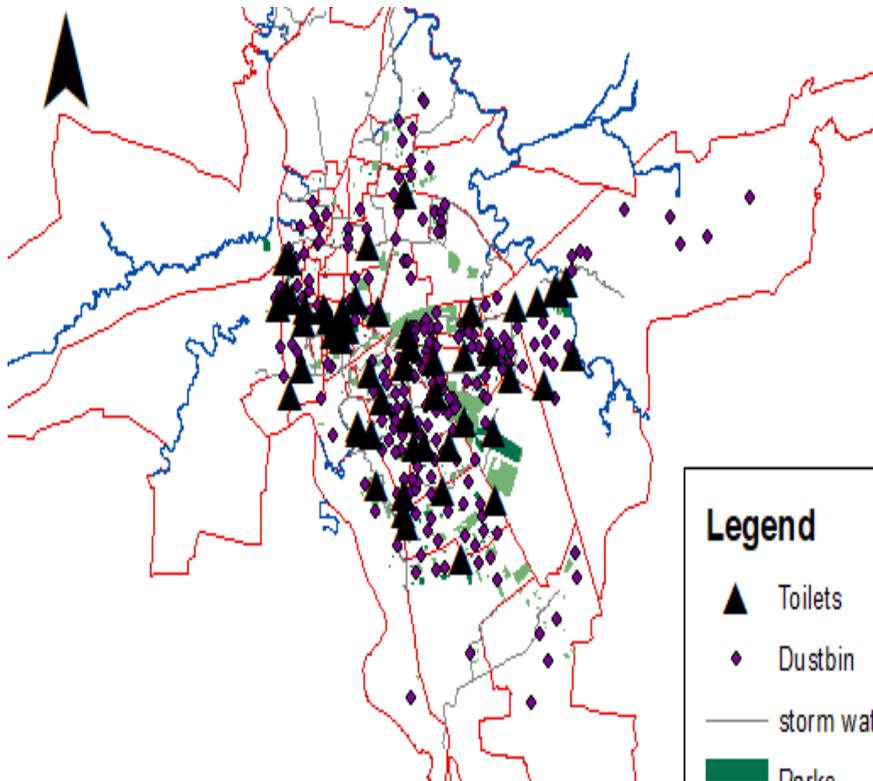


Figure 3: Map indicating natural drains, constructed storm water drains, open spaces, parks, public toilets and dustbins (solid waste bins)¹⁰

b) Mapping of diseases

¹⁶⁴ Development plan of Ujjain, India. Unpublished report, 3rd semester MPUR programme (2017), School of Planning and Architecture, Bhopal, India

The diseases identified through household survey have been divided into four categories such as: (i) Lifestyle diseases (including Diabetes, Blood sugar, Old aged problem, etc.), (ii) Water borne diseases (including Cholera, Diarrhea, Jaundice and various Gastroenterological problems), (iii) Vector borne diseases (including Malaria, Dengue etc.) and (iv) Respiratory diseases (including bronchitis, asthma etc.). Choropleth maps were generated for occurrences of these four categories of diseases. Overlay analysis was performed to find the relationship between diseases and infrastructure.

Cases of Vector Borne, Water Borne, Respiratory and Lifestyle Diseases, UMC

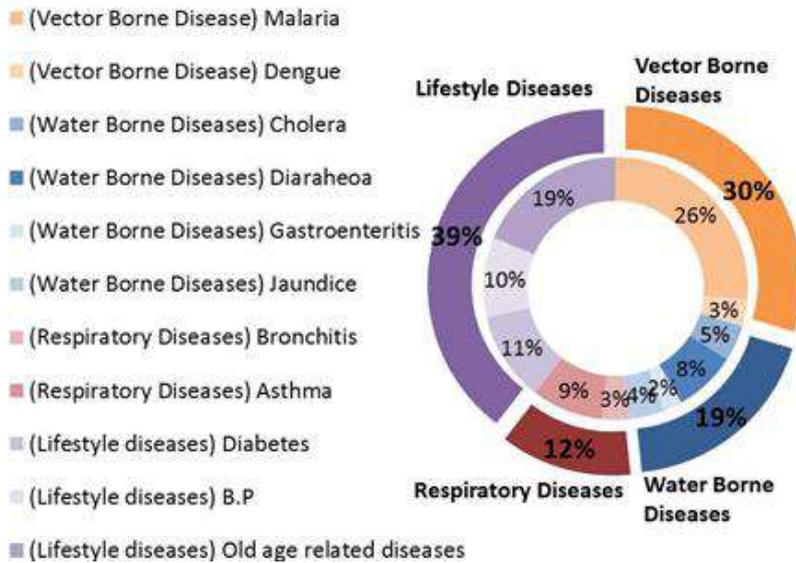


Figure 4: Percent distribution of responses by households for occurrences of diseases in Ujjain city¹⁰

c) Analysis of occurrence of vector borne diseases

Vector borne diseases are predominant in Ujjain Municipal Corporation (UMC) area, specially malaria and cerebral malaria. This leads to the issue of mosquitoes which has been reported by the residents (un-cleaned drains). To investigate the matter, an overlay analysis was performed between occurrence of vector borne diseases, slum distribution, sanitation facilities including access to toilets and natural and constructed drains (fig. 5). Overlay of maps indicate that vector borne diseases are more in areas where access to household toilet is less and slum is more. The map also shows that high occurrences of vector borne diseases follow the course of the Kshipra River (water is kept stagnant for most of the period of a year) and also Piliya khal (natural drain meeting Kshipra River).

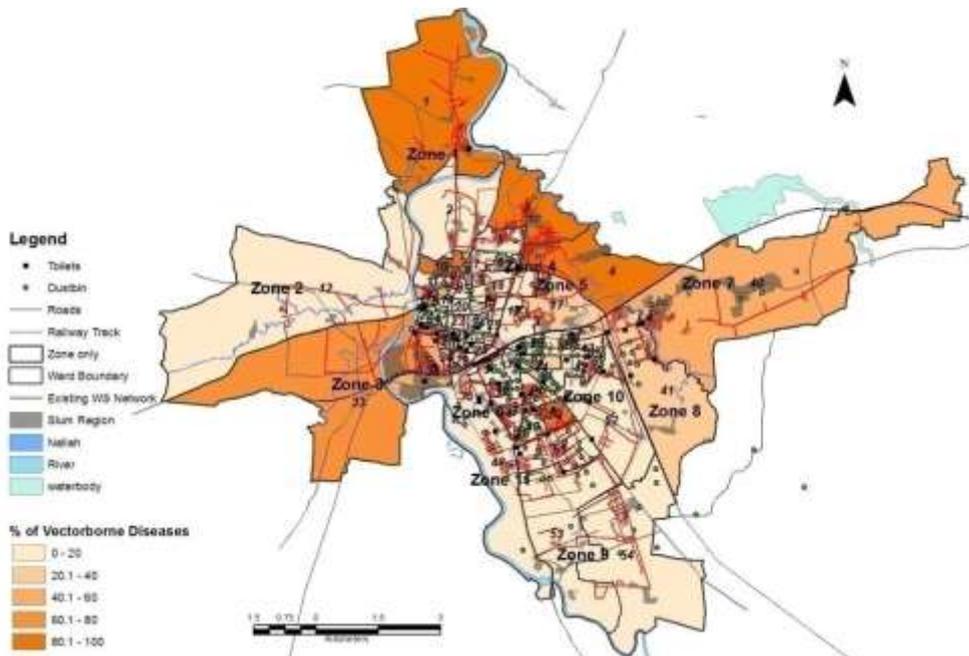


Figure 5: Overlay mapping of percent distribution of vector borne diseases, slums, watercourses, water bodies, public toilets and dustbins¹⁰

d) Analysis of occurrence of water borne diseases

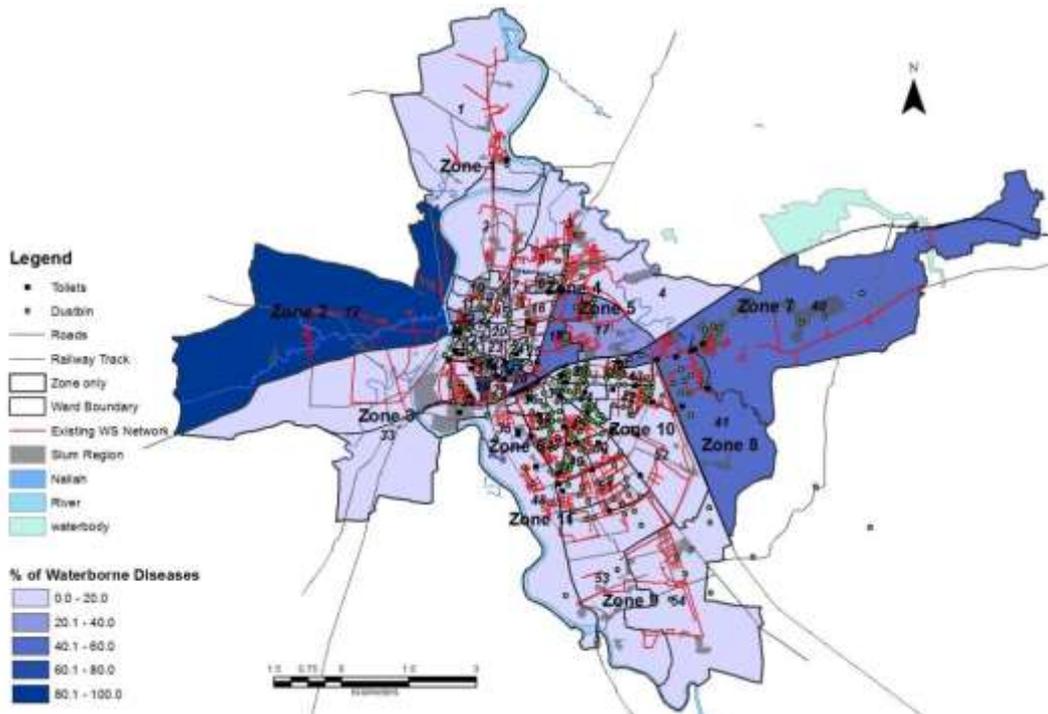


Figure 6: Overlay mapping of percent distribution of water borne diseases, slums, watercourses, water bodies, water supply network, public toilets and dustbins¹⁰

Figure 6 reveals that occurrence of water borne diseases are more in wards where primarily there is less coverage of water supply pipelines, wards with fewer dustbins [leading to accumulation of street-side litter] and where public toilets are less. It also indicates that wards / areas with less constructed and natural drains have a higher prevalence of water borne diseases. There is a high prevalence of water borne diseases in ward number 12 because of existence of a STP site within the at a place called 'Sadaval'.

e) Analysis of occurrence of respiratory diseases

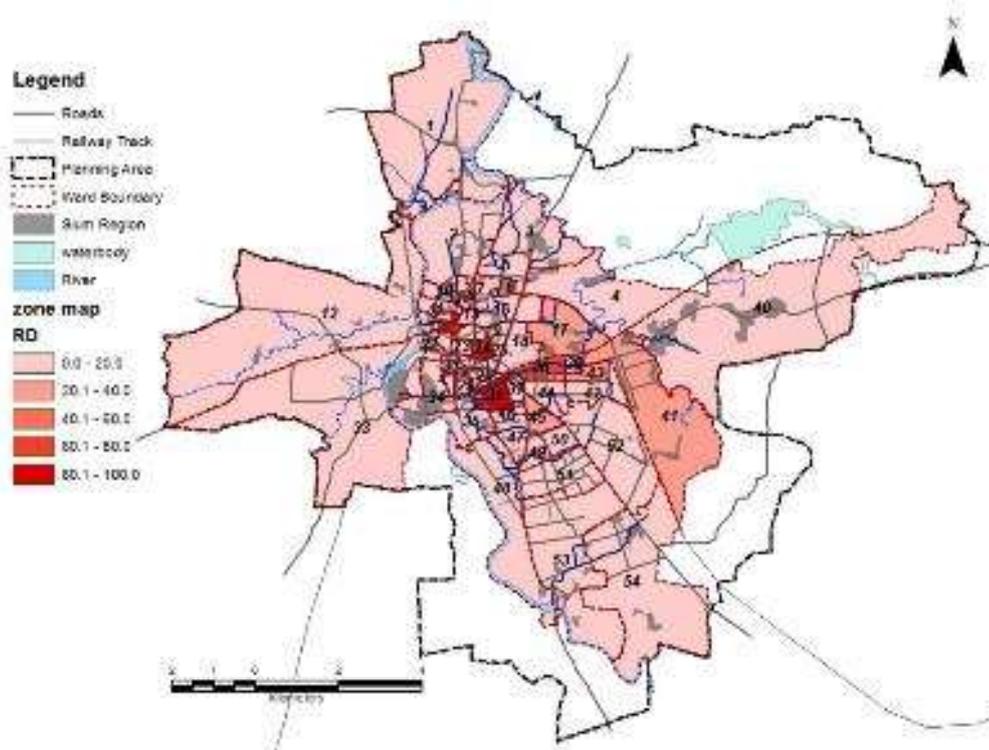


Figure 6: Overlay mapping of percent distribution of respiratory diseases and physical infrastructure¹⁰

Figure 6 shows that in Ujjain city there is no relationship between respiratory diseases and availability of public toilets, dustbins, water supply network etc. However, it indicates a relationship with location of major roads and railway track that is passing through the city. The wards which have major roads and railways line passing through have high occurrence of respiratory diseases.

f) Analysis of occurrence of lifestyle diseases

From the household survey, for the case of lifestyle diseases, mainly diabetes, blood pressure, old-age related issues were identified. Figure 7 reveals that the wards which are situated in the core area of the city have higher prevalence of lifestyle diseases. Occurrence of lifestyle diseases reduce significantly in the peripheral wards. Overlay of maps suggest wards with less availability of residential open spaces and parks are having higher prevalence of lifestyle diseases which may be further construed as a lack of opportunity for active lifestyle. The whole of the city, except for the religious area near the river Kshipra [at Ramghat area] does not have any separate pedestrian facility. Roads have a mixed mode of use, that is pedestrian, cyclists and motorists all use the same road. Hence, this factor has not been considered here. Comparisons with other maps suggest prevalence of lifestyle diseases in wards with higher population density and higher percentage of building footprints. However, age factor has not been taken into account in the analysis and in that way it is a limitation of the study.

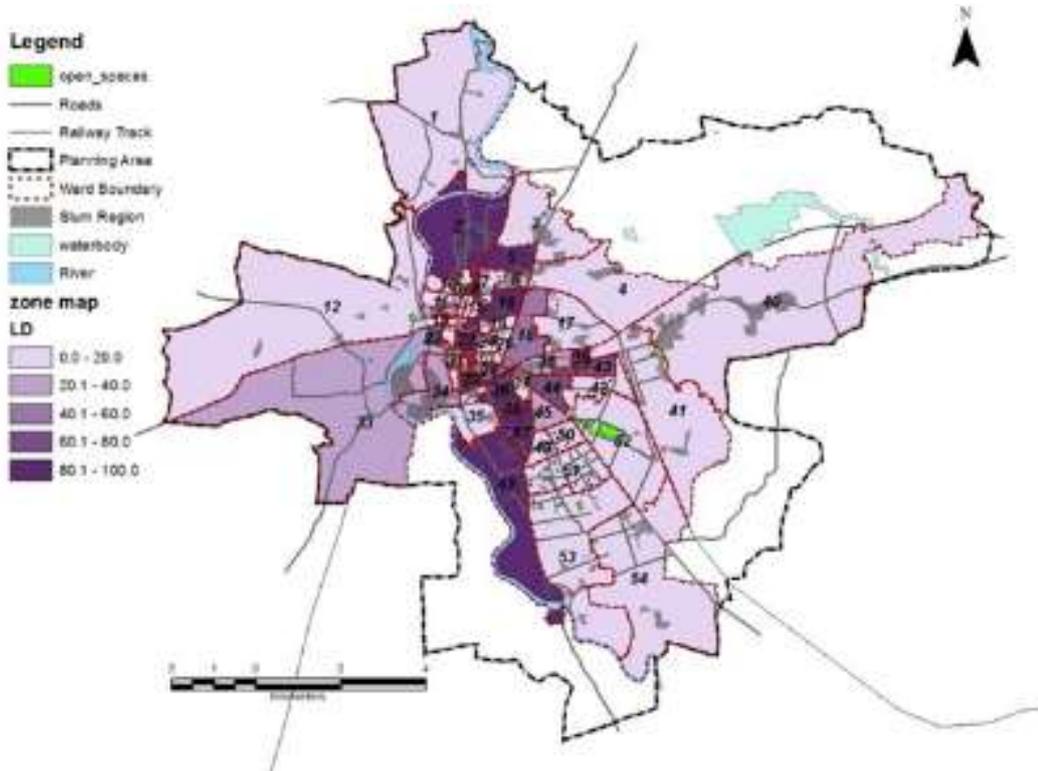


Figure 7: Overlay mapping of percent distribution of lifestyle diseases and open spaces¹⁰

g) Location and availability of medical Facilities

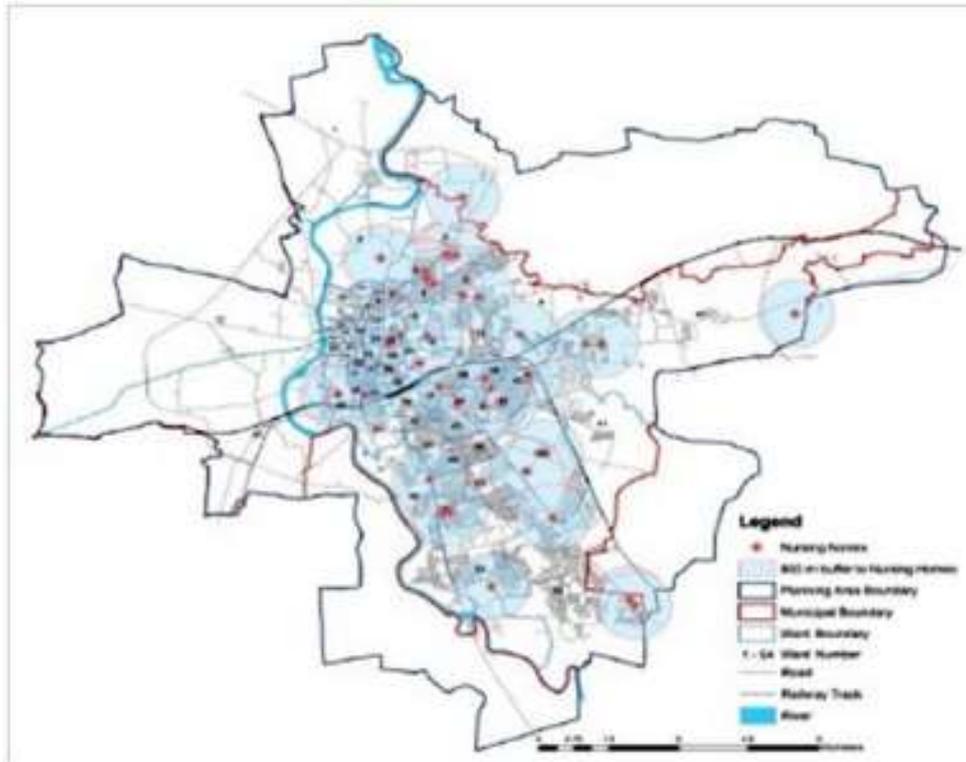


Figure 8: Location of medical facilities in different wards and Proximity Analysis using 800 m buffer distance¹⁰

Ujjain has a total of 5 government run facilities [1 district hospital, 2 civil hospitals and 2 dispensaries] and 74 private medical facilities [36 nursing homes and 38 clinics/ private hospitals]. For extrapolated population in 2017 in the city, considering URDPFI (Urban, Regional Plan Formulation and Implementation) guidelines 2014, the quantum of land used for medical facilities is a little less than as the norms suggest [less by 1.69 hectares]; whereas similarly considering 'Indian Public Health Standards', 2012, number of beds available is more than adequate. Ujjain has 4.9 numbers of doctors per 10,000 resident population, as compared to the World Health Organization Standards prescribed value of 10 [overall value for India: 5.1]. While analysis of ward-wise distribution of beds per 10,000 residents shows some amount of disparity, it was noted that wards 1, 12 and 15 have no health centres and that the facilities are concentrated in the core area of the city as is evident from figure 8. URDPFI guidelines 2014 suggests that the local level facilities to be provided at a preferable walking distance of 300 m to 800 m (located within 5-15 minutes of walk) to promote pedestrian access. A proximity analysis was carried out considering a buffer of 800 m surrounding the health facilities [Fig. 8]. The analysis indicates the areas that are not served by medical facilities within a walking distance. Also it was found that there is a lack of trauma centres in the periphery along major highways entering the city for attending to road accidents.

9. CONCLUSION

This study as a part of an academic exercise of preparing a physical development plan for Ujjain city analyzed four types of disease occurrences with relation to few types of physical infrastructure and existing physical features for example rivers and rivulets. Overlaying of disease occurrences and physical infrastructure/ features show a relation between these aspects. It may be concluded then if appropriate investments and actions are taken to improve the provision of infrastructure health and well-being, outcomes will improve. This research together with further research may provide an opportunity for evidence based planning and decision making for appropriate investments in achieving better health outcomes through physical development process. Scenario analysis for medical facilities show there is not much of deficit as per norms in terms of land being used for the purpose or number of beds. However, physical distribution of the facilities is not equitable spatially which again require attention of physical planners. Further, data of disease occurrence is maintained for the whole city and not for different zones within the city which may point to local issues as highlighted in the study.

1087 ARSENIC POISONING IN BENGAL DELTA-A GEO-ECOLOGICAL STUDY OF WEST BENGAL, INDIA

ABSTRACT

Arsenic contamination in drinking water is a serious issue and health agenda worldwide especially in Asian countries. During the past two decades, Arsenic(As) contamination via groundwater has become a major concern in the Bengal delta or Ganges Delta which includes the state of West Bengal situated at the eastern part in India. The objective of this paper is to identify the causes and the geo-spatial distribution of high As contamination in particularly Bengal Delta along with identifying the areas of high,medium and low As concentration and the people affected by it. The methodology adopted is the study of data,maps and information from different survey reports,journals,books,research papers and analysis of those data to depict the present scenario of As menace as a disaster in this region as well as field study in selected areas to survey the As affected people and their struggle of living. Districtwise study and mapping of As effected area as well as the risk,threat with health effect and mitigation are also highlighted. WHO(2011) has recommended the permissible limit of As of 0.01 mg/l whereas India consider it as 0.05mg/l.In India West Bengal has the highest As affected people.107 blocks in 9 districts are affected severely and about 80 million people are at ris- the southern part of Kolkata-the capital city has severe contamination in 141 out of 144 administrative wards.Its' main fatal effect is the health hazard.As enters human body through contaminated groundwater. Chronic arsenic poisoning, which stems from long-term exposure through drinking water cause a wide variety of diseases, including cancer of the skin,lungs, kidney, and urinary bladder and specially the development of Arsenicosis which can be lethal too.There is no specific medical treatment for these arsenic-related diseases.The study also reveals that regional distribution of this hazard lies in the geological and hydro-lithological structure of the Bengal delta.Moreover due to increasing demand of population, the water stress becomes acute leading to overuse of groundwater and reducing the piezometric level leading to As contamination. It can be concluded that the affected people are mainly poor and vulnerable section of the society and it has become an environmental threat with dense population, socio-political and economic factors exaggerating the problem.Application of knowledge in RS_GIS can help to identify geological structure, industrial effluents and other anthropogenic sources of As contamination and prepare risk map as well as sources of groundwater.

Keywords:- Arsenic,Delta,Contamination,Groundwater,Risk

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1638 GEOGRAPHICAL AND ENVIRONMENTAL ASSESSMENT OF EAST KOLKATA WETLAND REGION, WEST BENGAL, INDIA.

ABSTRACT

East Kolkata Wetland (EKW) is located adjacent to the eastern part of Kolkata in the district of North and South 24 Parganas of West Bengal. It occupies an area of 12,500 hectares and includes 254 sewage fed fisheries, several agricultural plots and solid waste farms. It is famous for having largest waste water fed aquaculture system in the world. Because of having efficient as well as eco friendly solid waste and sewer treatment system EKW is considered as kidney of the city Kolkata. Beside, the site is a harbour of diversified floral and faunal communities. Land and land cover changes has a slow but steady and prolonged effect on the loss of eco system and bio diversity. The total area EKW is 12,500 hectares of which approximately 45.93% is the water body and 38.92% is the agriculture land. The remaining portion is occupied by urban and rural settlements. The anthropogenic threat to bio diversity has been noticed through the fast changing land uses by destroying typical habitats for such resource base. While regulatory control is being attempted in the forest area, loss of greeneries in forest areas especially in wetland and its adjacent areas is now an issue of nature concern. A geographical analysis was done by questionnaire schedule for the study of people’s perception and array. Data and other information’s available and generating on the field have been quantified , compiled , analyzed using appropriate modern techniques like GIS and standard statistical methods and various diagrams to satisfy our objectives. In developing countries especially population pressure, food demands, urbanization etc. have compelled conversion of wetlands to build up an agricultural lands. EKW is a unique example where intense and rapid land cover change is going on. The changes in the quality of solid waste and sewer along with human neglect have put this Ramsar site under threat.

It is therefore necessary and need based to study the extent of loss of bio diversity in this area in relation to its changes in spatio-temporal perspectives. So the aims and objectives of our investigation are 1.To study the spatio- temporal changes over the last two decades of this region. 2. Impact of growing urbanization on environment. 3. To offer useful suggestions in the light of related findings.

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1751 CFD ANALYSIS OF DIFFERENT PASSIVE GUIDING SYSTEM GEOMETRIES ON A SEMI-CLOSED FISH FARM CAGE**António Maximiano¹, Luis Eça², Guilherme Vaz³, Marco Alves¹**¹ WavEC-Offshore Renewables Numerical Modeling Team, Rua Dom Jerónimo Osório, n 11, 1 andar, 1400-119, Lisboa Portugal, Email: antonio.maximiano@wavec.org, marco@wavec.org² IST-UTL, Mechanical Engineering Department Av. Rovisco Pais 1, 1049-001 Lisboa Portugal, Email: luis.eca@ist.utl.pt³ MARIN, R&D Department, P.O. Box 28, 6700 AA Wageningen The Netherlands, Email: g.vaz@marin.nl**ABSTRACT**

Salmon aquaculture is a growing industry, which can help meet the challenges of a growing population and increasing land scarcity. A challenge faced by this industry is the control of the sea lice parasite, which is estimated to account for 9%-23% of the salmon cost in Norwegian farms [1]. One promising approach to control this parasite is using enclosed or semi enclosed sea cages that severely mitigates exposure to the parasite at the expense of increased structure costs and often pumping power. A semi- closed enclosure, with a passive guiding system on the bottom of the skirt was developed by Hydra Pioneer to redirect the incoming current inside the enclosure and promote internal flow without the need for a pumping system. CFD is used to investigate the generated internal flow behaviour produced by four different design variations of the passive guiding system. The estimated water renewal time, internal flow velocity fields and current loads are compared at two different incoming current velocities. The most promising geometry variations are discussed, and further design variations are proposed that might produce better results.

INTRODUCTION

The increasing growth of the global population requires a significant increase in food production. This increase must happen within the context of growing population, where competition for land and water usage will make these resources scarcer than they are presently. So in order to do more with less, the food industry needs to become more efficient [2]. These challenges are relevant for the aquaculture industry, as one of the fastest growing field of the food industry in the past decades [2].

A particular challenge for the salmon aquaculture is the sea lice infestation. The costs to the industry stem not only from the fish lost to the infection, but also from the procurement and administration costs of treatments, often chemicals. The costs due to sea lice are estimated to range between 9 %-23 % in Norwegian salmon farms during the year 2014 [1]. Environmental concerns regarding sea lice are related with the chemicals used for its treatment, and the increased infestation pressure on local wild populations [3]. With increasing food needs, the pressure on livestock density might rise which could further increase the impact of the sea lice on salmon aquaculture. Therefore, sea lice control is one of the most important topics for salmon aquaculture.

Chemotherapeutants have been the most common way to address sea lice infestation, either through additives in fish feed or in bath-type treatments. However some drawbacks are related with the environmental impact of such agents on the local environment, particularly crustaceans, or the increasing resistance of the sea lice to the most common compounds [3, 4]. Alternative non-chemical methods have been used to mitigate the sea lice infestation, such as: fallowing, delousing lasers, or the use of cleaner fish [4, 5], with various degrees of success.

Other possible solutions include farming in closed containment systems, either onshore or floating closed cages. This restricts the contact between the salmon and the water borne parasites, typically present in the top layer of the ocean water (10 m-20 m), which mitigates the infection pressure on the farmed stocks. The use of closed systems also have potential benefits due to a more controlled environment, which can increase efficiency and reduce environmental concerns. However this comes at higher structural and/or pumping costs [6]. Several closed or semi-closed concepts have been studied and even implemented [7, 8, 9], with one in particular showing remarkable reduction in sea lice infestation levels when compared to open net cages in similar locations [6]. Within these systems, using a tarpaulin around existing open net cages is the simplest method, and has the possibility to be retrofitted to existing farms. However, it was found that without auxiliary systems, the oxygen levels inside the pen might drop below acceptable levels [7].

The design of these closed and semi-closed systems is often aided by understanding the flow behavior inside such structures, optimizing inlet-outlets arrangement, pumping power requirements or particle residence times. These questions can be tackled with the use of computational fluid dynamics (CFD), which has seen some use for salmon aquaculture [9], current loads acting on an array of closed structures [8], or understanding the flow behaviour through a compact abalone floating cage in order to design cages to withstand more energetic seas.

In this paper a semi closed fish farm design is studied with CFD. This system utilizes a passive guiding system to redirect the incoming current inside the structure, thus avoiding the use of a pumping system. This concept was developed by Hydra Pioneer and is patented in Norway and globally (PCT). Hydra Salmon Company AS has been awarded four concessions for the implementation of this technology.

Information on the passive guiding system design variations tested is given in the next section. The parameters studied are discussed in the "Variables of Interest" section, followed by a brief description of the CFD solver utilized, numerical settings and grids. Finally, the results are shown and discussed, including remarks on numerical accuracy, closing with some concluding remarks.

PROBLEM DEFINITION

A generic design of a semi enclosed fish farm is used, which consists of a circular skirt and a passive guiding system, located at the bottom of the skirt. The passive guiding system has two main elements: two horizontal flaps, to promote internal vertical flow; and several vertical flaps, positioned with an angle of attack with respect to the incoming flow, to promote a swirling motion inside the structure. The concept is shown schematically in Figure 1.

One configuration of the passive guiding system is chosen as a baseline, henceforth called "base geometry". In addition, three variations of the base geometry are tested: variation 1, where extended horizontal plates are used in the horizontal flaps; variation 2, where an increased angle of attack on the vertical flaps is used; and variation 3, with the horizontal flaps installed with a steeper angle. All these configurations are shown in Figure 2.

These configurations are evaluated at 0.25 m s⁻¹ and 0.5 m s⁻¹ current velocities, which represent typical minimum operational conditions. Due to the structure symmetry, it is sufficient to calculate a single current heading to fully characterize the internal flow on the structure.

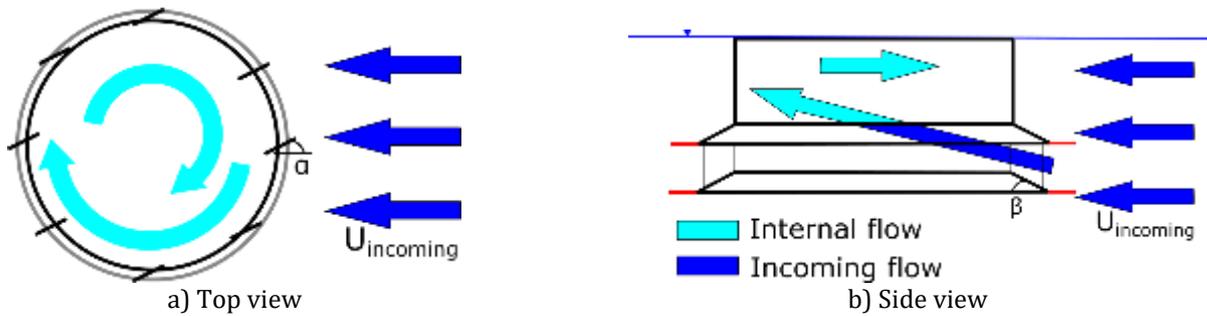


FIGURE 1: Semi-closed fish farm concept. The vertical flaps angle of attack, α , horizontal flap upward angle, β , and horizontal plate extensions (in red), used for the geometric variations are also shown. This concept is patented in Norway and globally (PCT).

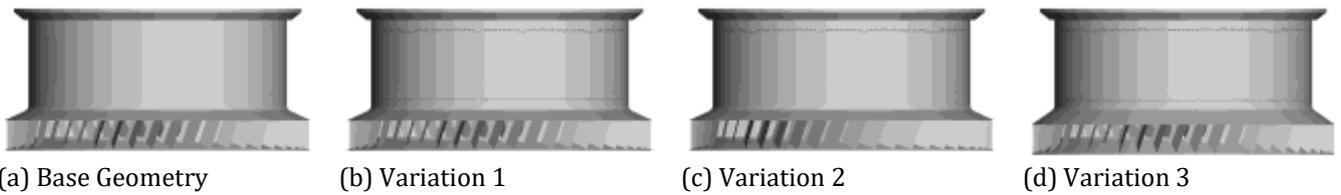


FIGURE 2: Different geometries tested.

VARIABLES OF INTEREST

Estimation of the Water Renewal Time

The time necessary to renovate the water volume inside the structure is of special interest for this application. A rough estimation of this parameter is made, based on the incompressibility assumption and mass balance. The internal volume is divided into N control volumes (CV), a sample CV is shown in Figure 3. An average mass flow rate is obtained for each CV, which is then divided by its volume to obtain an average renewal time for each CV, t_{cv_i} . A total time is computed by the summation of all CV. This time is made non dimensional by a reference time, chosen as the time necessary for a non-rigid pen of the same volume to renew its water, when exposed to the same current field.

$$t_{wrt} = \frac{4U_{ref}}{\pi D} \sum_{n=1}^N t_{cv_i} \quad (1)$$

Note that this provides an estimation for the average time for the renovation of the total volume by assuming an average flow rate per CV, i.e, a constant vertical velocity is assumed for the entire CV. However, since there are significant differences in the flow velocities inside the CV (e.g. vortices, lower velocity areas), longer times will be required to completely exchange the water volumes in these specific areas. This estimation is considered to be indicative for the comparison between the different geometries. However, it is noted that this estimation does not equal the maximum residence time of water particles inside the structure, and it serves as a rough estimation value for use in early design stages.

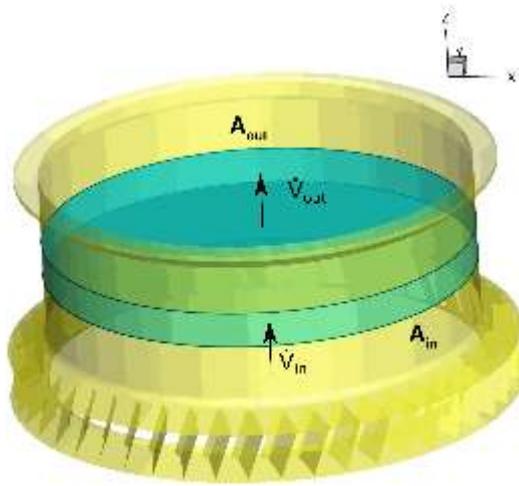


FIGURE 3: Example of a control volume.

VOLUMETRIC DISTRIBUTION OF THE VELOCITY

Another parameter used in this analysis is the local velocity magnitude nondimensionalized by the incoming current velocity, U_{ref} , defined as:

$$V_{mag} = \frac{(V_X^2 + V_Y^2 + V_Z^2)^{1/2}}{U_{ref}} \quad (2)$$

Velocity profiles at different depths are shown for flow pattern visualization, with the internal volumetric distribution of the non dimensional velocity magnitude also shown.

CURRENT LOAD COEFFICIENTS

For the current load calculations the force coefficients, CF_i , and moment coefficients, CM_i , are monitored. These coefficients are defined as:

$$CF_i = \frac{F_i}{\frac{1}{2}\rho U_{ref}^2 A_{ref,i}} \quad CM_i = \frac{M_i}{\frac{1}{2}\rho U_{ref}^2 A_{ref,i}^*} \quad (3)$$

where: $A_{ref,i}^*$ is the $A_{ref,i}$ multiplied by the moment arm; $A_{ref,i}$ is the projected area perpendicular to the i direction; F_i is the force along the i direction acting on the passive system; and M_i the moment around the i direction with respect to the center of the structure at the average depth of the passive guiding system. These forces are defined with respect to the coordinate system defined in Figure 4, with the positive Z axis pointing out of the water. The choice of presenting the loads acting on the passive system only, instead of the complete structure, is made for two reasons: first, it allows a direct comparison of the passive system design, which is the main factor of this study; and second, it avoids discussions regarding the computation of lift and drag coefficients of what is essentially a captive cylinder at a Reynolds number of the order 107.

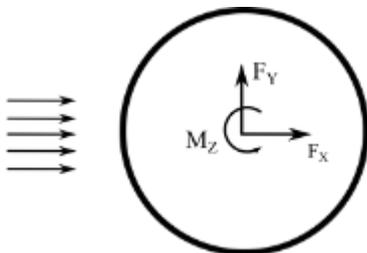


FIGURE 4: Sign convention

CFD APPROACH

Governing Equations

The governing equations are the incompressible steady Reynolds averaged Navier-Stokes equations (RANS) and the continuity equation, written as

$$\frac{\partial(\rho U_i)}{\partial x_i} = 0 \quad (4)$$

$$\frac{\partial(\rho U_i U_j)}{\partial x_j} = -\frac{\partial P}{\partial x_i} + \frac{\partial}{\partial x_j} \left[\mu \left(\frac{\partial U_i}{\partial x_j} + \frac{\partial U_j}{\partial x_i} \right) - \rho \overline{u'_i u'_j} \right] \quad (5)$$

Where U is the time averaged velocity, ρ the fluid density, P the time averaged pressure, μ the fluid kinematic viscosity and $\rho \overline{u'_i u'_j}$ the so called Reynolds stresses. The problem is not closed, as the Reynolds stresses requires additional equations to be determined. In the RANS framework, turbulence models are utilized to model the Reynolds stresses. In this work, the k- ω SST 2003 turbulence model is used, see [10], which relies on the Boussinesq Hypothesis,

$$-\rho \overline{u'_i u'_j} = \mu_t \left(\frac{\partial U_i}{\partial x_j} + \frac{\partial U_j}{\partial x_i} \right) - \frac{2}{3} \rho \delta_{ij} k \quad (6)$$

This turbulence model adds two additional transport equations, one for the turbulence kinetic energy, k , and another for the turbulence dissipation per unit kinetic energy, ω . These equations are omitted for the sake of brevity, but can be found in [10].

INITIAL AND BOUNDARY CONDITIONS

A cylindrical computational domain with a diameter equal to 10 structure diameters is used. The top of the domain corresponds to the water surface, and its bottom is located at approximately 15 structure drafts. The computational domain is presented in Figure 5. At the farfield boundary, inflow and outflow boundary conditions are applied.

At the inflow an uniform current velocity U_{ref} is prescribed. The eddy-viscosity ratio is $\mu T / \mu = 0.3$ and the turbulence intensity I is chosen equal to 10%. For the pressure a zero normal gradient condition is imposed. At the outflow boundary a constant static pressure is specified equal to p_{ref} and a zero normal gradient condition is imposed for all remaining flow quantities. At the water surface a free-slip wall condition is imposed, i.e. the normal velocity is set to zero. At the surface of the structure a no-slip boundary condition is imposed. A constant static pressure equal to p_{ref} is prescribed on the bottom surface of the domain.

The initial conditions for the calculations are defined in each computational cell by setting the velocity equal to the prescribed velocity of the inflow boundary. Furthermore, the pressure is chosen equal to the reference pressure at the outflow boundary and the eddy-viscosity ratio and turbulent intensity equal to the inflow boundary settings.

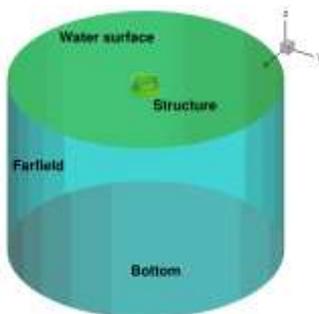


FIGURE 5: Computational domain.

Flow Solver ReFRESH

ReFRESH (www.refresco.org) is a community based open-usage CFD code for maritime applications. It solves multiphase (unsteady) incompressible viscous flows using the Navier-Stokes equations, complemented with turbulence models, cavitation models and volume-fraction transport equations for different phases [11]. The equations are discretised using a finite-volume approach with cell-centered collocated variables, in strong-conservation form, and a pressure-correction equation based on the SIMPLE algorithm is used to ensure mass conservation [12]. Time integration is performed implicitly with first or second-order backward schemes. At each implicit time step, the non-linear system for velocity and pressure is linearised with Picard's method and a segregated approach is used.

ReFRESH (v2.4.0) is currently being developed, verified and its several applications validated at MARIN (in the Netherlands) [13, 14] in collaboration with IST (in Portugal) [15], WavEC (Portugal) [16], and several other universities.

The code is targeted and optimized exclusively for hydrodynamic applications. It has already been applied, with verification and validation exercises for several offshore typical flows: current and manoeuvring coefficients for semi-submersibles, submarines and ships; roll damping; wave generation and wave loads; and for wind loads on offshore vessels.

Numerical Modeling

A first order upwind scheme is employed for the space discretization of the momentum equations and turbulence equations.¹⁶⁵ The diffusion terms are treated using central schemes. The iterative convergence criteria was defined as L2 norm $\leq 10^{-4}$ for the normalized residuals of all quantities.

The following assumptions are made when performing these calculations:

- The structure is kept stationary and fixed;
- Steady flow and forces are considered, unsteady effects are not taken into account;
- The structure is positioned in an uniform inflow velocity field;
- The effects of the free surface are assumed to be negligible, therefore the water surface is modeled with a free slip condition.
- The effects of the swimming fish and fish nets are not accounted for.

Computational Grids

Computational grids are constructed with the grid generator software package Hexpress. The grid is refined towards the hull of the structure to be able to capture the geometry. Some specifications of the grids used are presented in Table 1. The grid generated for the base geometry is shown in detail in Figure 6. The grids generated for the other geometries are equivalent to the base geometry grid shown here. Due to the large number of elements to be modeled and the high Reynolds number, grids with a large number of cells were required to perform the simulations in a reasonable manner. The cost and time constraints of the project, together with the very high cell count grids that would be required, made unfeasible to carry out a thorough Verification study [17], therefore no estimation of the numerical error is available. The lack of this estimation is discussed when interpreting the results.

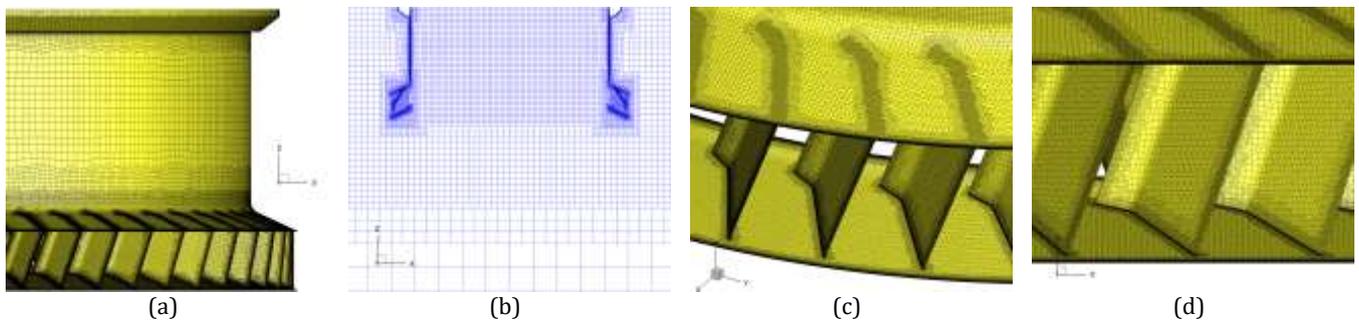


FIGURE 6: Computational grid for the base geometry. An overview of the grid is presented in (a), the grid on the interior on the structure (in blue) is shown in (b). A closer view of the grid on the guiding system is shown in (c) and (d).

TABLE 1: Grid properties of all tested cases.

Geometry	Current velocity $m s^{-1}$	# cells $[\times 10^6]$	max y^+ [-]	avr y^+ [-]
Base	0.50	34.3	103	23
	0.25	34.3	53	12
Variation 1	0.50	41.4	106	52
	0.25	41.4	55	27
Variation 2	0.50	42.0	105	54
	0.25	42.0	54	28
Variation 3	0.50	34.5	102	52
	0.25	34.5	54	27

RESULTS

Internal Flow Visualization

One advantage of performing CFD simulations is the physical insight provided by the availability of flow field visualization. For illustration purposes, the velocity magnitude, as defined in Equation 2, is shown for all geometries at four different depths in Figure 7. The first observation is that, for both current velocities, the non-dimensional velocity field is very similar. This similarity is observed for all geometric variations tested, which suggests that comparisons drawn between geometries are valid for current velocities between $0.25 m s^{-1}$ and $0.5 m s^{-1}$.

The incoming current flow enters the structure through the passive guiding system located at the bottom of the skirt. At this depth, velocities close to undisturbed flow velocity are present in the main inlet region, while lower velocities are present near the center of the structure. The velocity profiles extracted at shallower drafts show an overall deceleration, as is to be expected. Larger velocities occur in the continuation of a clockwise upward spiral jet, with a low velocity core

¹⁶⁵ At this stage, robustness is the key feature

present near the center of the structure. These three dimensional structures are illustrated in Figure 8 for the base geometry case, and are also present, albeit with different magnitudes, in the other geometry variations.

When the angle of attack of the vertical flaps increases (Var2), the high velocity area increases and is displaced closer to the wall due to the larger tangential component imposed by the guiding system. In addition, larger velocities are also felt at shallower drafts, when compared to the base geometry.

Conversely, when the upward flap angle is increased (Var3) this high velocity area gets smaller, but the jet has a stronger vertical component, and propagates better towards the top of the structure. However, there is also a noticeable increase of the low velocity region throughout the whole structure. This is presumably due to the increase of the blocking of the flow through the passive system (see Figure 2).

Adding an horizontal extension plate to the upward flaps (Var1) results in a more uniform flow in the passive guiding system, which produces a small increase in the high velocity area, which is also felt at shallower depths. It is interesting to note that Var1 achieves similar results to Var3, in terms of redirecting the incoming flow upwards, but with a less severe increase in low velocity areas, which favors Var1 in detriment of Var3.

Low velocity areas are generally undesirable in these applications, since it can be associated with low oxygenated areas, or particle/waste accumulation. Early identification of such flow features is valuable information to assess the design, and improve on it, should the need arise. Furthermore, the velocity profiles allow to pinpoint areas with large velocity gradients, which might not be compatible with fish safety parameters.

Velocity Distribution

As a means to quantify the observations made in the previous section, the velocity magnitude distribution, as a function of the internal volume where it occurs, is given in Figure 9. The base geometry shows the smallest volume of low velocity area: 30 % of the total volume with $U \leq 0.3U_{ref}$. Var1 and Var2 show a similar velocity distribution to the base geometry, with velocities in the range $0.7U_{ref} \leq U \leq 0.8U_{ref}$ more frequent for Var2. On the other hand, Var3 shows an increase in the occurrence of low velocities (43 % of the total volume with $U \leq 0.3U_{ref}$).

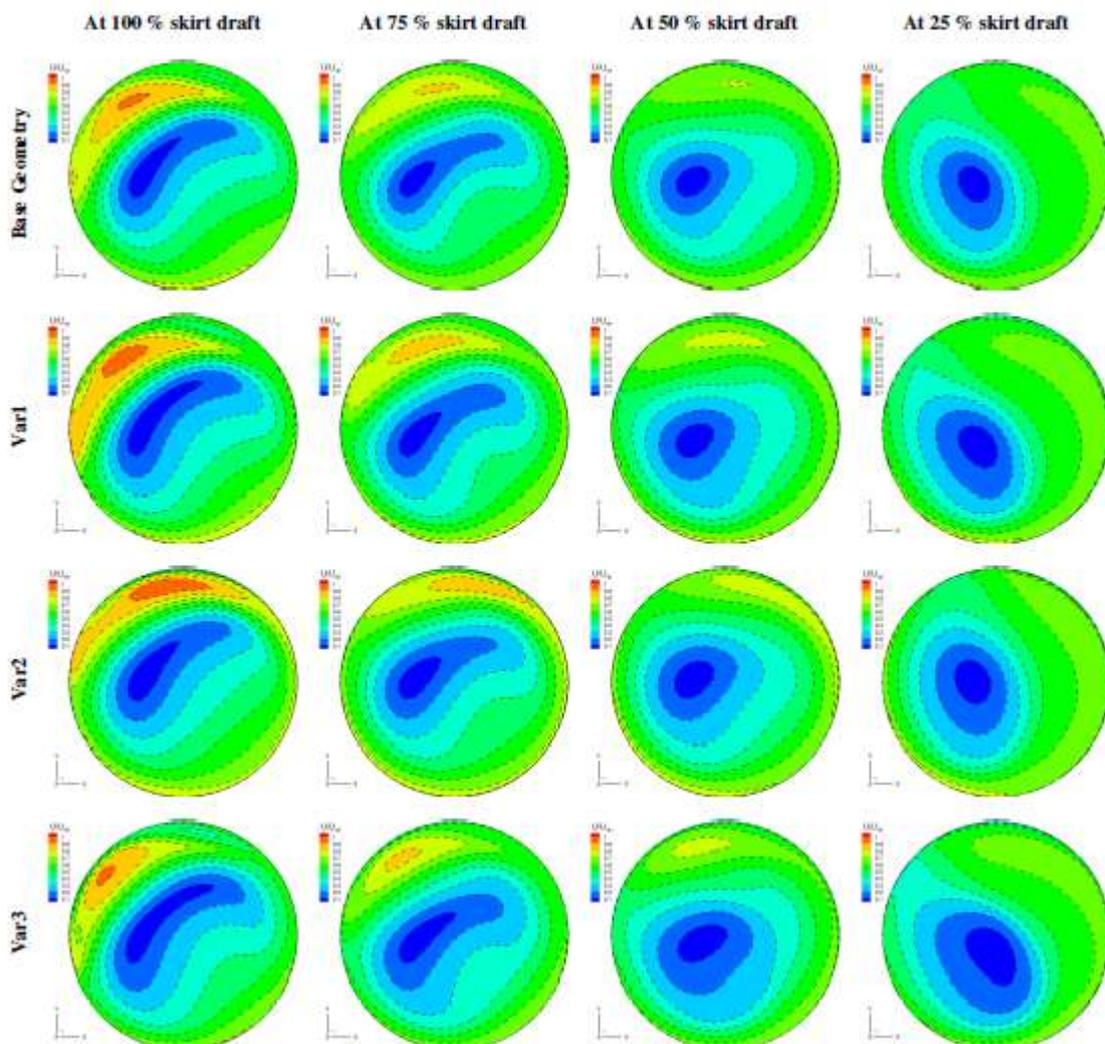


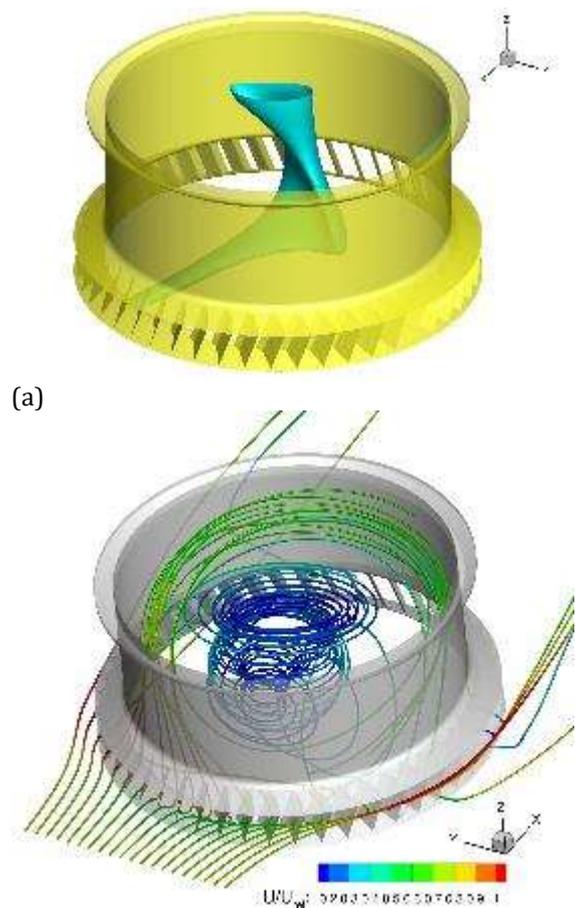
FIGURE 7: Top view of the velocity profiles extracted for all geometries tested at different depths, for a current velocity of 0.50 m s⁻¹ (colors) and 0.25 m s⁻¹ (dashed lines). The flow comes from left to right.

Estimated Water Renewal Time

The estimated time for water renewal, and average vertical velocity as function of the depth are shown in Figure 10 and summarized in Table 2 for all the variations tested. The time for water renewal is about 15-20 times larger than the open net scenario. The differences found between the base case and the geometry variations in the estimated time for total water renewal are under 8 %. The smallest time for total water renewal is found for Var3, while the longest time is found for Var2.

Based solely on this metric, one might assume that Var3 would be the preferred choice. However, as seen previously, the overall distribution of the velocity inside the structure does not favor Var3. This shows the importance of using several metrics in the assessment.

Since this metric is based on an average vertical velocity per control volume, at several depths, and Var3 promotes the vertical velocity component, it is expected that this metric shows favorable results for this geometry variation. It is also interesting to note that the average vertical velocity distribution is very similar between both Var3 and Var1, which suggests that the extension plates favor the vertical water motion, without the associated low velocity areas induced by the increased upward angle of the horizontal flaps.



(a) low velocity area ($U \leq 0.1U_{ref}$); and (b) streamlines colored by the velocity magnitude.

TABLE 2: Estimated time for total water renewal with the different geometries tested

Geometry	t_{wr}	Rel. dif.
Base	18.2	
Var 1	16.8	-7%
Var 2	19.2	+6%
Var 3	16.7	-8%

RS03.3. Environmental Issues

1184 URBANIZATION VERSUS RENEWABLE ENERGY TRANSITION IN DEVELOPING COUNTRIES: A SPATIAL ENERGY MODEL AND EVIDENCE FOR INDONESIA

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ABSTRACT

We develop a spatial energy model to analyze the trade-off between greening and brown expansion of electricity supply in developing countries, under influence of increasing agglomeration. We examine how the cost advantage of fossil fuels visa-vis low-carbon alternatives arises from three interrelated features: geography, power density and technology. Fossil fuels are more power dense and hence spatially more productive than renewable energy resources. Increasing concentration of economic activity in space may therefore impede the emergence of a low-carbon energy system. We calibrated our model to the case of Indonesia and find that until 2050 the expected population growth in Indonesia leads to a 1% annual reduction of the country's share of electricity produced with renewable energy sources. This result is weakened but not reversed at a substantially higher assumed power density of renewable energy sources.

Keywords: energy, electricity, geography, power density, spatial model, Indonesia

JEL Classification: O01, Q40, R12, R3

1. INTRODUCTION

In many developing countries energy scarcity and poor access to modern energy sources hamper the consumption, production and transportation of goods and services, thereby undermining economic development. Rapid expansion of (grid) infrastructure and generating capacity is therefore a key priority for policy makers in these countries. At the same time, fossil-fuel fired power plants, and those that burn coal in particular, are a leading cause of smog and local air pollution and are among the largest contributors to the emission of greenhouse gases. Developing countries therefore face a major dual “energy challenge”: the simultaneous expansion and greening of their electricity supply.

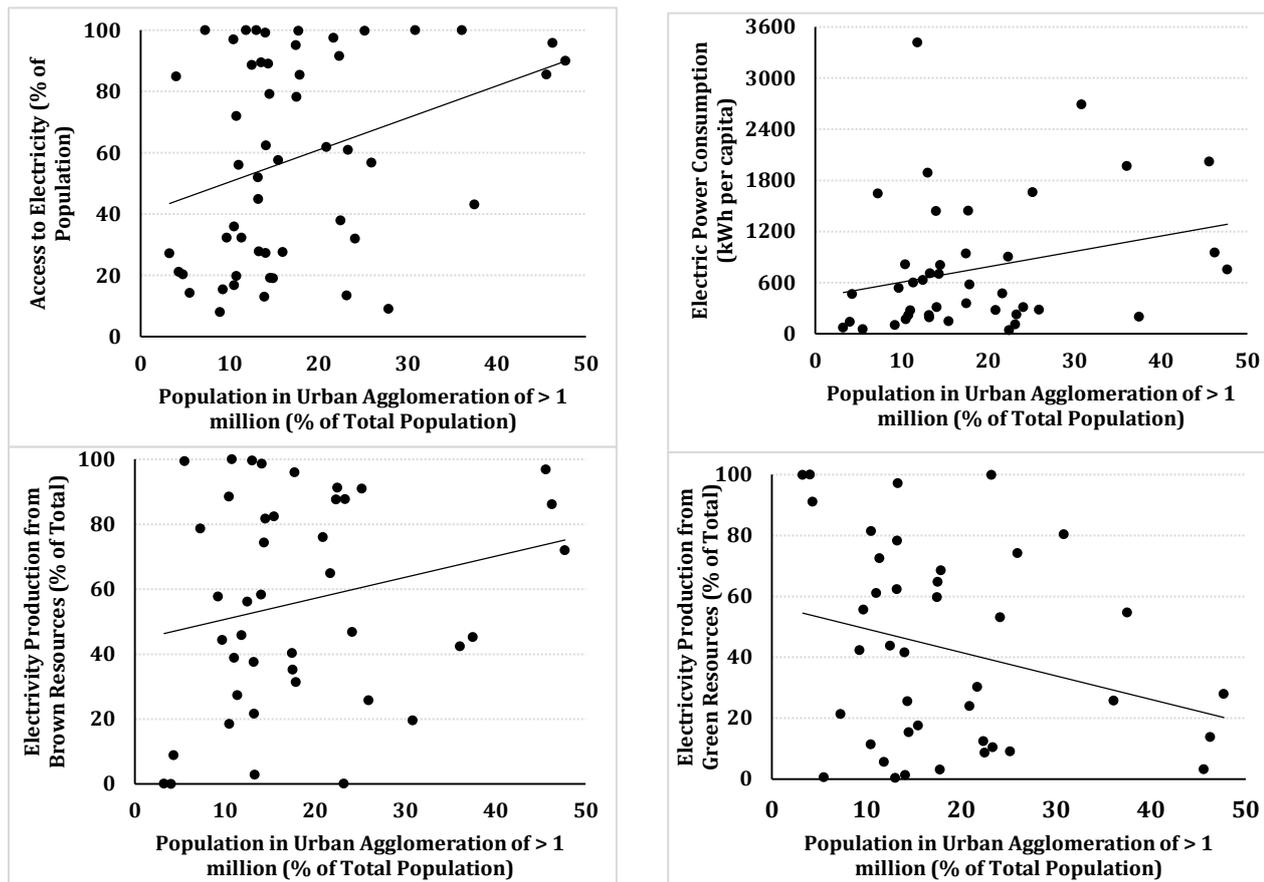
In this paper we analyze the trade-off between greening and brown expansion of electricity supply in developing countries, under influence of increasing population density. We do so by developing a spatial energy model that extends recent work by Moreno-Cruz and Taylor (2012, 2014, 2017), which we then calibrate to the case of Indonesia. In this archipelagic state, one of the most populous countries in the world, coal-fired power plants are increasingly satisfying the rising demand for electricity. Between 2009 and 2016 the usage of coal by the government-owned electricity company PLN increased from 36% to 50% (PLN, 2009 & 2017). Despite this, Indonesia's scattered geography, potentially implying large costs to transport coal, and its relatively “clean infrastructure slate”, providing the country with what Collier and Venables (2012) coined a latecomer advantage, should not necessarily predispose it towards the consumption of coal to the same extent as China and India, and in fact might even enable it to quickly exploit a range of low-carbon alternatives.

It is often argued that developing countries are in the position to leapfrog the lock-in into fossil fuels by building an energy system that meets their energy requirements from renewable energy resources (Goldemberg, 1998; Perkins, 2003; Collier & Venables, 2012). Despite this strong imperative, recent research suggests that fossil fuels are likely to remain the dominant source of energy in many regions around the world. Steckel *et al.* (2015) report that growth in a broad set of developing countries is increasingly supported by carbon-intensive power generation. As such, it appears that many developing countries are only partially meeting their energy challenge. Moreover, Steckel *et al.* (2015) show that the increase of the carbon intensity of energy production is caused mainly by an increase in the consumption of coal. Interestingly, this “renaissance of coal” is not restricted to China and India, but is quite common for emerging economies, especially for countries in Asia. As Steckel *et al.* (2015) and many others (Haftendorn & Holz, 2008; Schiermeier, 2012; Collier & Venables, 2014; Tyfield, 2014; Edenhofer, 2015) have noted, the low price of coal relative to low-carbon alternatives constitutes an important factor for its resurgence.

In this paper, we analyse how this cost advantage of coal visa-vis low-carbon alternatives arises from three interrelated features: geography, power density and technology. As economies grow and develop, the spatial distribution of population, employment and production changes. Probably the most prominent feature of spatial transformation in these countries is increased urbanization. In a few decades from now the global urban population will be larger than the entire global population today, and this urban transition is being driven by cities in the developing world, where 90% of urban growth is projected to take place. This unprecedented change in the geography of economic activity affects economic development and vice versa: an economy's degree of urbanization is not only a consequence of its development; it also determines its growth (Overman & Venables, 2005; World Bank, 2009; Desmet & Henderson, 2014; Duranton & Puga, 2014; Motamed, et al., 2014). As noted before, economic development is fuelled by access to modern energy sources, but if these sources mainly consist of fossil fuels, energy consumption will continue to be a main driver of local air pollution and global greenhouse gas emissions. Most research into the links between global environmental change and economic

development ignores the spatial dimension of both economic development and environmental degradation. In this paper, we explicitly address the role of space.

The dual challenge of expanding and greening the electricity supply relates to the degree of urbanization. Figure 1 shows that across low income and lower-middle income countries (per capita GNI \leq \$3,955) both access to electricity and per capita electric power consumption are positively correlated with concentration of population in urban agglomerations of more than 1 million people (see top left and top right of Figure 1). Also, concentration of population in large agglomerations is positively correlated with electricity production from brown (non-renewable) resources (see bottom left of Figure 1), while the opposite is true for electricity production from green (renewable) resources (see bottom right of Figure 1). In most low and lower middle-income countries, green resources are responsible for only a very small fraction of electricity production, i.e. $<58\%$ (see bottom right of Figure 1). However, in some low and lower middle-income countries, green resources are responsible for a substantial part of electricity production ($>90\%$). In those countries, population concentration in large agglomeration is less than 25% of total population (see bottom right of Figure 1).



Note: Brown resources = oil, gas and coal sources. Green resources = renewable sources, including hydroelectric

Data Source: World Bank Development Indicators (World Bank, 2017).

Figure 43. Concentration of People in Low and Lower-Middle Income Countries, in Relation to Electricity Access and Consumption (Top) as well as Electricity Production from Non-Renewable and Renewable Sources (Bottom)

The transition to a predominantly urban human population will have a significant impact on a transition to a low carbon energy system, because there are fundamental physical limits to how much energy we can extract from renewable resources for a given area of land. To measure this, we can calculate an energy source's power density in watts per square metre (W/m^2). "The power density of an energy resource measures its ability to provide a flow of power considering the area needed for its exploitation" (Moreno-Cruz & Taylor, 2017). The unit cost of transportation of an energy resource is inversely related to its power density, which implies that very power dense resources such as coal and oil will be collected at great distances, while energy resources like timber will not (Moreno-Cruz & Taylor, 2017). In sum, power density is a measure of a resource's "spatial productivity". High power density allows for concentration of people and firms in space (Smil, 2015; Wilson, 2013; Moreno-Cruz & Taylor, 2012). Economic historians have commonly held the interplay of energy density and transport costs responsible for the small city sizes in pre-industrial times (e.g. Smil, 2008, Wrigley, 2010). In a similar vein, Nunn and Qian (2011) recently linked the introduction of a new high-density energy source (the lowly potato) to population growth and urbanization in the Old World.

Following recent work by Moreno-Cruz and Taylor (2012, 2014, 2017), we develop in this paper a spatial energy model that builds on the concept of power density to analyze the potential trade-off between greening and brown expansion of the electricity supply in developing countries, under influence of increasing population density. It is a deterministic partial equilibrium model of the electricity supply chain, in which the demand for electricity in a central marketplace can be satisfied by a non-renewable energy fuel, a renewable energy source, or both. Power density differs between

renewable and fossil fuels. The non-renewable resource (coal) is more power dense and hence spatially more productive than the renewable resource (solar), which all things equal implies it is cheaper to transport coal than solar energy. Hence, for a given distance, the transport (or transmission) cost of solar should exceed that of coal. Because of this, coal will be sourced from a greater distance than solar and it will provide a greater share in total electricity production. If people, because of urbanization processes, increasingly are concentrated in space, the demand for resources with a relatively high “spatial productivity” will increase: according to the scaling law of Moreno-Cruz and Taylor (2017), the supply of energy from a particular energy source is increasing in its power density. Hence, the trade-offs between greening and expansion of electricity supply are subject to the distribution of population and economic development across space.

We find that lower population density and low growth of population density encourage the development of green electricity production and share. Population density has a bigger effect on the brown and green electricity shares for low elasticity of electricity demand and low elasticity of land investment cost for green exploitation area with regards to population density. Higher elasticity of electricity demand with regards to population density brings bigger green electricity production but with smaller share. Lower elasticity of land investment cost for green exploitation area with regards to population density, the greater the green electricity and share. The lower the brown power density and the higher the green power density, the greater the green electricity production and share. Last, we also find that changes on the brown and green power densities and on the elasticity of land investment cost for green exploitation area with regards to population density has no significant effect on the TSO’s profit but the TSO’s profit will be bigger with higher growth of population density and bigger electricity demand with regards to population density.

The remainder of this paper is organized as follows. In sections 2 and 3 we present our deterministic partial equilibrium theory and the model’s equilibrium path of the energy sector. In section 4 we briefly review recent developments in Indonesia’s energy and electricity sector and describe the calibration of our model to the Indonesian situation. In section 5 we present and discuss our main simulation results. Section 6 concludes.

2. THE MODEL

2.1 Introduction

To understand how geography, power density and technology (of fuel transportation, electricity generation and electricity transmission) influence local electricity diversification, we develop a deterministic partial equilibrium model of the energy supply chain. We extend the spatial energy model by Moreno-Cruz and Taylor (2014) by incorporating (i) both renewable and non-renewable energy sources, (ii) electricity transmission and (iii) investment in generation capacity.

Electricity can be generated by non-renewable energy fuels (e.g., coal, lignite and gas) or renewable energy (e.g., solar, wind and biomass). Two fundamental characteristics drive the supply of these resources in our model. First, wind and solar provide small amount of (free) energy per square meter of land compared to fossil fuels. In technical terms, renewable energy is characterized by relatively small power density. The diffuse nature of these resources implies that a sizeable deployment of renewable is dependent on an abundance of cheap and suitable land. Second, as wind and solar energy are free, their costs are primarily driven by the cost of capital associated with capacity investment. There are cities, whose location is fixed, demanding electricity. Electricity is generated either by the combustion of fossil fuels in thermal power plants or by renewable generators, e.g., wind turbines and solar panels. Thermal power plants are located near the cities and electricity transmission service is needed to supply electricity from producers to consumers.

We analyse four different sectors producing various intermediate goods and services. The non-renewable resource sector extracts fossil fuels from a range of locations across space and then transports these fuels to thermal power plants. Thermal power plant producers buy a non-renewable energy fuel to generate electricity using the available stock of generators. Producers of renewable electricity obtain free solar or wind energy in an amount that is proportional to installed generation capacity. Both producers sell their electricity in the electricity wholesale market to a Transmission Service Operator (TSO). In turn, the TSO delivers electricity along the electricity grid to consumers in the cities. Often, the TSO is the national electricity company, which is, especially in lower- and middle-income countries, usually owned or controlled by the state. All markets, except the consumer electricity market, are characterized by perfect competition. Since the TSO is the only supplier of electricity to consumers, the consumer electricity market is characterized by a monopoly, which we will explain in more detail later.

2.2 Geography of Electricity Production

We assume a small open economy zone, which consists of a large city (◆) and several small cities (●). The cities demand electricity, which is produced in a power plant (■) located within the small open economy, outside of the human settlements. The big city is located near the power plant and the small cities are located around the big city. Energy for electricity production is sourced from renewable and non-renewable resources. The non-renewable resources for the thermal power plant is supplied from a mine (▲) located outside of the small open economy zone. The distance between the power plant and the mine is r_B [m]. The frontier of the small open economy is located at a distance λ of the thermal power plant. This location also marks the beginning of the non-renewable resource zone, which is located outside the small open economy – implying that, in contrast to renewable resources, non-renewable resources are collected at the world market. Both the domestic and international zone are characterized by a width ω [m].

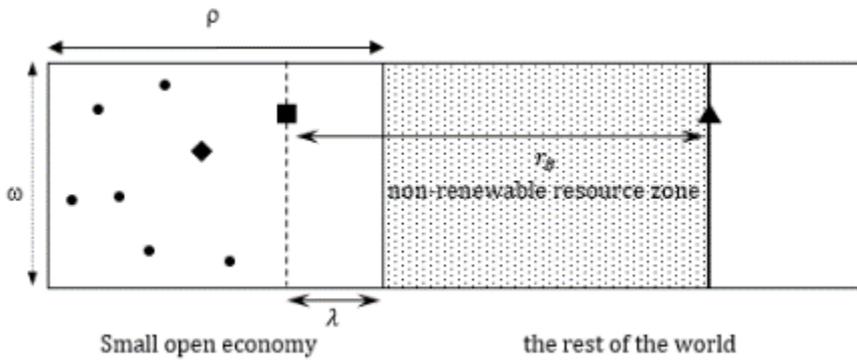


Figure 44 – Illustration of Small Open Economy and Exploitation Zone of Non-Renewable Resource

2.3 Electricity Market

Electricity Supply

The cities are supplied with the electricity produced by the thermal power plant producer and the producer of green electricity and distributed by the transmission service producer. The net supply of electricity, W_S^e [W], is the total electricity production minus the electricity loss in the distribution:

$$W_S^e = (1 - L_B)W_B^e + (1 - L_G)W_G^e \tag{1}$$

where L_B and L_G are the percentage loss of electricity generated from non-renewable resource and renewable resource respectively.

Electricity Demand

Electricity demand is the total electricity consumption of population in the small open economy:

$$W_D^e = iAD^{\beta_w} \tag{2}$$

with:

$$i = b - gp^e \tag{3}$$

$$AD = N \tag{4}$$

where i [W/people] is the electricity intensity, b [W/people] is the maximum intensity of electricity consumption, g [W²/\$·people] is the effect of the electricity price on the electricity intensity with $b, g > 0$, A [m²] is the small open economy area, D [people/m²] is population density in the small open economy, β_w is the elasticity of electricity demand with regards to population density,¹⁶⁶ and N [people] is population in all cities in the small open economy. Hence, the model can best be interpreted as a single (representative) city model.¹⁶⁷

Market Equilibrium

In market equilibrium, electricity supply W_S^e [W], equals electricity demand W_D^e [W]:

$$W_S^e = W_D^e \Leftrightarrow (1 - L_B)W_B^e + (1 - L_G)W_G^e = (b - gp^e)AD^{\beta_w} \tag{5}$$

From this definition, it follows that the consumer electricity price in equilibrium is:

$$p^e = \frac{b}{g} - \frac{(1-L_G)W_G^e + (1-L_B)W_B^e}{gAD^{\beta_w}} \tag{6}$$

Equation (6) shows that the consumer electricity price is increasing in maximum intensity of electricity consumption (b), distribution losses (L_G, L_B), the small open economy area (A), population density (D) and the elasticity of electricity demand with regards to population density (β_w). The consumer electricity price is decreasing in supply of electricity (W_S^e, W_B^e) and the price elasticity electricity intensity (g).

Moreno-Cruz and Taylor (2012) focus on explaining how the location and productivity of energy resources determine the distribution of economic activity around the globe. While the distribution of energy resources in the Asian-Pacific region may influence the distribution of economic activity both within and across Indonesia and surrounding countries, we recognize that there may be other drivers as well. We therefore take the potential demand for electricity as given and then try to explain and predict how various features of geography and technology affect both the overall supply of energy as well as the energy mix in Indonesia.

¹⁶⁶ We adjust Bettencourt's *et al.* (2007) formulation. In Bettencourt's *et al.* (2007), β_w is the elasticity of electricity demand with regards to population size.

¹⁶⁷ In principle, we could model energy consumption over a large number of cities as: $W_d^e = \sum_{i=1}^N w_0(n_i)^{\beta_w}$, where n_i is population size of city i . However, calibration of the model then requires city-specific data on the elasticity of electricity demand with regards to population density, which is yet unavailable for Indonesia. Also, on the supply side, where "D" plays a role in the transmission losses, we have a single city. A multi-city model thus requires at least to make the length of the electricity grid city specific as well, implying a need to collect city-specific data on transmission losses - which is also yet unavailable. We therefore leave this for future research.

2.4 Non-Renewable Resource Production

Producers, like mining companies, use a constant-returns-to-scale transportation technology to collect and carry energy fuels from the non-renewable resource zone to the thermal power plant located near the big city. Transport of energy fuels from the mine to the electricity power plant is costly, and costs increase with the distance and the resource weight. Let us define the physical density of the resource by f_B [kg/m²] and the exploitation area of the non-renewable resource by A_B [m²], then the resource weight x_B [kg] equals $f_B \cdot A_B$. Next, let us define the price of the non-renewable fuel set by the mine producer as p_B^m [\$/W]. Producers of brown resources earn revenues $p_B^m \alpha_B A_B$, with α_B [W/m²] the power density of the non-renewable resource. If producers pay a unit cost u_B [\$/kg·m] per total carry x [kg] over distance r_B [m] of the resource, then producer gets profit:

$$\pi_B^m = p_B^m \alpha_B A_B - u_B f_B A_B r_B \quad (7)$$

where m and B successively refer to the mine and brown or non-renewable resource. Resource producers will extract resources until the marginal revenue from the last unit extracted equals its cost of carry. The marginal supplier in the non-renewable resource zone is indifferent between supplying fossil fuels or not when profits have fallen to zero, i.e. the marginal revenue from the last unit extracted equals its cost of carry. To find the distance r_B associated with this marginal unit, we set profits equal to zero:

$$\pi_B^m = 0 \Leftrightarrow r_B^* = \frac{p_B^m \alpha_B}{u_B f_B} \quad (8)$$

$$\Leftrightarrow p_B^m = \frac{u_B f_B r_B}{\alpha_B} \quad (9)$$

The right-hand side of equation (9) represents the average cost. Further, based on equation (7) and (8), the higher the resource price and the bigger the power density of the resource, then the greater the gross revenues from the resource collection and the greater the willingness of the mine producer to explore the resource farther from the power plant.

To find the net supply of energy to the thermal power plant, note that across the whole width ω of the resource zone, a total of α_B watts can be collected every meter and delivered to the power plant. Following Moreno-Cruz and Taylor (2014), we do not model energy use in transport of resources. To obtain net resource supply W_B^m to the thermal power plant, we sum the net “physical resource rents” over the whole area of exploitation:

$$W_B^m = \int_{\lambda}^{r_B} \omega \alpha_B dr = \alpha_B \omega (r_B - \lambda) \quad (10)$$

From (10) we find that the greater the power density, the greater the supply of non-renewable resources to the thermal power plant. This is because power density not only increases the supply of energy via the intensive margin, that is, it boosts the supply of energy from infra marginal lands, but also via the extensive margin, that is, it increases the supply of energy by extending the resource frontier outwards. Equation (10) also reveals that if the non-renewable resource zone is located far away from the power plant then net supply to the power plant decreases. In the absence of new resource discoveries, the consumption of non-renewable resources will thus first peak and then decline (Moreno-Cruz & Taylor, 2014).

This boom-bust pattern has already become apparent for Indonesia where the declining production of oil fuel has forced Indonesia to become more reliant on domestic coal production and imports of fossil fuel, possibly turning Indonesia into a net energy importer before 2019 (Indonesian DGNEEC, 2012). Equation (10) explains why in some remote areas like in Indonesia, local resources with much lower power density have not been exploited and those areas are still depending more on non-renewable resources. However, the long delivery distance for the resource caused high cost. For example, the cost to provide oil fuel (including the transport cost) is \$1.52 per liter in the remote Indonesia province of Papua in 2013.¹⁶⁸ This is more than one and half times the price of non-subsidized oil fuel at \$0.8-0.9 per liter.¹⁶⁹ Inclusive of maintenance cost, the electricity production cost per kWh is 38¢, considerably higher than the average basic electricity tariff at only 7¢ per kWh (Dhany, 2013). The high cost lowers the electricity supply and makes power outage happens quite frequent in remote areas.

2.5 Wholesale Electricity Production

Brown electricity

The producer of brown electricity, i.e. the thermal power plant, buys non-renewable resource at price p_B^m , convert them into electricity at the efficiency rate η_B with $0 < \eta_B < 1$ and sells electricity on the wholesale electricity market to the TSO at price p_B^e [\$/W]. Abstracting from operation and maintenance costs, thermal power plant profits equal:

$$\Pi_B^e = p_B^e W_B^e - p_B^m W_B^m - I_B k_B \quad (11)$$

where e refers to electricity producer and I_B [\$/W] is the investment cost of the thermal power plant per unit of installed capacity, k_B [W]. Brown electricity production W_B^e [W] can never exceed full capacity so:

$$W_B^e = \eta_B W_B^m = z_B k_B \leq k_B \quad (12)$$

where z_B is the rate of production at the brown power plant, with $0 \leq z_B \leq 1$. If $z_B = 1$, then the power plant produces at full capacity.

¹⁶⁸ The IDR value was converted to USD based on the average exchange rates in 2013 (Bank Indonesia, 2015).

¹⁶⁹ In 2017, President Joko Widodo commanded to set the uniform oil fuel price in all areas in Indonesia (Irfany, 2017).

Using equation (9), (10) and (12), we can reformulate equation (11):

$$\Pi_B^e = \left(\left(p_B^e - \frac{I_B}{z_B} \right) \eta_B \alpha_B - u_B f_B r_B \right) A_B \quad (13)$$

Equation (13) demonstrates that the higher the price of brown electricity and the efficiency rate in the thermal power plant, the bigger the power density of the resource and the wider exploitation area of the resource, the greater the profit of the brown electricity producer. Equation (13) also describes that the higher the investment cost and the unit cost of carry, the heavier the resource weight collected per meter square of the exploitation area, the farther the distance between the power plant and the resource mine and the lower the production rate in the power plant, the greater the cost and the lower the profit of the brown electricity producer.

With the market for brown generation capacity being perfectly competitive, investors will increase capacity until profits are equal to zero. Setting the right-hand side of equation (11) equal to zero, and rearranging, we obtain:

$$k_B = \left(\frac{p_B^e \eta - p_B^m}{I_B} \right) W_B^m = \left(\frac{p_B^e \eta - p_B^m}{I_B} \right) \alpha_B \omega \left(\frac{p_B^m \alpha_B}{u_B f_B} - \lambda \right) \quad (14)$$

We assume that the brown electricity producer is a non-profit firm who works under zero economic profit. Using equation (9) and (12), the zero-economic profit condition can be written:

$$\Pi_B^e = 0 \Leftrightarrow p_B^e = \frac{I_B}{z_B} + \frac{u_B f_B}{\eta_B \alpha_B} r_B \quad (15)$$

According to equation (15), the higher the investment cost and the unit cost of total carry, the heavier the resource and the farther the distance between the power plant and the resource mine, then the higher the price of brown electricity, but higher production and efficiency rates in the thermal power plant and greater power density of the resource, the lower the brown electricity price.

Green Electricity

The producer of green electricity collects energy from renewable energy source like sunlight, wind and geothermal heat, converts this into electricity at the efficiency rate η_G with $0 < \eta_G < 1$ and sells the green electricity on the wholesale electricity market to the TSO at price p_G^e [\$/W]. We assume that the green electricity producer only needs to cover investment cost, because for many renewable energy technologies the renewable resources (like wind and sun) can be collected for free at the power plant. Hence, the profit function of the green electricity producer is:

$$\Pi_G^e = p_G^e W_G^e - I_G k_G \quad (16)$$

where G refers to green or renewable resource, I_G [\$/W] is the investment and maintenance cost of the green power plant per unit of installed capacity, k_G [W]. We assume that the costs for generating green power decrease in the power density α_G and the efficiency rate η_G with which the flow of renewable resources can be exploited (IRENA, 2015), but increase in population density D because this reduces the potential exploitation area of the renewable resource (A_G). An increasing demand for residential land area implies increasing scarcity of suitable land to harvest green energy from hydro dams, windmills, biomass crops and solar farms, and thus higher production costs. We model these various effects as follows:

$$I_G = I_G^k + \frac{I_G^l}{\eta_G \alpha_G} \psi_G = I_G^k + \frac{A_G}{\eta_G \alpha_G A} I_G^l \quad (17)$$

with I_G^k [\$/W] the cost of the green power equipment (like solar panels), I_G^l [\$/m²] the cost of land area needed for green power production, ψ_G ($0 < \psi_G < 1$) the share of the small open economy area (A) that is used for the green energy production (so $A_G = \psi_G A$), and the other parameters as before.¹⁷⁰ Supply of green electricity production, W_G^e [W], depends on the renewable resource supply, W_G^r , and the efficiency rate of green power production, η_G . Furthermore, we assume that green power plants always run at full capacity, implying that the rate of production at the green power plant $z_G = 1$.¹⁷¹ This implies that:

$$W_G^e = \eta_G W_G^r = z_G k_G = k_G \quad (18)$$

The net renewable resource supply, W_G^r , to the green power plant(s) is defined by the amount of renewable watts that can be collected every square meter – the power density α_G – across the exploitation area A_G of the renewable resource at a cost of I_G^l [\$/m²], with the exploitation area being defined by its width ω and length ρ (see Figure 2). We do not model energy use or other costs in transport of resources.¹⁷² Hence, the net “physical resource rents” over the whole area of exploitation are:

$$W_G^r = \alpha_G \omega \rho \psi_G = \alpha_G \psi_G A \quad (19)$$

Using equation (17), (18) and (19), we can reformulate equation (16):

¹⁷⁰ We could assume that the costs for generating green power decrease in the cumulative installed production capacity K_G because of a technology learning effect (IRENA, 2016), such that $I_G^k = aK_G^{-b}$. However, this would complicate the model without yielding additional insights for the purpose of our analysis. Therefore, we take I_G^k as a fixed cost, implicitly assuming that learning effects materialize in the world market from which green power equipment is imported.

¹⁷¹ This assumption implies that solar panels and windmills are never switched off, which is a reasonable assumption (especially for solar panels, the most important source of renewable energy in Indonesia).

¹⁷² These costs are zero by definition in the case of electricity production from solar, wind and hydro, but maybe positive in the case of burning biomass.

$$\Pi_G^e = (p_G^e - I_G)\eta_G\alpha_G\psi_G A \quad (20)$$

Equation (20) shows that green electricity profits are increasing in the green electricity price and decreasing in the cost of investment, subject to the efficiency rate of green power production, η_G , the power density of the renewable resource, α_G , the size of the small open economy area, A , the share of the small open economy area that is used for green energy production, ψ_G , and the cost of land area needed for green power production I_G^k . With the market for renewable generation capacity being perfectly competitive, investors will find it worthwhile to increase capacity until the green electricity price equals the effective per unit capital cost. Setting the right-hand side of equation (20) equal to zero, using equation (17) and rearranging, we obtain:

$$k_G = \left(\frac{p_G^e \eta_G}{I_G}\right) W_G^r = \left(\frac{p_G^e \eta_G}{I_G}\right) \alpha_G \psi_G A = \left(\frac{p_G^e \eta_G}{I_G^k + \frac{I_G^l}{\eta_G \alpha_G} \psi_G}\right) \alpha_G \psi_G A = \frac{p_G^e (\eta_G \alpha_G)^2 A \psi_G}{I_G^k \eta_G \alpha_G + I_G^l \psi_G} \quad (21)$$

According to equation (21), the installed capacity of green power production increases in the green electricity price, p_G^e , the efficiency rate of green power production, η_G , the power density of the renewable resource, α_G , and the size of the open economy area, while it decreases in the cost of the green power equipment (like solar panels), I_G^0 [\$/W], and the price of land for green energy production, I_G^l .

We assume that the green electricity producer is a non-profit firm who works under zero economic profit. Using equation (17), the zero-economic profit condition can be written:

$$\Pi_G^e = 0 \Leftrightarrow p_G^e = I_G^k + \frac{\psi_G}{\eta_G \alpha_G} I_G^l \quad (22)$$

According to equation (22), the higher the land and equipment investment cost and the share of the small open economy area that is used for green energy production, then the higher the price of green electricity, but greater power density of the renewable resource and higher efficiency rates in power production plant, the lower the green electricity price.

2.6 Transmission of Electrical Power Transmission Technology and the Electricity Grid

We assume that the thermal power station is located outside of the large city (◆), creating a natural demand for the transportation of electrical power from producer to consumers. Since their inception in the 19th century, electricity grids have enabled the transportation of electrical power across long distances. The bulk of electricity is transferred, or transmitted, along high-voltage power lines from power station to electrical substations. Central to the final stage of the delivery of electricity to consumers is a more fine-grained collection of power lines, a part of the infrastructure often referred to as the distribution grid. Together the transmission and distribution grid are referred to as the electricity grid. The transmission of electrical power depends on the geographic distribution of power producers and electricity consumers. For green electricity, we assume that it could be generated by a utility-scale solar power plant which is also located outside of the city, but the green electricity generator may also be installed at the consumer's residency, e.g., a set of solar panels that is placed on the roof.

The longer the electricity grid, i.e. s_B and s_G [mc]¹⁷³, the more expensive the distribution of electricity will be. Moreover, if people cluster in the large city (◆), fewer lines are required. On the other hand, if people live scattered in small cities (●) or the countryside, more lines are needed. Therefore:

$$L_B = \tau s_B = \tau \gamma_B D^{-\beta_s} \quad (23)$$

$$L_G = \tau s_G = \tau \gamma_G D^{-\beta_s} \quad (24)$$

with:

$$s_B = \gamma_B D^{-\beta_s} \quad (25)$$

$$s_G = \gamma_G D^{-\beta_s} \quad (26)$$

where L is losses, τ [%/mc] is the effect of the distribution distance on the electricity loss, γ^{174} is the effect of population density on the length of distribution line and β_s is the elasticity of population density on electricity loss through the length of distribution lines. We assume that $\beta_s > 0$.¹⁷⁵ Since the thermal power plant cannot be in the cities then the brown electricity always needs the transmission service and so: $\gamma_B > 0$. Moreover, since the green electricity generator could be placed at the customers' residency so: $\gamma_G \geq 0$. If we assume that the green electricity is generated by solar power and the solar power is installed at the top of the customers' roof, then the transmission service is not needed. In that case, $\gamma_G = 0$, so that $s_G = 0$ and $L_G = 0$.

Transmission Service Operator

¹⁷³ mc = meter circuit

¹⁷⁴ If $\beta_s = 1$ then the unit measurement for γ is mc·people/m².

¹⁷⁵ Notice that in our model, the elasticity measured the effect of population density on the electricity loss or the length of distribution line, while Bettencourt *et al.* (2007) present the effect of population size on the length of distribution line.

The transmission system operator buys power at the price p_B^e for electricity generated from the non-renewable resource and at the price p_G^e for electricity generated from the renewable resource, and sells electricity to consumers in the small open economy at price p^e [\$/W],¹⁷⁶ taking into account that the electricity supplied suffers from transmission losses:

$$\Pi_T^e = ((1 - L_B)p^e - p_B^e)W_B^e + ((1 - L_G)p^e - p_G^e)W_G^e \quad (27)$$

Rewriting equation (27) using equations (10), (12), (15), (18), (19), (22), (23), (24) gives us:

$$\Pi_T^e = \left((1 - \tau\gamma_B D^{-\beta_s})p^e - \frac{I_B}{z_B} - \frac{u_B f_B}{\eta_B \alpha_B} r_B \right) \eta_B \alpha_B A_B + \left((1 - \tau\gamma_G D^{-\beta_s})p^e - I_G^k - \frac{\psi_G}{\eta_G \alpha_G} I_G^l \right) \eta_G \alpha_G A_G \quad (28)$$

Equation (28) defines that profits of the transmission service producer are increasing in the price of electricity, the power plant efficiency rate, the power density of the energy resources, the resource exploitation areas and the production rate at the generator. Profits are decreasing in the electricity loss per unit of the length of the distribution line, the effect of the electricity generation technology on the length of the distribution line and the cost of investment. Furthermore, greater population density and a lower elasticity of the line distance with respect to population density reduce transmission cost and raise profits.

Higher cost to deliver the resource from the mine to the thermal power plant, greater weight of the brown resource and farther distance between the thermal power plant and the mine reduce the profit but lower learning rate coefficient increases the profit.

3. MODEL EQUILIBRIUM

To close the model, we assume that it is the objective of the Transmission Service Operator (TSO) to maximize profits by choosing the optimal mix of brown and green electricity from the electricity producers, subject to the equilibrium condition (5) where total electricity supply equals total electricity demand by consumers. By substituting equation (6) into equation (27), the profit function of the TSO reads as:

$$\Pi_T^e = \left(\frac{b}{g}(1 - L_B) - p_B^e \right) W_B^e + \left(\frac{b}{g}(1 - L_G) - p_G^e \right) W_G^e - \frac{2(1-L_B)(1-L_G)}{gAD^{\beta_W}} W_B^e W_G^e - \frac{(1-L_B)^2}{gAD^{\beta_W}} W_B^{e2} - \frac{(1-L_G)^2}{gAD^{\beta_W}} W_G^{e2} \quad (29)$$

The first-order conditions for maximization of Π_T^e are:

$$\frac{\partial \Pi_T^e}{\partial W_B^e} = 0 \Leftrightarrow \frac{b}{g}(1 - L_B) - p_B^e - \frac{2(1-L_B)(1-L_G)}{gAD^{\beta_W}} W_G^e - \frac{2(1-L_B)^2}{gAD^{\beta_W}} W_B^e = 0 \quad (30)$$

$$\frac{\partial \Pi_T^e}{\partial W_G^e} = 0 \Leftrightarrow \frac{b}{g}(1 - L_G) - p_G^e - \frac{2(1-L_B)(1-L_G)}{gAD^{\beta_W}} W_B^e - \frac{2(1-L_G)^2}{gAD^{\beta_W}} W_G^e = 0 \quad (31)$$

Re-arranging equations (30) and (31) yields the optimal quantities of brown (W_B^e) and green (W_G^e) electricity, respectively:

$$W_B^e = \frac{gAD^{\beta_W}}{2(1-L_B)^2} \left[\frac{b}{g}(1 - L_B) - p_B^e \right] - \left(\frac{1-L_G}{1-L_B} \right) W_G^e \quad (32)$$

$$W_G^e = \frac{gAD^{\beta_W}}{2(1-L_G)^2} \left[\frac{b}{g}(1 - L_G) - p_G^e \right] - \left(\frac{1-L_B}{1-L_G} \right) W_B^e \quad (33)$$

From equations (32) and (33), it can be seen that the optimal quantity of both brown and green electricity increases in the small open economy area (A), population density (D), the elasticity of electricity demand with regards to population density (β_W) and the maximum intensity of electricity consumption (b). Furthermore, the optimal quantity of green (brown) electricity increases in distribution losses and production price of brown (green) electricity.

To further specify W_B^{e*} and W_G^{e*} we make use of equations (10) and (12) to define r_B as a function of W_B^e :

$$W_B^e = \eta_B W_B^m = \eta_B \alpha_B \omega (r_B - \lambda) \Leftrightarrow r_B = \frac{1}{\eta_B \alpha_B \omega} W_B^e + \lambda \quad (34)$$

and we make use of equations (18) and (19) to define η_G as a function of W_G^e :

$$W_G^e = \eta_G W_G^r = \eta_G \alpha_G \omega \rho \psi_G = \eta_G \alpha_G \psi_G A \Leftrightarrow \eta_G = \frac{1}{\alpha_G \psi_G A} W_G^e \quad (35)$$

Next, we substitute (33) and (34) into (32), as well as (32) and (35) into (33). In doing so, we make use of $p_B^e = \frac{I_B}{z_B} +$

$\frac{u_B f_B}{\eta_B \alpha_B} r_B$ from equation (15) and $p_G^e = I_G^k + \frac{\psi_G}{\eta_G \alpha_G} I_G^l$ from equation (22). After re-arranging, we get:

$$W_B^{e*} = \frac{(\eta_B \alpha_B)^2 \omega}{u_B f_B} \left[\left(\frac{1-L_B}{1-L_G} \right) \left(I_G^k + \frac{\psi_G}{\eta_G \alpha_G} I_G^l \right) - \left(\frac{I_B}{z_B} + \lambda \frac{u_B f_B}{\eta_B \alpha_B} \right) \right] \quad (36)$$

$$W_G^{e*} = \frac{(\eta_G \alpha_G)^2 A}{I_G^l} \left[\left(\frac{1-L_G}{1-L_B} \right) \left(\frac{I_B}{z_B} + \frac{u_B f_B}{\eta_B \alpha_B} r_B \right) - I_G^k \right] \quad (37)$$

Next, let us make the following assumptions:

¹⁷⁶ The electricity price in reality is the price of energy (\$/kWh) but in our model, the electricity price is the price of electrical power (\$/W). Power is energy per unit of time. We convert the price in \$/kWh into \$/W by assuming that the time is one year.

A1. The green electricity price net of transmission losses must be strictly larger than the first unit of brown electricity delivered, $p_G^e \left(\frac{1-L_B}{1-L_G} \right) > \frac{I_B}{z_B} + \frac{u_B f_B \lambda}{\eta_B \alpha_B}$.

A2. Electricity demand must be sufficiently large, that is,

$$\frac{(\eta_B \alpha_B)^2 \omega}{u_B f_B} \left[\left(\frac{1-L_B}{1-L_G} \right) \left(I_G^k + \frac{\psi_G}{\eta_G \alpha_G} I_G^L \right) - \left(\frac{I_B}{z_B} + \lambda \frac{u_B f_B}{\eta_B \alpha_B} \right) \right] < \frac{iAD^{\beta_W}}{1-L_B}$$

We can then summarize our findings in the following propositions.

Proposition 1. Assume A1 and A2 hold. The equilibrium pair (W_B^{e*}, W_G^{e*}) represented by equations (36)–(37) is then strictly interior, that is, $(W_B^{e*}, W_G^{e*}) > (0,0)$.

In equilibrium, the level of brown electricity produced is increasing (and the level of green electricity produced is decreasing) in the width of the non-renewable exploitation area, the resource and production efficiency of the thermal power plant, the power density of the non-renewable resource, the share of total land area devoted to green power production, the unit price (or cost) of green electricity, green transmission losses and population density.

On the other hand, the level of green electricity produced is increasing (and the level of brown electricity produced is decreasing) in the size of the open economy area, the efficiency rate of green power production, the power density of the renewable resource, the unit price (or cost) of brown electricity, brown transmission losses and the transport costs of the non-renewable resource to the thermal power plant.

From equation (17), (22) and (36) it follows that in equilibrium, a high share of total land area devoted to green power production, ψ_G , increases the level of brown electricity produced because the more land area used for green power produced the more scarce suitable land to harvest green energy will be, thus increasing the costs of land for green power production and therefore the unit price (or cost) of green electricity. At the same time, in section 2.5 we have argued that the potential renewable exploitation area will also become scarcer under influence of increasing population density, D , because of the implied increasing demand for residential land area. Let us assume that the costs of land for green power production, I_G^L , depend on population density, D , according to:

$$I_G^L = \theta D^{\beta_L} \tag{38}$$

with $0 < \beta_L < 1$ the price elasticity of land. Combining equation (38) with the definitions of population density and the share ψ_G of the small open economy area (A) that is used for the green energy production as given in, respectively, equations (4) and (17), allows us to define how the green electricity price (see equation (22)), depends on population size, the size of the renewable exploitation area A_G and its share ψ_G in the small open economy area (A):

$$p_G^e = I_G^k + \frac{\psi_G}{\eta_G \alpha_G} \theta D^{\beta_L} = I_G^k + \frac{\theta \psi_G^{1+\beta_L}}{\eta_G \alpha_G} \left(\frac{N}{A_G} \right)^{\beta_L} \tag{39}$$

This leads to the following proposition.

Proposition 2. The green electricity price (and thus the level of brown electricity produced) is increasing in population size, the share of total land area devoted to green energy production and the price elasticity of land.

On the other hand, the green electricity price (and thus the level of brown electricity produced) is decreasing in the efficiency rate of green power production, the power density of the renewable resource and the size of the renewable exploitation area.

Hence, we find that the role of increasing the renewable exploitation area in greening the electricity supply is ambiguous, since it depends on the price elasticity of land, β_L , and population size. Increasing the renewable exploitation area stimulates green electricity production only if price elasticity of land price and population size are modest. To further gain insight in the role of a growing population on the greening of the electricity supply we substitute equation (36) into the equilibrium condition (5), to obtain:

$$W_G^{e*} = \frac{(b-gp^e)AD^{\beta_W} - (1-L_B)W_B^{e*}}{(1-L_G)} = \frac{(b-gp^e)AD^{\beta_W} - (1-L_B) \frac{(\eta_B \alpha_B)^2 \omega}{u_B f_B} \left[\left(\frac{1-L_B}{1-L_G} \right) \left(I_G^k + \frac{\theta D^{\beta_L}}{\eta_G \alpha_G} \psi_G \right) - \left(\frac{I_B}{z_B} + \lambda \frac{u_B f_B}{\eta_B \alpha_B} \right) \right]}{(1-L_G)} \tag{40}$$

From equation (40) it follows that a higher population density, D , on the one hand increases the equilibrium level of green electricity, W_G^{e*} , through a higher demand $(b - gp^e)AD^{\beta_W}$ ($g > 0$), subject to the elasticity of electricity demand with regards to population density, β_W . On the other hand, a higher population density, D , decreases the equilibrium level of green electricity, W_G^{e*} , by increasing the equilibrium level of brown electricity (see proposition 1). The latter effect reflects the economies of scale and scope in production and distribution of brown electricity with a relatively high power density, as discussed before. We need to simulate our model to learn the total effect of population density on greening the electricity supply in Indonesia.

Finally, inserting equations (36) and (37) into equation (29) gives us the maximum profit obtained by the TSO. By substituting L_B and L_G from equation (23) and (24) we can then write the maximum profit of the transmission service producer as a function of population density:

$$\Pi_T^{e*} = \left(\frac{b}{g} (1 - \tau_{Y_B} D^{-\beta_S}) - p_B^e \right) W_B^{e*} + \left(\frac{b}{g} (1 - \tau_{Y_G} D^{-\beta_S}) - p_G^e \right) W_G^{e*} - \frac{2(1-\tau_{Y_B} D^{-\beta_S})(1-\tau_{Y_G} D^{-\beta_S})}{gAD^{\beta_W}} W_B^{e*} W_G^{e*} - \frac{(1-\tau_{Y_B} D^{-\beta_S})^2}{gAD^{\beta_W}} W_B^{e*2} - \frac{(1-\tau_{Y_G} D^{-\beta_S})^2}{gAD^{\beta_W}} W_G^{e*2} \tag{41}$$

Equation (41) can be used to determine the population density threshold for a certain level of maximum profits of the TSO.

4. MODEL CALIBRATION AND SIMULATIONS

In this section, we first describe major developments in the electricity system in Indonesia, including a brief portrayal of its institutional context. Next, we briefly describe the calibration of our model on the Indonesian situation.

4.1 The electricity system in Indonesia

As noted in the introduction, Indonesia could in principle benefit from a 'latecomer advantage' to develop a low-carbon electricity system, but currently increasingly uses coal-fired power plants to meet its rising demand for electricity. Also, it is one of the most populous countries in the world. In combination with rising per capita income, continued urbanization and its archipelagic geography, this imposes formidable challenges to its national electricity company (PLN) in terms of expanding and greening its electricity. Most Indonesian residents get their electricity from PLN, the state electricity company in Indonesia, which also buy electricity from Independent Power Producers (IPPs) and Private Power Utilities (PPUs)¹⁷⁷. Besides producing electricity, PLN is also responsible for most of the electricity distribution. Hence, PLN corresponds well with the Transmission Service Operator (TSO) in our model.

PLN is facing difficulties in realizing much needed investments in maintenance and expansion of its generating capacity and network infrastructure. An important reason for this is that the Government of Indonesia regulates the electricity prices and has for years forced PLN to sell electricity under its long-term cost price. Government subsidies to PLN were only sufficient to cover operational cost (Heriyono & Yopi, 2009), and they also have been reduced in recent years. As a result, the consumer electricity price has increased substantially over the last few years.¹⁷⁸ According to the draft of *National Electricity General Plan 2015–2034* (Indonesian MEMR, 2015), Indonesia needs to meet additional power demand at the size of 784 TWh generating capacity until 2034 (compared to 2014). During 2015–2019 the government is planning to build 35GW extra power generating capacity. PLN is responsible for realizing about 29% of this capacity increase while the rest should be developed by the private sector (Indonesian MEMR, 2017).

The national energy policy in Indonesia aims to increase the share of renewable energy from 5% in 2013 to 23% in 2025 and 31% in 2050 (Indonesian MEMR, 2015). In 2015, 90% of PLN's electricity production and purchasing came from non-renewable resources (Indonesian MEMR, 2017). Although PLN had been successful in reducing its dependency on oil fuels from 29% in 2009 to 11% in 2015, the usage of coal and gas as fuel has increased from 36% in 2009 to 52% in 2015 and from 24% in 2009 to 29% in 2015, respectively (PLN, 2010; PLN, 2017). In the longer term, this transition from oil fuel to gas and coal is under pressure, because natural gas production in Indonesia tied up in long-term contracts (Hutagalung & Hartono, 2012; Kompas, 2014) and coal reserves are depleting, while the need for gas and coal increases with the construction of new thermal power plants.¹⁷⁹ In addition, coal producers are inclined to sell their products abroad because it is more profitable (Sutianto, 2014).

Together, this raises the need for the government to keep developing new electricity generating capacity based on renewable resources. Most of PLN's current production and purchasing of green electricity is mainly generated from hydro-power (5.87%) and geothermal energy (4.3%), plus a small amount from biomass (0.2%), waste (0.008%), solar power (0.002%) and wind power (0.0016%). According to PLN's business plan (Indonesian MEMR, 2017), about 41% of additional power plant capacity in 2017-2026 will come from coal steam power. Nonetheless, about 27.7% is supposed to come from renewable resources such as hydropower (18%), geothermal (8.1%) and wind, solar, waste and biomass (1.6%).

The electrification ratio in Indonesia is 91.16% (Indonesian MEMR, 2017), but spatial distribution of electricity access is uneven. The electrification ratio in Java is 91.73% while outside of Java it is on average only 83.28%, with the lowest electrification rate in the West Papua province being 45.93% (Indonesian DGE, 2016). Most of the areas lacking access to electricity are remote areas. Their geographic conditions make it difficult to build power plant and its electricity distribution network.

4.2 Model Calibration

We calibrate the model in this paper using data from Indonesian and international sources, such that the model reflects the electricity system in Indonesia in 2015. After that, we use the model to simulate the effect of some changes on parameters in the model on the profit of the transmission producer and the share of green electricity. More precisely, we

¹⁷⁷ Independent Power Producer (IPP) is a private company that owns power plant to produce electricity for sale to the public under a Power Purchase Agreement (PPA), whereas Private Power Utility (PPU) is a private company which generates, transmits and distributes electricity to its own customer in a certain area (Austrade, 2012). The Indonesian government is also developing Energy Self-Sufficient Villages (ESSV) program. ESSV is a village which is able to generate at least 60% of their electricity and fuel need from local renewable energy resources (Indonesian MEMR, 2014).

¹⁷⁸ The increase of the electricity price sold by PLN is regulated by the Ministry of Energy and Mineral Resources. Since 2015, the basic electricity tariff for household consumer with minimum power of 1300 VA is adjusted every month. With the adjustment price, the highest price increase for household with power 1300 VA is in December 2015 with the price increase of 38.475% from the price in July-August 2014. The price adjustment for household with power of 900 VA is applied since 2017. The price increase in July-September 2017 is 123.47% compared to the price in July-August 2014. For household with power 450 VA, the price is stable.

¹⁷⁹ In 2016, coal reserve and production in Indonesia is 28,457.29 million ton and 456,197,775 ton respectively (Indonesian MEMR, 2017). Assuming that there is no new reserve found then with the same production rate, coal in Indonesia will be exhausted in about 62 years.

use the model to find the production of brown electricity (W_B^e) and the production of green electricity (W_G^e) that maximize profit of the TSO (Π_T^e), given the changes in population density (D) over time.

Land area, population size and population density values are taken from the World Development Indicator database (World Bank, 2017). Population density in Indonesia from 2016 to 2050 is assumed to grow 23%, a value that we take from the United Nations (2017) for medium growth scenario. We measure the length of the economy from the distance between Sabang (the northernmost and westernmost city) and Merauke (the easternmost regency). The effect of population density on the length of the line needed to distributed brown electricity is estimated based on estimations for the line length, population density and brown and green electricity production of Indonesia over the period 1999-2014. Because of lack of data, we assume that the length of the line needed to distribute brown electricity is proportionate to brown electricity production. We set the distance between the thermal power plant and the border between the small open economy and the exploitation area of the brown resources at zero (as if the power plant is in the border between the small open economy and the exploitation area of the brown resources). The reason is that we cannot easily obtain a true value, given that there are many power plants in many locations. By setting the value at zero, the effect of parameter changes in the simulation on the distance between the power plant and the mine (r_B) can be showed clearly. The distance between the power plant and the mining of brown resources is estimated based on brown electricity production (Indonesian MEMR, 2017), as well as the estimated brown power density and the brown efficiency rate in 2016. The share of the green exploitation area is estimated based on brown and green electricity production in 2016 (Indonesian MEMR, 2017), the estimated green power density and the green efficiency rate in 2016, the width of the Indonesia area ($\omega = \frac{A}{\rho}$) and the distance between small open economy and the exploitation area of the brown resources.

Because coal steam power is dominating in Indonesia, power density of brown resources is estimated based on coal power density in coal power plants (Donald, 2016), while power density of green resources is based on the average solar radiation in Indonesia (Indonesian DGNREEC, 2013). The value for physical density of the brown resource is based on the normal weight of coal (145 tons) from one acre area with the thickness of 30 inches (The Kentucky Foundation, 2007). The efficiency rate of the thermal power plant is based on the average thermal efficiency rate in Indonesia in 2016, while the efficiency rate for green electricity production is estimated on the basis of the efficiency rate of solar panels (c-Si type) in 2003 and 2012 (IEA, 2014; IRENA, 2015). The unit delivery cost of brown energy resource from the mine to the thermal power plant is based on maximum coal transport cost by train in Indonesia in 2016 (IDOMINING, 2016). Actual production rate in the thermal power plant is estimated based on the installed capacity and electricity production in Indonesia during 2001–2016. Unit investment cost of thermal power plant is based on an estimation of investment cost of coal steam power plants per year of lifetime. The unit capital investment cost of green power plant are based on the investment of solar power plant per year of lifetime (IRENA, 2016).

The elasticity of the electricity loss or the line length with regards to population density is estimated based on data about electricity losses in transmission and distribution and data for population density in Indonesia during the period 1990-2016. The elasticity of electricity demand with regards to population density is estimated based on the average total electricity sales and population density of Indonesia during 1989/1990-2015. Since we do not have information about the land investment cost for green power plants, we set the elasticity of the costs of green land area with regards to population density at 1. The electricity price is based on the average electricity selling price in Indonesia in 2016. The intensity of electricity consumption is estimated based on PLN electricity sales in 2016 (Indonesian MEMR, 2017). The effect of the electricity price on electricity consumption intensity is estimated based on the estimated electricity consumption intensity and the average selling price during 2001–2015. The effect of length of the line on the transmission and distribution loss is estimated based on the electricity loss in the transmission and distribution and total length of line of low, medium, high and extra high voltage of Indonesia in 2016.

Most of data used to estimate parameter values in the model come from the Indonesian Ministry of Energy and Mineral Resources, PLN, and the World Bank but some are taken from other sources (see Table B.1 in Appendix B).

5. SIMULATION RESULTS

In this section we present our most important simulation results. The simulations are presented in Figure 3–5, showing how the share and production green electricity changes over time under influence of changes in population density, the elasticity of electricity demand with regards to population density (β_W), brown and green power densities (α_B and α_G) and the elasticity of the land investment cost for green power plant with regards to population density (β_L).

A first key result, as shown in Figures 3 and 4, is that increasing population density over time leads to an expected decreasing share and level of green electricity production. The top of Figure 3 shows that in the medium population growth scenario the share of green electricity decreases from about 13% in 2016 to about 7% in 2050 (left-hand side). This equals an annual reduction of just over 1%. Over the same period, production of green electricity decreases from about 3.5 billion Watt in 2016 to 2.5 billion Watt in 2050 (right-hand side), which equals a reduction of just over 30%. The reduction of the green electricity production is accompanied by a decrease of the green exploitation area, suggesting that there indeed is a competition for land between the need for the green exploitation area and other needs, such as land needed for residential use. In the high population growth scenario, the share of green electricity drops to about 5% by 2050, corresponding with about 2 billion Watt in production. Interestingly, in the low population growth scenario, the share of green electricity follows a U-curve shaped pattern, with a minimum around the year 2040. This pattern can be explained by the opposing forces of increasing population density, increasing electricity demand and a relatively low

green electricity price because of the relatively low costs of green land area under influence of a moderate population density.

The bottom of Figure 3 shows that the model outcomes are sensitive to the elasticity of electricity demand with respect to population density, β_W . An elasticity of 1 instead of 1.29 (baseline) leads to about a four-fold increase in the share of green electricity (left-hand side). The impact on total green electricity is only marginal (right-hand side), implying that the increasing share of green electricity levels out with the relatively moderate increase in total demand. This underlines the importance of better understanding how agglomeration (increasing population density) impacts the demand for energy in general, and electricity in particular. In the literature on scaling laws (see, for example, Bettencourt et al. 2007), there is some evidence given for the elasticity of electricity demand with regards to population size in cities. In the urban studies literature some evidence is provided that both increasing urban density and increasing city size reduce households' average energy consumption (see, e.g., Glaeser & Kahn, 2010; Larson & Yezer, 2015; Sugahara & Bermont, 2016). The basic idea underlying this so-called compact city argument is that a higher population density makes cities more environmentally friendly because it decreases average commuting distance, increases public transport usage, while smaller housing units help to reduce transport and home energy use (Glaeser & Kahn, 2010). However, thus far the compact city argument received only very little attention in the context of developing countries; exceptions include Chen et al. (2008), Jenks and Burgess (2004), and Permana et al. (2008).

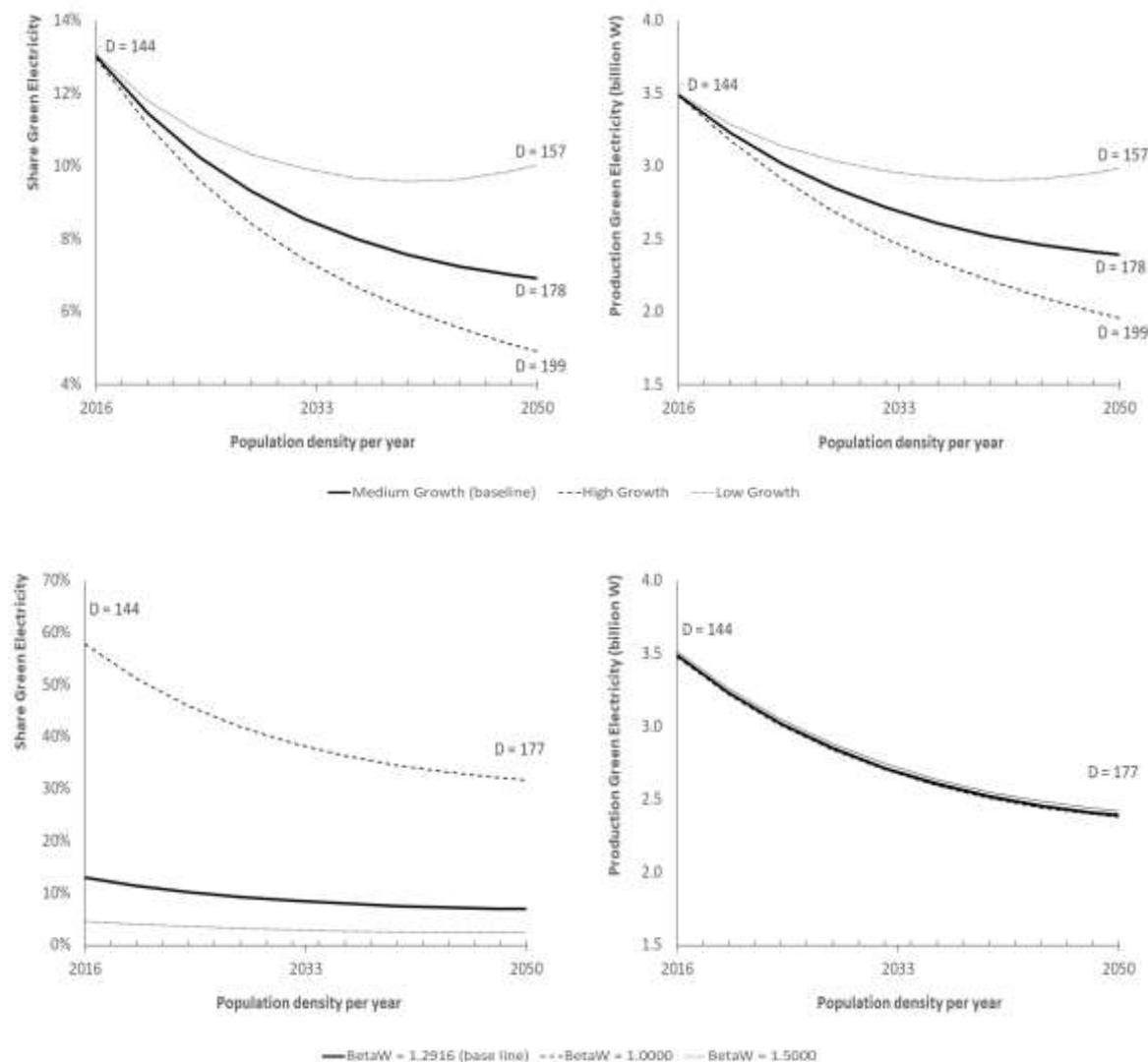


Figure 3. The share (left) and production (right) of green electricity under influence of changing population density (D) and elasticity of electricity demand with respect to population density (β_W)

The top of Figure 4 shows that the share and size of green electricity production increases 2–2.5 times if green power density (α_G) increases with 50% (from 200 to 300) or the elasticity of investment cost for green area with respect to population density (β_I) decreases with 20%. In contrast, a 70% reduction of brown power density (α_B) has almost no impact on the share and size of green electricity production. The latter can be explained by the already substantial higher power density of brown resources as compared to green resources. The bottom of Figure 4 shows that the share of green electricity production decreases below 3% if green power density (α_G) would fall with 50% (from 200 to 100) and even become almost zero if the elasticity of electricity demand with respect to population density (β_I) doubles (to 2). Again, a 50% increase in brown power density (α_B) has almost no impact on the share and size of green electricity production.

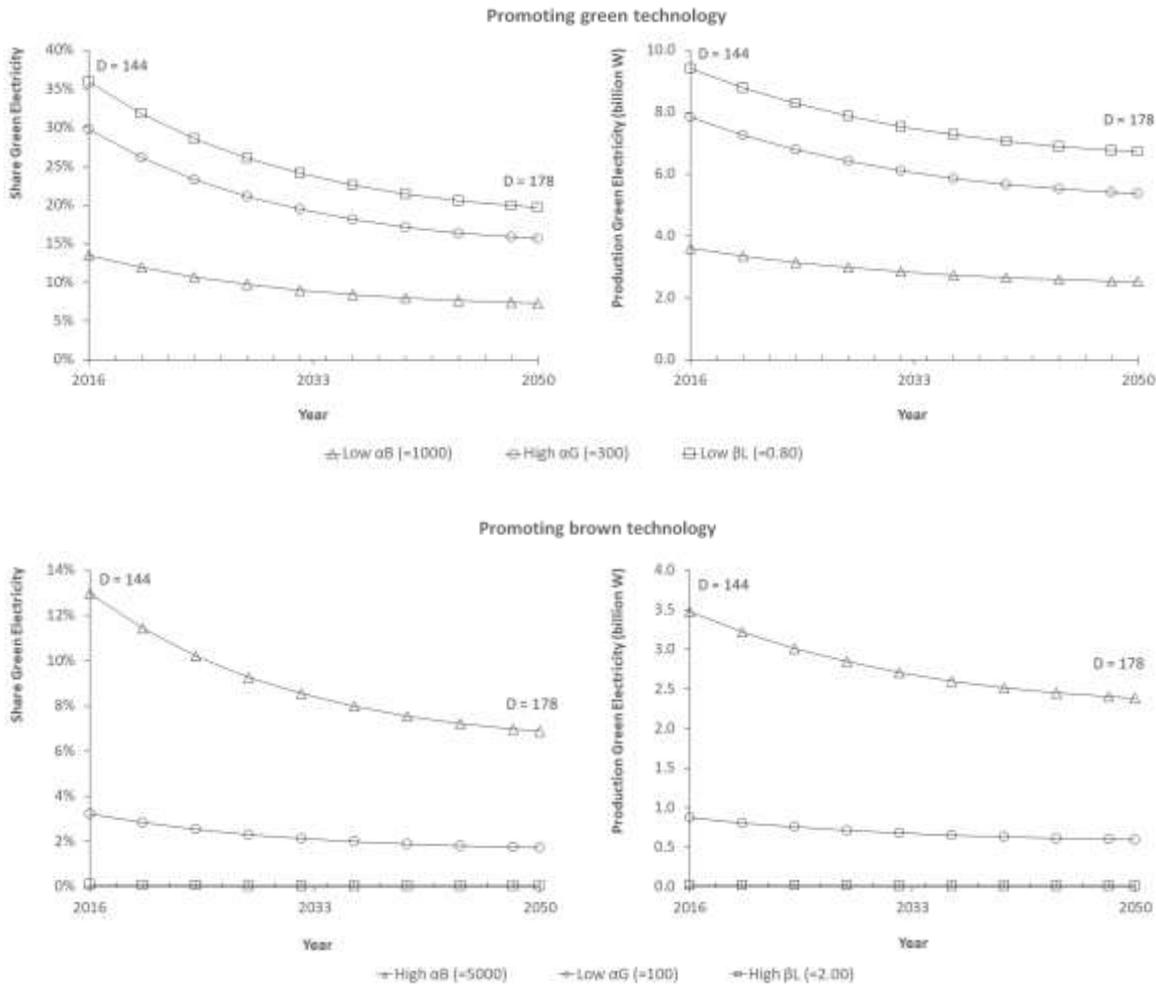


Figure 4. The share (left) and production (right) of green electricity under influence of promoting green technology (top) versus brown (bottom) technology.*

* Promoting green technology: low power density of fossil fuels, high power density of renewables, low price elasticity of green land area. Promoting brown technology: high power density of fossil fuels, low power density of renewables and high price elasticity of green land area.

Finally, we show in Figure 5 how the costs of green land area change under influence of increasing population density (left) and different price elasticity of green land area (right).

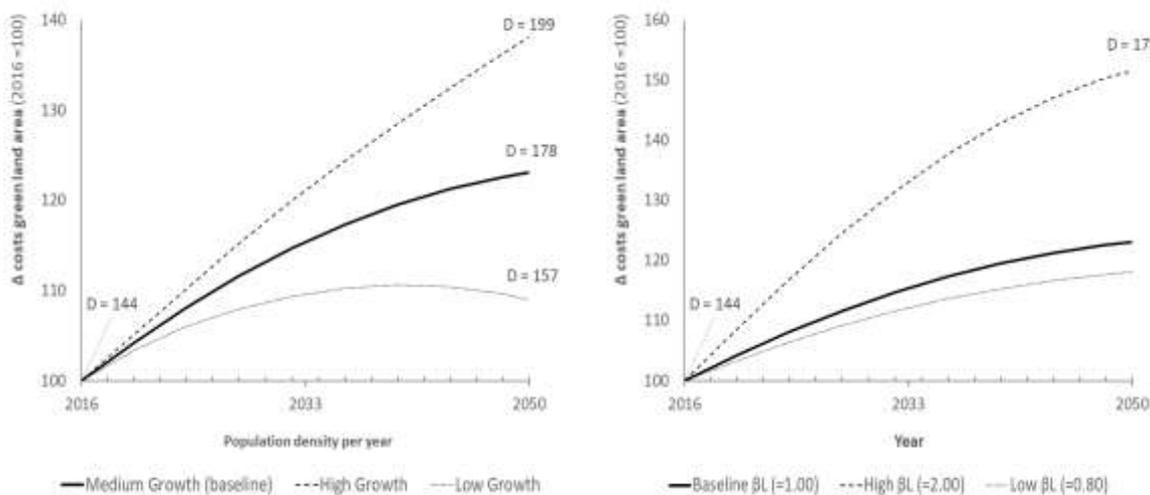


Figure 5. The increase in costs of green land area under influence of increasing population density (left) and different price elasticity of green land area (right).

From the left-hand side of the Figure it can be concluded that in the medium population growth scenario, the costs of land needed for green electricity production increase almost 25% until 2050. In the high- and low population growth scenarios, these costs increases are, respectively, about 40% and 10%. The right-hand side of the Figure shows that a doubling of the elasticity of electricity demand with respect to population density (β_L) leads to more than a 50% increase in the price of land needed for green electricity production by 2050, given the medium population growth scenario.

6. CONCLUSIONS

Poor access to modern energy and environmental concerns make developing countries often facing a dual energy challenge: the simultaneous expansion and greening of their electricity supply. We developed a spatial energy model to analyze the trade-off between greening and brown expansion of electricity supply in developing countries, under influence of increasing population density. We analyzed how the cost advantage of fossil fuels vis-a-vis low-carbon alternatives arises from three interrelated features: geography, power density and technology.

Probably the most prominent feature of spatial transformation in developing countries is increased urbanization. The transition to a predominantly urban society will have a significant impact on a transition to a low carbon energy system, because there are fundamental physical limits to how much energy we can extract from renewable resources for a given area of land. Fossil fuel are more power dense and hence spatially more productive than renewable energy resources (like solar), which all things equal implies it is cheaper to transport fossil fuels. If people, because of urbanization processes, increasingly are concentrated in space, the demand for resources with a relatively high “spatial productivity” will increase, thus impeding the emergence of a low-carbon energy system.

Our spatial energy model is a deterministic partial equilibrium model of the electricity supply chain, in which the demand for electricity in a large city can be satisfied by a non-renewable (‘brown’) energy fuel, a renewable (‘green’) energy source, or both. We find in equilibrium that the level of brown electricity produced is increasing in the width of the non-renewable exploitation area, the resource and production efficiency of the thermal power plant, the power density of the non-renewable resource, the share of total land area devoted to green power production, the unit price (or cost) of green electricity, green transmission losses and population density. In contrast, the level of green electricity produced is increasing in the size of the open economy area, the efficiency rate of green power production, the power density of the renewable resource, the unit price (or cost) of brown electricity, brown transmission losses and the transport costs of the non-renewable resource to the thermal power plant.

Also, we find that the green electricity price (and thus the level of brown electricity produced) is increasing in population size, the share of total land area devoted to green energy production and the price elasticity of land. On the other hand, the green electricity price (and thus the level of brown electricity produced) is decreasing in the efficiency rate of green power production, the power density of the renewable resource and the size of the renewable exploitation area.

We calibrated our model to the case of Indonesia. In Indonesia, coal-fired power plants are increasingly satisfying the rising demand for electricity but the country’s scattered geography, potentially implying large costs to transport coal, and its relatively “clean infrastructure slate”, may enable the country to quickly exploit a range of low-carbon alternatives. However, we find for Indonesia that an increasing population density over time causes a reduction in green electricity production and thus a falling share of green electricity production in total electricity supply. We show that until 2050 expected population growth in Indonesia leads to a 1% annual reduction of the country’s share of electricity produced with renewable energy sources. This reduction is accompanied by a decrease of the renewable exploitation area, suggesting a competition between land needed for renewable energy production and other needs, such as land needed for residential use. These results are weakened but not reversed at a substantially higher assumed power density of the renewable energy sources.

REFERENCES

- Austrade, 2012. *Trade Opportunities. Low Emissions Technology and Services (LETS)*, Jakarta, Indonesia: the Australian Trade Commission.
- Bank Indonesia, 2015. *Foreign Exchange Rate*. [Online] Available at: <http://www.bi.go.id/en/moneter/informasi-kurs/transaksi-bi-Default.aspx> [Accessed 10 August 2015].
- Bettencourt, L. M. et al., 2007. Growth, Innovation, Scaling, and the Pace of Life in Cities. *PNAS*, 104(17), p. 7301–7306.
- CDM, 2006. *Draft Thresholds and Criteria for the Eligibility of Hydroelectric Reservoirs as CDM Projects*. s.l.:https://cdm.unfccc.int/Panels/meth/meeting/mp_06.html#019.
- Chen, H., Jia, B. & Lau, S., 2008. Sustainable Urban Form for Chinese Compact Cities: Challenges of a Rapid Urbanized Economy. *Habitat International*, 32(1), pp. 28-40.
- Collier, P. & Venables, A. J., 2012. Greening Africa? Technologies, Endowments and the Latecomer Effect. *Energy Economics*, Volume 34, p. S75–S84.
- Collier, P. & Venables, A. J., 2014. Closing Coal: Economic and Moral Incentives. *Oxford Review of Economic Policy*, 30(3), pp. 492-512.
- Cruz, J. M. & Taylor, M. S., 2012. *Back to the Future of Green Powered Economies (NBER Working Paper No. 18236)*, Cambridge, The United Kingdom: National Bureau of Economic Research (NBER).
- Detik Finance, 2013. Mahalnya Produksi Listrik di Papua, PLN Harus Beli BBM Rp 16 Ribu/Liter.. *Detik Finance*, 19 September, pp. <https://finance.detik.com/energi/2363267/mahalnya-produksi-listrik-di-papua-pln-harus-beli-bbm-rp-16-ribuliter>.
- Donald, J. W., 2016. *Climate Lawyers Blog*. [Online] Available at: <http://www.climatelawyers.com/post/2016/10/11/some-real-numbers-about-transitioning-a-coal-plant-to-a-solar-farm.aspx>
- Edenhofer, O., 2015. King Coal and the Queen of Subsidies. *Science*, 349(6245), pp. 1286-1287.
- Energi, 2012. Rencana 100 MW PLTS. *Sustainable Energy Monthly Magazine*, 4 June.
- Fevriera, S. & Mulder, P., 2017. *The Impact of Urbanization on Energy Consumption in Indonesia. Evidence from Indonesian Cities.. Manado, Indonesia, Indonesian Regional Science Association (IRSA)*.
- Glaeser, L. E. & Kahn, E. M., 2010. The Geeness of Cities: Carbon Dioxide Emissions and Urban Development. *Journal of Urban Economics*, 67(3), pp. 404-418.
- Goldemberg, J., 1998. Leapfrog Energy Technologies. *Energy Policy*, 26(10), pp. 729-741.

- Haftendorn, C. & Holz, F., 2008. *Analysis of the World Market for Steam Coal Using a Complementarity Model (DIW Discussion Papers No. 818)*, Berlin, Germany: Deutsches Institut für Wirtschaftsforschung (DIW).
- Heriyono & Yopi, A., 2009. *Problem Listrik dari Hulu ke Hilir, PLN Tak Berdaya*, Bandung, Indonesia: <http://www.tekmira.esdm.go.id/currentissues/?p=2476>.
- Hutagalung, A. & Hartono, D., 2012. *The Economic-Wide Impact of Natural Gas Allocation in Indonesia: An Analysis Using Recursive Dynamic Computable General Equilibrium Model*. Brussels, Belgium, <http://crninet.com/2012/B5a-2.pdf>.
- IDOMINING, 2016. *idmining.wordpress.com*. [Online] Available at: <https://idmining.wordpress.com/2016/03/24/penentuan-freight-rate-kapal-batu-bara/>[Accessed 2017].
- IEA, 2014. *Technology Roadmap, Solar Photovoltaic Energy, 2014 edition*, Paris, France: International Energy Agency.
- Indonesian DGE, 2016. *Statistik Ketenagalistrikan 2015*, Jakarta, Indonesia: Directorate General of Electricity (DGE), Ministry of Energy and Mineral Resources, Republic of Indonesia.
- Indonesian DGNEEC, 2012. *Target Realistis Pengembangan EBTKE Hingga Tahun 2025*. Jakarta: Directorate General of New, Renewable Energy and Energy Conservation (DGNREEC), Ministry of Energy and Mineral Resources, Republic of Indonesia.
- Indonesian DGNREEC, 2013. *Development and Challenge of Solar PV in Indonesia*. Jakarta, Indonesia: Directorate General of New, Renewable Energy and Energy Conservation (DGNREEC), Ministry of Energy and Mineral Resources, Republic of Indonesia.
- Indonesian MEMR, 2014. *Laporan Akuntabilitas Kinerja Instansi Pemerintah KESDM 2013*, Jakarta, Indonesia: Ministry of Energy and Mineral Resources (MEMR), Republic of Indonesia.
- Indonesian MEMR, 2015. *Rencana Strategis Kementerian Energi dan Sumber Daya Mineral*. Jakarta: Ministry of Energy and Mineral Resources, Republic of Indonesia.
- Indonesian MEMR, 2015. *Rencana Umum Ketenagalistrikan Nasional (Draf)*, Jakarta: Ministry of Energy and Resources (MEMR), Republic of Indonesia.
- Indonesian MEMR, 2017. *Handbook of Energy and Mineral Resources 2017*, Jakarta, Indonesia: Ministry of Energy and Mineral Resources (MEMR), Republic of Indonesia.
- Indonesian MEMR, 2017. *Rencana Usaha Penyediaan Tenaga Listrik PT Perusahaan Listrik Negara (Persero) Tahun 2017 s.d. 2026*, Jakarta: Ministry of Energy and Mineral Resources (MEMR), Republic of Indonesia.
- IRENA, 2015. *Renewable Power Generation Costs in 2014*, s.l.: The International Renewable Energy Agency (IRENA).
- IRENA, 2016. *The Power to Change: Solar and Wind Cost Reduction Potential to 2025*, s.l.: The International Renewable Energy Agency (IRENA).
- Irfany, R., 2017. One-Price Fuel Policy Applies Gradually. *Tempo.co*, 3 January, pp. <https://en.tempo.co/read/news/2017/01/03/056832150/OnePrice-Fuel-Policy-Applies-Gradually-Ministry>.
- Jenks, M. & Burgess, R., 2000. *Sustainable Urban Forms for Developing Countries*. London and New York: Spon Press.
- Kompas, 2014. *Gas Bumi: Pasar Domestik vs Pasar Ekspor*. [Online] Available at: <http://bisniskeuangan.kompas.com/read/2014/11/17/140505826/Gas.Bumi.Pasar.Domestik.vs.Pasar.Ekspor>
- Larson, W. & Yezer, A., 2015. The Energy Implications of City Size and Density. *Journal of Urban Economics*, Volume 90, pp. 35-49.
- Matthews, J. A., 2013. Greening of Development Strategies. *Seoul Journal of Economics*, 26(2), pp. 147-172.
- McKinsey Global Institute , 2011. *Meeting the World's Energy, Materials, Food, and Water Needs*, s.l.: McKinsey & Company. Retrieved from http://www.mckinsey.com/insights/energy_resources_materials/resource_revolution.
- Moreno-Cruz, J. & Taylor, M. S., 2012. *Back to The Future of Green Powered Economies*, Cambridge, United Kingdom: National Bureau of Economic Research (NBER) Working Paper 18236.
- Moreno-Cruz, J. & Taylor, M. S., 2014. *A Spatial Approach to Energy Economics: Theory, Measurement and Empirics (CESIFO Working Paper No. 4845)*, Munich, Germany: Center for Economic Studies & Ifo Studies (CESIFO).
- Moreno-Cruz, J. & Taylor, M. S., 2017. An Energy-centric Theory of Agglomeration. *Journal of Environmental Economics and Management*, Volume 84, pp. 153-172.
- National Geographic Indonesia, 2015. *Indonesia Diduga Akan Mengimpor Batubara*. [Online] Available at: <http://nationalgeographic.co.id/berita/2015/03/2036-indonesia-diduga-akan-mengimpor-batubara>[Accessed 24 August 2015].
- Perkins, R., 2003. Environmental Leapfrogging in Developing Countries: A Critical Assessment and Reconstruction. *Natural Resources Forum*, 27(3), p. 177-188.
- Permana, A., Perera, R. & Kumar, S., 2008. Understanding Energy Consumption Pattern of Households in Different Urban Development Forms: A Comparative Study in Bandung City, Indonesia. *Energy Policy*, 36(11), pp. 4287-4297.
- PLN, 2010. *Statistik PLN 2009*, Jakarta, Indonesia: PT PLN (Persero).
- PLN, 2017. *Statistik PLN 2016*, Jakarta, Indonesia: PT PLN (Persero).
- Schiermeier, Q., 2012. Hot Air. *Nature*, Volume 491, pp. 656-658.
- Smil, V., 2015. *Power Density: A Key to Understanding Energy Sources and Uses*. Cambridge, Massachussets: MIT Press.
- Steckel, J. C., Edenhofer, O. & Jakob, M., 2015. Drivers for the Renaissance of Coal. *PNAS*, 112(29), p. E3775-E3781.
- Sugahara, M. & Bermont, L., 2016. *Energy and Resilient Cities (OECD Regional Development Working Papers 2016/05)*, Paris: OECD.
- Sutianto, F. D., 2014. RI Harus Punya Cadangan Batubara untuk 100 Tahun Mendatang. *Detik Finance*, 7 January, p. <http://finance.detik.com/read/2014/01/07/113631/2460188/1034/>.
- The Kentucky Foundation, 2007. *Kentucky Coal Education*. [Online] Available at: http://www.coaleducation.org/q&a/many_tons_of_coal.htm [Accessed June 2017].
- Tyfield, D., 2014. 'King Coal is Dead! Long Live the King!': The Paradoxes of Coal's Resurgence in the Emergence of Global Low-Carbon Societies. *Theory, Culture and Society*, 31(5), pp. 59-81.
- United Nations, 2017. *World Population Prospects: The 2017 Revision*, s.l.: United Nations.
- Wilson, R., 2013. *The Future of Energy: Why Power Density Matters*. [Online] Available at: <http://www.theenergycollective.com/robertwilson190/257481/why-power-density-matters>[Accessed 23 September 2014].
- World Bank, 2017. *World Development Indicator*. [Online] Available at: <http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators>[Accessed 17 August 2017].
- Wrigley, E.A. (2010). *Energy and the English Industrial Revolution*. Cambridge University Press. Cambridge, UK.

A.1. Define Profit of the Transmission Service Producer as a Function of Brown and Green Electricity Production

By substituting equation (6) into equation (27) we get:

$$\begin{aligned} \Pi_T^e &= ((1 - L_B)p^e - p_B^e)W_B^e + ((1 - L_G)p^e - p_G^e)W_G^e \\ &= \left((1 - L_B) \left(\frac{b}{g} - \frac{(1 - L_G)W_G^e + (1 - L_B)W_B^e}{gAD^{\beta W}} \right) - p_B^e \right) W_B^e \\ &+ \left((1 - L_G) \left(\frac{b}{g} - \frac{(1 - L_G)W_G^e + (1 - L_B)W_B^e}{gAD^{\beta W}} \right) - p_G^e \right) W_G^e \\ &= \left(\frac{b}{g} (1 - L_B) - p_B^e \right) W_B^e + \left(\frac{b}{g} (1 - L_G) - p_G^e \right) W_G^e - \frac{2(1 - L_B)(1 - L_G)}{gAD^{\beta W}} W_B^e W_G^e \\ &- \frac{(1 - L_B)^2}{gAD^{\beta W}} W_B^{e2} - \frac{(1 - L_G)^2}{gAD^{\beta W}} W_G^{e2} \end{aligned} \tag{27}$$

A.2. Define the Brown Electricity Production

First, substitute equations (15) and (22) into equations (30) and (31):

$$W_B^e = \frac{gAD^{\beta W}}{(1 - L_B)} \cdot \frac{1}{2} \left[\frac{b}{g} - \frac{\left(\frac{I_B}{z_B} + \frac{u_B f_B r_B}{\eta_B \alpha_B} \right)}{(1 - L_B)} \right] - \left(\frac{1 - L_G}{1 - L_B} \right) W_G^e \tag{30.1}$$

$$W_G^e = \frac{gAD^{\beta W}}{(1 - L_G)} \cdot \frac{1}{2} \left[\frac{b}{g} - \frac{I_G^k + \frac{I_G^L}{\eta_G \alpha_G} \psi_G}{(1 - L_G)} \right] - \left(\frac{1 - L_B}{1 - L_G} \right) W_B^e \tag{31.1}$$

Next, use equation (10) and (12) to define r_B as a function of W_B^e :

$$W_B^e = \eta_B W_B^m = \eta_B \alpha_B \omega (r_B - \lambda) \Leftrightarrow r_B = \frac{1}{\eta_B \alpha_B \omega} W_B^e + \lambda \tag{34}$$

We substitute both (31.1) and (34) into (30.1), to get:

$$\begin{aligned} W_B^e &= \frac{gAD^{\beta W}}{(1 - L_B)} \cdot \frac{1}{2} \left[\frac{b}{g} - \frac{\left(\frac{I_B}{z_B} + \frac{u_B f_B}{\eta_B \alpha_B} \left[\frac{1}{\eta_B \alpha_B \omega} W_B^e + \lambda \right] \right)}{(1 - L_B)} \right] - \left(\frac{1 - L_G}{1 - L_B} \right) \left\{ \frac{gAD^{\beta W}}{(1 - L_G)} \cdot \frac{1}{2} \left[\frac{b}{g} - \frac{I_G^k + \frac{I_G^L}{\eta_G \alpha_G} \psi_G}{(1 - L_G)} \right] - \left(\frac{1 - L_B}{1 - L_G} \right) W_B^e \right\} \\ \Leftrightarrow W_B^e &= \frac{gAD^{\beta W}}{(1 - L_B)} \cdot \frac{1}{2} \left[\frac{b}{g} - \frac{\left(\frac{I_B + \lambda u_B f_B + \frac{u_B f_B}{\eta_B \alpha_B} W_B^e}{\eta_B \alpha_B} \right)}{(1 - L_B)} \right] - \frac{gAD^{\beta W}}{(1 - L_B)} \cdot \frac{1}{2} \left[\frac{b}{g} - \frac{I_G^k + \frac{I_G^L}{\eta_G \alpha_G} \psi_G}{(1 - L_G)} \right] + W_B^e \\ \Leftrightarrow \frac{gAD^{\beta W}}{(1 - L_B)^2} \cdot \frac{1}{2} \frac{u_B f_B}{(\eta_B \alpha_B)^2 \omega} W_B^e &= \frac{gAD^{\beta W}}{(1 - L_B)} \cdot \frac{1}{2} \left[\frac{b}{g} - \frac{\left(\frac{I_B + \lambda u_B f_B}{z_B + \lambda \eta_B \alpha_B} \right)}{(1 - L_B)} \right] - \frac{gAD^{\beta W}}{(1 - L_B)} \cdot \frac{1}{2} \left[\frac{b}{g} - \frac{I_G^k + \frac{I_G^L}{\eta_G \alpha_G} \psi_G}{(1 - L_G)} \right] \\ \Leftrightarrow \frac{u_B f_B}{(1 - L_B)(\eta_B \alpha_B)^2 \omega} W_B^e &= \frac{I_G^k + \frac{I_G^L}{\eta_G \alpha_G} \psi_G}{(1 - L_G)} - \frac{\left(\frac{I_B + \lambda u_B f_B}{z_B + \lambda \eta_B \alpha_B} \right)}{(1 - L_B)} \\ \Leftrightarrow W_B^e &= \frac{(1 - L_B)(\eta_B \alpha_B)^2 \omega}{u_B f_B} \left[\frac{I_G^k + \frac{I_G^L}{\eta_G \alpha_G} \psi_G}{(1 - L_G)} - \frac{\left(\frac{I_B + \lambda u_B f_B}{z_B + \lambda \eta_B \alpha_B} \right)}{(1 - L_B)} \right] \\ \Leftrightarrow W_B^{e*} &= \frac{(\eta_B \alpha_B)^2 \omega}{u_B f_B} \left[\left(\frac{1 - L_B}{1 - L_G} \right) \left(I_G^k + \frac{I_G^L}{\eta_G \alpha_G} \psi_G \right) - \left(\frac{I_B}{z_B} + \lambda \frac{u_B f_B}{\eta_B \alpha_B} \right) \right] \end{aligned} \tag{36}$$

A.3. Define the Green Electricity Production

Substitute equation (32) into equation (33):

$$\begin{aligned} W_G^e &= \frac{gAD^{\beta W}}{(1 - L_G)} \cdot \frac{1}{2} \left[\frac{b}{g} - \frac{I_G^k + \frac{I_G^L}{\eta_G \alpha_G} \psi_G}{(1 - L_G)} \right] - \left(\frac{1 - L_B}{1 - L_G} \right) \left\{ \frac{gAD^{\beta W}}{(1 - L_B)} \cdot \frac{1}{2} \left[\frac{b}{g} - \frac{\left(\frac{I_B + u_B f_B r_B}{z_B + \eta_B \alpha_B} \right)}{(1 - L_B)} \right] - \left(\frac{1 - L_G}{1 - L_B} \right) W_G^e \right\} \\ \Leftrightarrow W_G^e &= \frac{gAD^{\beta W}}{(1 - L_G)} \cdot \frac{1}{2} \left[\frac{b}{g} - \frac{I_G^k + \frac{I_G^L}{\eta_G \alpha_G} \psi_G}{(1 - L_G)} \right] - \left(\frac{1 - L_B}{1 - L_G} \right) \frac{gAD^{\beta W}}{(1 - L_B)} \cdot \frac{1}{2} \left[\frac{b}{g} - \frac{\left(\frac{I_B + u_B f_B r_B}{z_B + \eta_B \alpha_B} \right)}{(1 - L_B)} \right] + W_G^e \end{aligned} \tag{33.1}$$

Next, use of equations (18) and (19) to define η_G as a function of W_G^e :

$$W_G^e = \eta_G W_G^r = \eta_G \alpha_G \psi_G A \Leftrightarrow \psi_G = \frac{1}{\eta_G \alpha_G A} W_G^e \tag{35}$$

Using equation (35) and rewriting (33.1) yields:

$$\begin{aligned}
 W_G^e &= \frac{1}{2} \frac{b}{g} \frac{gAD^{\beta_W}}{(1-L_G)} - \frac{1}{2} \frac{gAD^{\beta_W}}{(1-L_G)} \frac{I_G^k + \frac{I_G^L}{(\eta_G \alpha_G)^2} W_G^e}{(1-L_G)} - \frac{gAD^{\beta_W}}{(1-L_G)} \frac{1}{2} \frac{b}{g} + \frac{gAD^{\beta_W}}{(1-L_G)} \frac{1}{2} \frac{\left(\frac{I_B}{z_B} + \frac{u_B f_B}{\eta_B \alpha_B} r_B\right)}{(1-L_B)} + W_G^e \\
 \Leftrightarrow \frac{1}{2} \frac{gAD^{\beta_W}}{(1-L_G)} \frac{I_G^k + \frac{I_G^L}{(\eta_G \alpha_G)^2} W_G^e}{(1-L_G)} &= \frac{gAD^{\beta_W}}{(1-L_G)} \frac{1}{2} \frac{\left(\frac{I_B}{z_B} + \frac{u_B f_B}{\eta_B \alpha_B} r_B\right)}{(1-L_B)} \\
 \Leftrightarrow \frac{I_G^k + \frac{I_G^L}{(\eta_G \alpha_G)^2} W_G^e}{(1-L_G)} &= \frac{\left(\frac{I_B}{z_B} + \frac{u_B f_B}{\eta_B \alpha_B} r_B\right)}{(1-L_B)} \\
 \Leftrightarrow I_G^k + \frac{I_G^L}{(\eta_G \alpha_G)^2} W_G^e &= \left(\frac{1-L_G}{1-L_B}\right) \left(\frac{I_B}{z_B} + \frac{u_B f_B}{\eta_B \alpha_B} r_B\right) \\
 \Leftrightarrow \frac{I_G^L}{(\eta_G \alpha_G)^2} W_G^e &= \left(\frac{1-L_G}{1-L_B}\right) \left(\frac{I_B}{z_B} + \frac{u_B f_B}{\eta_B \alpha_B} r_B\right) - I_G^k \\
 \Leftrightarrow W_G^{e*} &= \frac{(\eta_G \alpha_G)^2}{I_G^L} \left[\left(\frac{1-L_G}{1-L_B}\right) \left(\frac{I_B}{z_B} + \frac{u_B f_B}{\eta_B \alpha_B} r_B\right) - I_G^k \right] \tag{37}
 \end{aligned}$$

A.4. Define Profit of the Transmission Service Producer as a Function of Population Density

By substituting equations (23), (24), (36) and (37) into equation (29):

$$\begin{aligned}
 \Pi_T^e &= \left(\frac{b}{g} (1 - \tau \gamma_B D^{-\beta_s}) - p^e\right) W_B^{e*} + \left(\frac{b}{g} (1 - \tau \gamma_G D^{-\beta_s}) - p^e\right) W_G^{e*} \\
 &\quad - \frac{2(1-\tau \gamma_B D^{-\beta_s})(1-\tau \gamma_G D^{-\beta_s})}{gAD^{\beta_W}} W_B^{e*} W_G^{e*} \\
 &\quad - \frac{(1-\tau \gamma_B D^{-\beta_s})^2}{gAD^{\beta_W}} W_B^{e*2} - \frac{(1-\tau \gamma_G D^{-\beta_s})^2}{gAD^{\beta_W}} W_G^{e*2}
 \end{aligned}$$

we can define Π_T^e as a function of D .

APPENDIX B: PARAMETER ESTIMATION

Table B.21 – List of Parameters Values in the Base Simulation

Parameter	Symbol	Value	Unit	Note
The small open economy area	A	1,812	thousand km ²	The land area of Indonesia.
The length of the small open economy	ρ	5,2491.07	km	This value in the model cannot reflect the real distances because in reality, the width of the small open economy and the exploitation area of the brown resource are different. We set ρ as the distance between Sabang (the northernmost and westernmost city) and Merauke (the easternmost regency).
The power density of brown resource	α_B	3,297.07	W/m ²	Estimated based on the coal power density in the coal power plant stated by Donald (2016) and the efficiency rate on the thermal power plant (η_B).
The power density of green resource	α_G	200	W/m ²	Based on the average solar radiation in Indonesia by Indonesian DGNREEC (2013).
The elasticity of the electricity loss or the line length with regards to population density	β_s	1.1324		Estimated based on the electricity loss in the transmission and distribution and population density of Indonesia during 1990-2016.
The elasticity of electricity demand with regards to population density	β_W	1.2916		Estimated based on the average total electricity sales and population density of Indonesia during 1989/1990-2015.
The elasticity of the price land on the green investment cost with regards to population density	β_L	1.0000		Because we do not have information about the land investment cost for green power plant, then we set this parameter into 1.
The electricity price	p^e	0.6543	\$/W	Based on the average electricity selling price in Indonesia in 2016.
The intensity of electricity consumption	i	22.1035	W-m ² /people	This parameter is estimated based on PLN electricity sales in 2016 (Indonesian MEMR, 2017), population density in 2016 from World Development Indicator (World Bank, 2017), the area of Indonesia and β_W .
The maximum intensity of electricity consumption	b	31.5667	W-m ² /people	This parameter is estimated based on equation (24).
The effect of the electricity price on the electricity consumption intensity	g	14.4621	W ² -m ² /(\$-people)	Estimated based on the estimated electricity consumption intensity and the average selling price in price 2016 during 2001-2015.
Population density	D	144.14	people/km ²	Population density of Indonesia in 2016 by World Development Indicator (World Bank, 2017).
The effect of population density on the land price on the green investment cost	θ	9.7440e+7	\$/people	This parameter is set so that the electricity supply and the share of brown and green production close to the real data.
The efficiency rate on the thermal power plant	η_B	30.33%		Based on the average thermal efficiency rate in Indonesia in 2016.
The efficiency rate on the green power plant	η_G	23.83%		Estimated based on the efficiency rate of the solar panel (c-Si type) in 2003 and 2012 by IRENA (2015) and IEA (IEA, 2014).

Parameter	Symbol	Value	Unit	Note
The physical density of brown resource	f_B	1,075	kg/m ²	Based on the normal weight of coal (145 tons) from one acre area with the thickness of 30 inches by Kentucky Fondation (2007).
The effect of population density on the length of the line needed to distributed brown electricity	γ_B	2.5936e+8	kmc-km ² / people	Estimated based on estimation for the line length, population density and brown and green electricity production of Indonesia in 1999–2014. Because there is no available information, we assume that the line needed to distribute the brown electricity is proportionate to the brown electricity production.
The effect of population density on the length of the line needed to distributed green electricity	γ_G	0	kmc-km ² / people	It is assumed that the green electricity is generated by solar panel that can be put in the consumer's roof.
Unit investment cost of thermal power plant	I_B	0.0385	\$/W	Based on the estimation of investment cost of coal steam power plant in Indonesia in 2016 price per year of lifetime from some sources.
The unit capital investment cost of green power plant	I_G^k	0.0746	\$/W	Based on the investment of solar power plant by IRENA (2016) in 2016 price per year of lifetime.
The distance between the thermal power plant and the border between the small open economy and the exploitation area of the brown resources	λ	0	km	Because this value in the model cannot reflect the real distance where there are many power plants in many locations, then we set $\lambda = \text{zero}$ (as if the power plant is in the border between the small open economy and the exploitation area of the brown resources) so that the effect of parameter changes in the simulation on the distance between the power plant and the mine (r_B) can be showed clearly.
The distance between the power plant and the mining of brown resources	r_B	67.5505	m	Estimated based on the brown production in 2016 (Indonesian MEMR, 2017) , the estimated brown power density (α_B) and the brown efficiency rate (η_B) in 2016.
The share of the green exploitation area	ψ_G	4.0393e-5		Estimated based on the green production in 2016 (Indonesian MEMR, 2017), the estimated green power density (α_G) and the green efficiency rate (η_G) in 2016, the width of Indonesia area ($\omega = \frac{A}{\rho}$) and the distance between small open economy and the exploitation area of the brown resources (ρ).
The effect of length of the line on the transmission and distribution loss	τ	1.0179e-8	%/mc	Estimated based on the electricity loss in the transmission and distribution and total length of line of low, medium, high and extra high voltage of Indonesia in 2016.
The unit delivery cost of brown resource	u_B	5,3284e-7	\$/kg.m	Based on the maximum coal transport cost by train in Indonesia in 2016 Price by IDOMINING (2016).
Production rate in the thermal power plant	z_B	49.14%		Estimated based on the installed capacity and the electricity production of thermal and green power plants of Indonesia during 2001-2016.
Production rate in the thermal power plant	z_G	100.00%		The green production is assumed to be at full capacity.

Note: (1) All monetary values are converted into price in 2016. (2) kmc = km circuit.

Table B.2 – The Result of the Base Simulation from GAMS Software to Get W_B^e and W_G^e that Maximize Π_t^e

Parameters & Exogenous Variables

Unit	Parameter	Value
km ²	A	1.8116E+06
km	ρ	5.2491E+03
W/m ²	α_B	3.2971E+03
W/m ²	α_G	2.0000E+02
	β_s	1.1324E+00
	β_w	1.2916E-01
\$/W	p^e	6.5434E-01
\$/people	b	3.1567E+01
W ² /\$-people	g	1.4462E+01
W/people	i	2.2103E+01
people/km ²	D	1.4414E+02
\$/people	θ	9.7440E+07
	β_L	1.0000E+00
	ψ_G	4.0393E-05
	η_B	3.0330E-01
	η_G	2.3834E-01
kg/m ²	f_B	1.0749E+03
kmc. people/km ²	γ_B	2.5936E+08
kmc. people/km ²	γ_G	0.0000E+00
\$/W	I_B	3.8466E-02
\$/W	I_G^k	7.4626E-02
m	r_B	6.7750E+01
km	λ	0.0000E+00
	L_B	9.4822E-02
	L_G	0.0000E+00
mc	s_B	9.3152E+08

mc	s_G	0.0000E+00
/mc	τ	1.0179E-10
\$/kgm	u_B	5.3284E-07
kW	W_D^e	2.4591E+10
	z_B	4.9137E-01
	z_G	1.0000E+00
km	ω	3.4512E+02
\$/m ²	I_G^L	1.4045E+04
people	N	2.6112E+08
\$/W	I_G	8.6527E-02
\$/W	p_G^e	8.6527E-02

Variables

Unit	Variable	Value
m ²	A_B	2.3313E+07
m ²	A_G	7.3174E+07
W	k_B	4.7446E+10
W	k_G	3.4881E+09
\$/W	p_B^e	7.8322E-02
\$/W	p_B^m	1.1735E-05
\$	Π_B^e	0.0000E+00
\$	Π_G^e	0.0000E+00
\$	Π_B^m	0.0000E+00
\$	Π_T^e	1.3963E+10
W	W_B^e	2.3313E+10
W	W_B^m	7.6865E+10
W	W_G^e	3.4881E+09
W	W_S^e	2.4591E+10
ton	x_B	2.5059E+10
	$\%W_B^e$	8.6985E-01
	$\%W_G^e$	1.3015E-01

Table B.3 – Comparison of the Basic Simulation Result with Real Data

Variable	Unit	Simulation	Data in 2016	Note
W_S^e	W	2.4591E+10	2.4658E+10	
W_B^e	W	2.3313E+10	2.4814E+10	Based on data in 2016
W_G^e	W	3.4881E+09	3.4881E+09	
k_B	W	4.7446E+10	5.1399E+10	
k_G	W	3.4881E+09	7.1624E+09	Estimated based on data in 1989–2015
$L_B + L_G$	%	9.4822	9.4800	

Note: (1) Data in 2016 and data used to estimate data in 2016 are from the Indonesian Ministry of Energy and Mineral Resources or PLN. (2) Unit measurement in Wh is converted to W where hours in year t = number of days in year t × 24 hours/day. (3) The simulation is based on the assumption that the production rate on the green power plant is at full capacity, In reality, the production is not at full capacity.

1193 THE IMPACT OF URBANIZATION ON ENERGY CONSUMPTION IN THE GLOBAL SOUTH. EVIDENCE ACROSS COUNTRIES, CITIES AND NEIGHBORHOODS.

ABSTRACT

We analyze how city size and urban form impacts residential energy use in low- and middle-income countries. Traditionally, energy consumption and emission levels are highest in rich countries, but, nowadays both urban and GHG emission growth is largely driven by countries in the global South. By 2050, around 80% of total urban population is expected to live in cities in low- and middle-income countries. Despite the importance of urban areas for energy use and global emissions, data on urban energy use worldwide are in short supply. The data scarcity is even worse when it comes to urban areas in the developing world. This paper aims to reduce this knowledge gap by presenting new evidence on how city size and urban form impact energy use in the global South. In contrast to most of the energy studies literature on residential energy use in low- and middle-income countries (cf Barnes et al. 2004), we focus on the role of the spatial distribution of population and economic activities on energy consumption and vice versa. Existing urban economics research on the relationship between energy use and city structure suggests that per capita energy consumption decreases when urban density increases. The basic idea underlying this so-called compact city argument is that a higher population density decreases average commuting distance, increases public transport usage, while smaller housing units help to reduce transport and home energy use (Glaeser and Kahn 2010, Muniz and Galindo 2005). But, the evidence for this compact city hypothesis comes almost exclusively from rich countries. In contrast, we focus on low- and middle-income countries. Our dataset combines information at three levels of spatial aggregation: i) 60 low- and middle-income countries; ii) 136 cities in Indonesia and Mozambique; iii) 62 neighborhoods within the metropolitan areas of Yogyakarta (Indonesia) and Maputo (Mozambique). This allows us to combine different levels of aggregation in our analysis, including an assessment of the role of city size, population density, distance from the CBD and commuting behavior within two large metropolitan areas. Furthermore, in contrast to existing studies on the relationship between urbanization and energy across developing countries (cf Poumanyong & Kaneko 2010, Martinez-Zarzoso and Maruotti 2011, Sadorsky 2013), we use a sorting model (cf Combes et al. 2008) and an IV regression approach to identify causal mechanisms in the relationship between urbanization and energy use. At all levels of spatial aggregation, we find that in the global South urbanization leads to increasing per capita energy use through an income-effect. This robust positive income effect dominates weak evidence of a negative impact of population density on per capita energy consumption. At the country level, we find no evidence that urbanization has a direct effect on energy use.

Yet, for Maputo we found evidence that a 1% increase in commuting distance increases per capita transport energy use with 5%. For Indonesia, our data for Yogyakarta city include evidence that population density has a negative impact on total and dwelling energy consumption per capita, thus lending support to the compact city theory.

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1529 THE MUTUAL RELATIONSHIP BETWEEN REGIONAL INCOME AND DEFORESTATION: A STUDY ON TURKEY

ABSTRACT

This paper addresses the bilateral relationship between growth and environment. It aims to show how regional economic growth causes environmental deterioration, while the environmental resources function in turn as a supply factor for economic development. A simultaneous-equations model is developed and applied to test this two-way relationship statistically, where economic growth is measured by regional income, and environmental deterioration by deforestation. Using data from 26 NUTS 2 regions in Turkey between the years 2004 and 2014, the results of the two-stage least squares (2SLS) regression analysis reveal strong evidence on the presence of a mutual relationship between deforestation and regional income, while lagged deforestation is a statistically significant positive determinant of income growth, and vice versa.

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1354 LIVELIHOOD DEVELOPMENT FOR SUSTAINABLE FOREST MANAGEMENT

ABSTRACT

Rural economy of India in agriculture based with tremendous success in productivity since independence. But livelihood of agro-based region of many parts of India still remain under developed. In west Bengal the plateau district is relatively backward because of low productivity, drought, insufficient irrigation system, poor soil quality, lateritic waste land, lack of proper planning. Forest is the main natural capital of livelihood development as this region has low agricultural productivity and more than 35% land fall under forest. Here more than 80% protected forest is Under JEM program since nineties. But lack of proper planning, lack of knowledge, fund scarcity, and sever poverty are the main reason for failure of JFM program which further leads to forest degradation and deforestation, and forest land conversion. The aim of this paper is to discuss the present scenario of forest and to find out how forest can be conserve with fulfilment of economic benefits from the forest to sustain the livelihood of the poor forest fringe villagers in Rupnarayan Forest Division, West Bengal emphasizing Non Timber Forest Products production.

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1331 ASTHMA PREDICTABILITY INDEX AMONG CHILDREN OF ATOPIC PARENTS LIVING IN AND AROUND KOLKATA METROPOLIS AND ITS CO-RELATION WITH VARIOUS AIR POLLUTION INDICES

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ABSTRACT

Asthma is not just a public health problem for developed countries. In developing countries, however, the incidence of the disease varies greatly. Although heredity plays a major role in asthma and in other allergic diseases, mechanisms underlying the inheritance of these disorders are poorly understood, as is the relative contribution of maternal and paternal conditions to risk of disease. Asthma attacks all age groups but often starts in childhood. It is a disease characterized by recurrent attacks of breathlessness and wheezing, which vary in severity and frequency from person to person. In an individual, they may occur from hour to hour and day to day. This condition is due to inflammation of the air passages in the lungs and affects the sensitivity of the nerve endings in the airways so they become easily irritated. In an attack, the lining of the passages swell causing the airways to narrow and reducing the flow of air in and out of the lungs.

Objectives: We tried to evaluate the relationship of new-onset asthma with pollution and an attempt to draw a predictability index for children below 6 years of age with atopic parents.

Methods: Children below 6 years of age with atopic parents are the subject of study. Parent-reported physician diagnosis of new-onset asthma ($n=82$) was identified during one year of study. We assessed traffic-related pollution exposure based on automatic data generated by Central Pollution Control Board, Kolkata and local meteorology.

Results: The adverse effect of air pollution on respiratory health has been well established in, but our results are not consistent with this evidence. The concentration of pollutants such as PM₁₀ and NO₂ no longer provides a statistical explanation for variations in asthma prevalence across urban units. Interestingly, the relationship between childhood asthma and SO₂ was consistently negative. And surprisingly, these annual mean levels of PM₁₀ (0.091mg/m³), NO₂ (0.042mg/m³), and SO₂ (0.042mg/m³) detected during the sampling period did not conform with. Asthma risk increased with modeled traffic-related pollution exposure from roadways near homes. Traffic-related pollutant levels may also be considerably higher during the morning hours, when children are arriving at school, especially during temperature inversions that occur largely in the winter months when children are attending school ([Kim et al. 2002](#); [Ning et al. 2007](#)). The odds of having a child with asthma were three times greater in families with one asthmatic parent and six times greater in families with two asthmatic parents than in families where only one parent had inhalant allergy without asthma; furthermore, inhalant allergy in one parent also conferred additional risk in the presence of asthma in the other parent.

Conclusions: Our results indicate that children exposed to higher levels of traffic-related air pollution at school and home are at increased risk of developing asthma. Hereditary factor plays a major in asthma among children.

Keywords: air pollution, asthma, child

INTRODUCTION

Asthma is one of the most chronic inflammatory disorders characterized by recurrent attacks of wheezing, breathlessness, cough, and/or chest tightness, which vary in severity and frequency from person to person. The prevalence of allergic airway diseases, such as asthma and rhinitis, has been increasingly common to epidemic proportions worldwide. About 334 million people worldwide are now suffering from asthma.

A large number of studies have confirmed that respiratory diseases are related to the physical characteristics of the living area: multiple factors affect asthma including exogenous factors like air pollution and climate. The link between urban air pollution, climatic factors, and asthma is established. However, there are merely a few analyses developing a comparative approach of differences in asthma morbidity among places, such as cities. In addition, levels of outdoor air pollutants have been associated with asthma incidence but not clearly with asthma prevalence at the population level. Under this circumstance, this paper investigated the local disparities' correlation with air pollutants and climatic factors in different areas of Kolkata.

Respiratory viruses and symptoms of early asthma may be hard to tell apart, making diagnosis and treatment tricky. But doctors and parents now have a tool to help them predict with reasonable accuracy if the child will develop asthma or simply outgrow it.

The asthma predictive index (API) is a guide to determining which small children will likely have asthma in later years. Children younger than 3 years who have had 4 or more significant wheezing episodes in the past year are much more likely to have persistent (ie, lifelong) asthma after 5 years if they have either of the following:

- Parent with asthma
- Physician diagnosis of eczema (atopic dermatitis)

- Sensitivity to allergens in the air (as determined by physician through positive skin tests or blood tests to allergens such as trees, grasses, weeds, molds, or dust mites)
- Wheezing is very uncommon during the first two months of life, but in the next few months, first-time wheezing increases, peaking between two and five months of age. Infants' airways (compared to older children and adults) are smaller around, have less smooth muscle and make more mucus, which can lead to more coughing, wheezing, chest tightness, shortness of breath, or rapid breathing.
- The 2007 National Heart, Lung and Blood Institute (NHLBI) Guidelines for the Diagnosis and Management of Asthma describes the Asthma Predictive Index (API), a guide to determining which small children will likely have asthma in later years.

The API was developed 10 years ago by using data from 1246 children in the Tucson Children's Respiratory Study birth cohort. It was based on factors that were found during the first 3 years of life to predict continued wheezing at school age

OBJECTIVE

The aim of this study was to investigate the potential role of city-average air-pollutant levels and climatic factors in explaining regional differences in asthma prevalence among children below 6 years of age with atopic parents in Kolkata. To evaluate the development of asthma in children below 6 years who were seen for an acute wheezing episode in infancy and to determine the effectiveness of the API in predicting the development of asthma in this group of children.

METHODOLOGY

Asthma Data

Asthma data in this study was collected from outdoor department of Allergy and Asthma Research Centre, Kolkata, Missionaries of Charity, Kolkata. The selected data of asthma prevalence were defined as children who had experienced at least one asthma attack in the last two years or have not experienced any but have atopic parents.

Informed consent was obtained from the next of kin, caretakers, or guardians on behalf of children. The consent on behalf of the children enrolled was written. The study design was approved by the ethics committee of the Allergy and Asthma Research Centre, Kolkata.

Air pollution data was in the form of seasonal concentrations of air pollutants and other climatic factors were obtained for the same period from several government departments. Data analysis was implemented with descriptive statistics, Pearson correlation coefficient, and multiple regression analysis.

Parents provided informed consent and completed a baseline and yearly questionnaire with information about demographic characteristics, respiratory illness, and risk factors for asthma at study entry. To ensure that the study population was free of any previously undiagnosed asthma, I also excluded children with a history of wheeze ($n=24$, 29.3%) and additional children with missing information about wheeze, or missing or a "don't know" answer about asthma ($n=12$, 14.6%).

A positive API score by the age of 3 years was associated with a 77% chance of active asthma from ages 6 to 13 years; children with a negative API score at the age of 3 years had less than a 3% chance of having active asthma during their school years.

Major Criteria	Minor Criteria
1. Parental MD asthma	1. MD allergic rhinitis
2. MD eczema	2. Wheezing apart from colds
	3. Eosinophilia

- Loose index for the prediction of asthma: early wheezer plus one of the two major criteria or two of three minor criteria.

New-onset asthma and covariates

The date of new onset of asthma could not be precisely defined. Therefore, the date of onset was assigned to the midpoint of the interval between the date of the questionnaire when asthma diagnosis was first reported and the date of the previous questionnaire reporting asthma status, and this date was used for estimating follow-up time in all statistical analyses. Socio demographic characteristics, exposure to cigarette and wildfire smoke, health insurance, housing characteristics, history of allergy, and parental asthma were assessed by questionnaire.

DISCUSSION

Causes

Asthma cannot be cured, but could be controlled. The strongest risk factors for developing asthma are exposure, especially in infancy, to indoor allergens (such as domestic mites in bedding, carpets and stuffed furniture, cats and cockroaches) and a family history of asthma or allergy.

Exposure to tobacco smoke and exposure to chemical irritants in the workplace are additional risk factors. Other risk factors include certain drugs (aspirin and other non-steroid anti-inflammatory drugs), low birth weight and respiratory infection. The weather (cold air), extreme emotional expression and physical exercise can exacerbate asthma.

Urbanization appears to be correlated with an increase in asthma. The nature of the risk is unclear because studies have not taken into account indoor allergens although these have been identified as significant risk factors.

Experts are struggling to understand why rates world-wide are, on average, rising by 50% every decade. And they are baffled by isolated incidents involving hundreds of people in a city, who suffer from allergies such as hay fever but who had never had asthma, suddenly being struck down by asthma attacks so severe they needed emergency hospital treatment.

The way forward and the role of the WHO

WHO recognizes asthma as a disease of major public health importance and plays a unique role in the co-ordination of international efforts against the disease. International action is needed to increase public awareness of the disease to make sure patients and health professionals recognize the disease and are aware of the severity of associated problems; organize and co-ordinate global epidemiological surveillance to monitor global and regional trends in asthma; develop and implement an optimal strategy for its management and prevention (many studies have shown that this will result in the control of asthma in most patients); and stimulate research into the causes of asthma to develop new control strategies and treatment techniques.

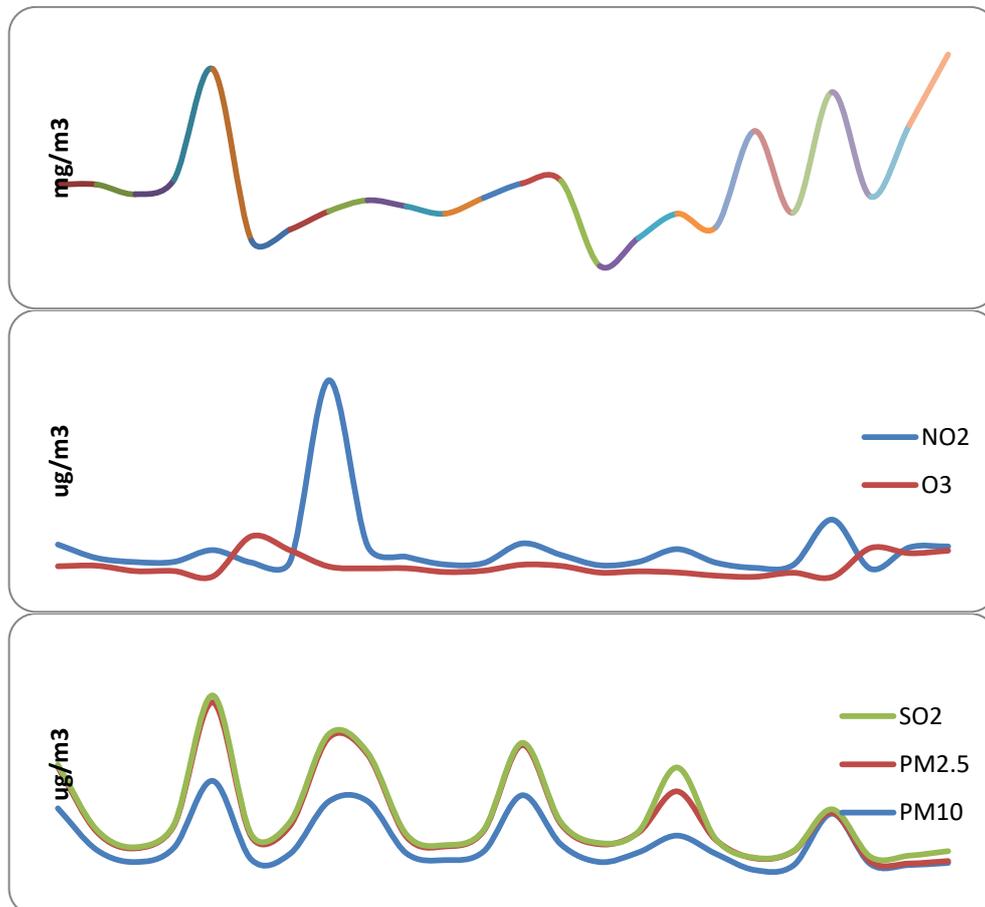
Among children < 5 yr of age, the proportion with asthma was 8.2%. Among children ≥ 5 yr of age, this proportion was greater: 17.9% among children between 5 and 10 yr of age.

The proportions of asthma and other allergic conditions were higher among mothers than among fathers . Of the 56 families, 11 (19.6 %) had both parents with asthma, 38(67.8%) had 1 parent with asthma, 7(12.5 %) had both parents with asthma.

Air pollution

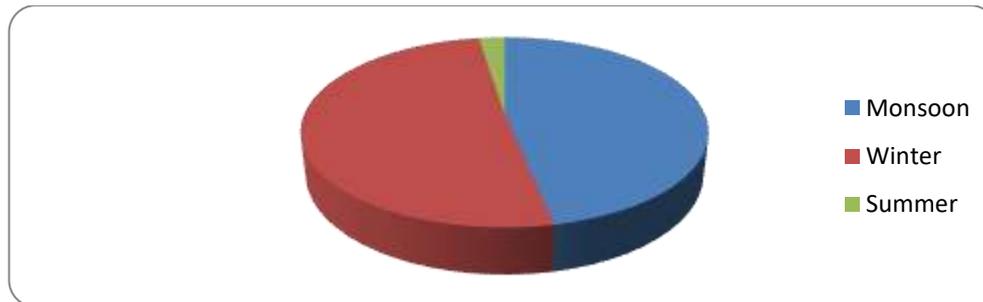
Air pollution data included the annual (January 2017 to December 2017)) average values for particulate matter less than or equal to 10 μm PM10 (μg/m³), sulfur dioxide SO₂ (μg/m³), and nitrogen dioxide NO₂ (μg/m³). All the data were obtained from the Central Pollution Control Board, Kolkata which collected monthly average concentrations of air pollutants through automated fixed-site monitoring stations. The data were regularly recorded from January 1, 2017, to December 31, 2017. The World Health Organization Air Quality Guidelines for annual mean concentrations of PM10 and NO₂ and for 24-hour mean concentrations of SO₂ were 20 μg/m³, 40 μg/m³, and 20 μg/m³, respectively.

Seasonal variation of air parameters in different locations in Kolkata were monitored for a year.



Evidence of a school effect comparable with that associated with the much larger amount of time spent at home could potentially be explained by physical education and other exercise at school that may increase ventilation rate and dose of pollutants to the lungs and thereby increase the risk associated with exposure.

Traffic-related pollutant levels may also be considerably higher during the morning hours, when children are arriving at school, especially during temperature inversions that occur largely in the winter months when children are attending school (Kim et al. 2002; Ning et al. 2007).



Incidence rate is much higher in winter months. This is due to the trapping of air pollutants because of temperature inversion.

Correlations between asthma prevalence, air pollutants, and climatic factors

According to Pearson correlation analysis, there were significant associations between asthma prevalence and several factors including SO₂ ($r = -0.323, p < 0.05$), relative humidity ($r = -0.351, p < 0.05$), and hours of sunshine ($r = -0.476, p < 0.05$). As can be seen, these correlations between PM₁₀, NO₂, air temperature, precipitation, and asthma prevalence were not statistically significant.

The adverse effect of air pollution on respiratory health has been well established, but our results are not consistent with this evidence. The concentration of pollutants such as PM₁₀ and NO₂ no longer provides a statistical explanation for variations in asthma prevalence. Interestingly, the relationship between childhood asthma and SO₂ was consistently negative. And surprisingly, these annual mean levels of PM₁₀ (0.091mg/m³), NO₂ (0.042mg/m³), and SO₂ (0.042mg/m³) detected during the sampling period did not conform with.

Regarding the effect of climatic variables, a large number of studies have confirmed that temperature is related to asthma. However, for our study, there has not been shown any statistically significant association between annual mean temperature and asthma prevalence. Thus, a direct comparison of results is not possible.

There is no confirmation in the literature that the association between climate and asthma prevalence reflects a causal relationship or that correlations are a result of indirect relationships and linked to other factors like air pollution levels. Little is known about the long-term influence of climate on asthma prevalence, but the findings from our study do not suggest that climate, at least in children, plays a major role.

CONCLUSION

To conclude, our study showed associations between long term exposure to urban air pollution and climate conditions, using Pearson correlation coefficient and multiple regression analysis capturing variations within communities, and asthma. First, the study shows the surprising results for the contribution of pollution factors. In contrast to reports from within-community studies of individuals exposed to traffic pollution, we found no evidence of a positive relation between air pollution and asthma prevalence. Meanwhile, our results suggest that climate may affect the prevalence of asthma, yet climate does not play a major role, at least in terms of children.

The most impressive aspect of the API is its ability to rule out the likelihood of asthma by school age in young children with wheezing. For children who are “early wheezers during the first 3 years of life,” API negative predictive values ranged from 93.9% at 6 years of age. For children who are “early frequent wheezers during the first 3 years of life,” the negative predictive values were 91.6%.

Factors such as genetic polymorphisms, environmental and socioeconomic factors and family health beliefs might also be taken into account. Even if an index is accurate, it must be easy to apply, validated in different populations, and shown to improve patient outcome to be used by busy clinicians. The simplicity of the API allows its use in every health care setting worldwide.

REFERENCES

- Guilbert TW, Morgan WJ, Krawiec M, et al. The Prevention of Early Asthma in Kids study: design, rationale and methods for the Childhood Asthma Research and Education network. *Control Clin Trials*. 2004; 25:286–310. [PubMed]
- Health Effects Institute. *Traffic-related air pollution: a critical review of the literature on emissions, exposure, and health effects*. Boston, MA: Health Effects Institute; 2010. Panel on the Health Effects of Traffic-Related Air Pollution
- Morgan WJ, Stern DA, Sherrill DL, et al. Outcome of asthma and wheezing in the first 6 years of life: follow-up through adolescence. *Am J Respir Crit Care Med*. 2005; 172:1253–1258. [PMC free article][PubMed]
- Wong GWK, Chow CM. Childhood asthma epidemiology: insights from comparative studies of rural and urban populations. *Pediatr Pulmonol*. 2008; 43:107–16. [PubMed]

RS03.4. Environmental Issues

1764 PROMOTING THE DIFFUSION OF ENVIRONMENTAL INNOVATIONS ACROSS DEVELOPING NATIONS: THE IMPACT OF INNOVATIVE AND ABSORPTIVE CAPABILITIES

ABSTRACT

Environmental policies and regulations play a central role in promoting technological innovation. However, in order to achieve sustainable development, not only developed but developing countries must also be involved in promoting and spreading those innovations. In this research we first analyze the trends on environmental patent activity (air pollution abatement, water pollution abatement and waste management) in 6 selected countries: the top three inventors of the past including Japan, US and Germany and the most rapid developing nations in the last two decades. The patent activity was analyzed for the last decade of the 90s and first decade of this century. The study also analyzed the innovation dissemination and indigenous innovation trends by using claimed priorities and priority applications as proxies respectively. Findings suggest that while in developed nations environmental regulations have played a central role in inducing innovations the case has not been the same for developing or mid income countries. The study argues that diffusion of technologies can be determined by domestic technological capabilities (R

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RS03.5. Environmental Issues

1014 HOW CAN CROSS-SECTOR PARTNERSHIPS BE MADE TO WORK SUCCESSFULLY? LESSONS FROM THE MERSEY BASIN CAMPAIGN, 1985-2010

ABSTRACT

Experience suggests that cross-sector partnerships can turn out to be a big disappointment: a cozy talking shop with plenty of warm words but not a lot of action to show for it. The Mersey Basin Campaign, however, was a major exception. As a government-sponsored 25-year initiative to clean up the rivers, canals and estuary of the Mersey river basin in North West England, the Campaign was a pioneer in public-private-voluntary partnership working and, in the period it was active (1985-2010), made great progress in improving water quality, promoting waterside regeneration, and engaging stakeholders, in a region with a history of severe industrial dereliction and pollution. In this paper, by a former leader of the Campaign, a number of themes are explored: Why was a Campaign needed? What did it try to achieve? How did it do this? What impact did it have? What are the critical success factors for partnership working? The story ends with an interesting twist: the present speaker brought the Campaign to a close in 2010, arguing that, after its planned life of 25 years, it had done what it set out to do. Now, much to the surprise of many people, several aspects of the Campaign are being re-created, albeit in a quite different institutional and financial context.

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1239 THE SQUARES OF OLD GOA: THEIR ROLE IN THE ORGANIZATION OF THE CITY**Manuel C. Teixeira**CIAUD, Lisbon School of Architecture, Universidade de Lisboa
Rua Sá Nogueira, 1349-063 Lisboa, Portugal**1. INTRODUCTION**

Urban squares play an important role in the structure and the image of cities built by the Portuguese, or which they rebuilt, restructured or had some type of intervention. Goa is no exception. There, one may find examples of the different types of squares that occur in cities of Portuguese origin, and fulfilling similar roles in the organization of the urban fabric. For this survey of the squares of Goa, one shall take as reference the late sixteenth century. The best known representations of Goa from this period are the plan by Georg Braun and the plan included in the *Itinerario* of Linschotten.

2. GOA'S URBAN STRUCTURE

Goa was an affluent port city when in 1510 Afonso de Albuquerque conquered it to the sultan of Bijapur, Adil-Shah, also called the Sabaio in Portuguese chronicles. A former Hindu city, Goa had been conquered by the Muhammadan princes in 1469 (1). The wealth of Goa, its role as an important entrepôt for the commerce of Asia and its strategic location were amongst the main reasons for the Portuguese control of the city.

Although considerably smaller than under the Portuguese rule, the city had a consistent urban structure. Located in a moderate slope, oriented north, Goa was surrounded by a wall with a rounded perimeter and a ditch filled with water. The main city gates were located at the cardinal points, and articulated with the main streets within the city, defining a classical organization of two main axes, crossing each other at right angles. The main buildings and public spaces were located at their intersection. This was the location of the Palace of the Sabaio, in the centre of the city, in front of a vast open square called the Terreiro do Sabaio. The Great Mosque was located nearby. The most important axis had the north-south direction; it was called the *Rua Direita*, and was the main structuring element of the city. As one of the principal emporiums of trade on the western coast of India, the area by the river Mandovi was occupied by shipyards, warehouses and other buildings related to maritime and merchant activities.

The intersection of two main axes within a walled enclosure is the fundamental structure of a city, which one may find in urban settlements built in different historical times, different cultural contexts and geographical settings located wide apart. This is the basic structure of a city from the earliest periods of urban civilization. It is the physical translation of principles that relate to the very concept of a city, and at the same time the expression of basic principles of man's conception of the world, which was rooted on the observation of the course of the sun through the skies and the four cardinal points. These principles were similar in different cultures and the urban structure of Goa fits into this matrix.

Cities are expensive infrastructures and human and material resources were always scarce in colonial contexts. Goa was a prosperous, and a well-established functioning city, with an urban structure to which the Portuguese could easily adapt, and as a consequence of that the city's basic structure and its main buildings were maintained. Within the walled-in city, the fundamental transformations that occurred over the years consisted either in functional changes of existing buildings or in the construction of new institutional buildings. These were built in locations that reinforced the existing urban structure and the hierarchies of the city. The palace of the Sabaio, became the palace of the Viceroy and later, in 1560, the siege of the Inquisition, whereas the new Vice Royal palace would occupy the Sabaio's fortress by the river, in 1554. Other buildings were occupied by new functions or its site rebuilt, like the convent of São Francisco that was built where Goa's principal mosque had stood. The Jesuitical college of São Paulo was also built over a former mosque.

New Portuguese buildings included the *Misericórdia*, built just within the south city gate, which reinforced the importance of *Rua Direita* as the main axis of the city, linking this southern gate to the Viceroy's gate, in the north. The institutional centre of the city, formerly made up of the Palace and *Terreiro do Sabaio*, saw its role as the institutional centre of the city greatly increased with the construction of the Cathedral, the Bishop's Palace, the Municipality, and the Franciscan convent.

Within the city walls, there were two types of urban fabric, on one side and the other of *Rua Direita*. On the western side, the urban fabric consisted of an orthogonal street network, where *Terreiro do Sabaio* and the nearby buildings occupied a central position. On the eastern side, the urban fabric was made up of a number of arching streets that converged on the *Misericórdia* and the square to which it was associated.

The city soon grew beyond its old limits. The city walls disappeared, either demolished or engulfed by constructions: "the wide ditch that surrounded its walls were filled up, and the additional space thus created was (...) assigned for new buildings. Once the old barriers were overstepped, the city rapidly grew in size in almost every direction" (2). Whereas the old city, within walls, had been built in a gentle slope surrounded by hills, now the city grew over this hilly land. The logics of location of new institutional buildings in this new territory, the layout of the new street network and the design strategies adopted were identical to those of other Portuguese urban settlements. The rounded perimeter of the city walls influenced the way the city developed in the immediate periphery, outside its old limits. In the cartography of Goa one may see one or two circular, concentric streets, which were built following the curving of the old city walls.

Beyond this first area of expansion, that followed the rounded contour of the old city, there were two different types of urban layouts. One, in the south, was fairly orthogonal, continuing the orthogonality that characterized the western part of the old city. Another type of urban layout, in the eastern and the western parts of the city, was made up of streets that converged into important institutional buildings built in singular locations of the city. In the east, the main focuses of these converging streets were the college of São Paulo, the Dominican convent and the church of Santa Ana. In the western part of the city, the convergence of streets was made towards the site of the former city gate, where the chapel of Santa Catarina and the Franciscan convent had been built.

The most important roads built outside the former city limits followed the natural lines of the territory, being built either along the valleys or along the ridges. Other streets made the connection between them, articulating the different levels. The most important topographic features of Goa's territories of expansion were a wide valley in the south-eastern direction that led to the lagoon, and a narrower and less pronounced valley in the south-western direction. The first valley was limited by two roads implanted at the foot of the hills, on one side and the other of the valley. The second valley was defined by a road that was the continuation of *Rua Direita* and went on into the hinterland.

These two valleys separated three main elevations, each one of them punctuated by religious buildings. One, in the east, where the chapel of Nossa Senhora do Monte was implanted; another in the south, with the convent of Cruz dos Milagres; and another elevation in the west, where a significant number of religious buildings were located: the nunnery of Santa Mónica, the convents of Santo Agostinho and São João de Deus, the church of Nossa Senhora da Graça and the chapel of Santo António. The main streets that led to these religious enclosures were built along the ridges, or climbed the hills diagonally.

Religious buildings were located in singular points of these natural lines, usually at the end or at points of divergence or inflection of ridges. Churches and convents were built in these topographically dominant locations both for symbolic reasons and to ensure their role as urban landmarks and focal points for the organization of the urban fabric. While the natural lines of the territory were integrated into the urban fabric as major streets, the construction of religious buildings in dominant locations, their association with squares and their careful positioning in relation to other urban elements, meant that these sites were reinforced as singular points of the urban structure and these buildings became the natural foci of street perspectives or views from afar.

In Goa, both convents with their *terreiros* and churches and chapels with their *adros* played an important role in the structuring of the city and the organization of the urban fabric. Their location was never casual. Singular buildings were either built in topographically dominant locations, in places imbued with a symbolic meaning and that ensured their visibility or in dominant locations in terms of the logic of the urban fabric. The convents' *terreiros* were larger and they were, or would become, major ordering elements of the city. The smaller *adros* of churches had a structuring role rather at the scale of the neighbourhood. Both these two types of spaces were sometimes punctuated by *cruzeiros* or other architectural elements which, together with the singular buildings in front of which they stood, became landmarks in the city, elements of reference for the alignment of streets, the definition of perspectives, the rotation of streets, the articulation of different sectors of the urban fabric, or references for the identification of singular urban situations, or the functional or symbolic importance of those buildings.

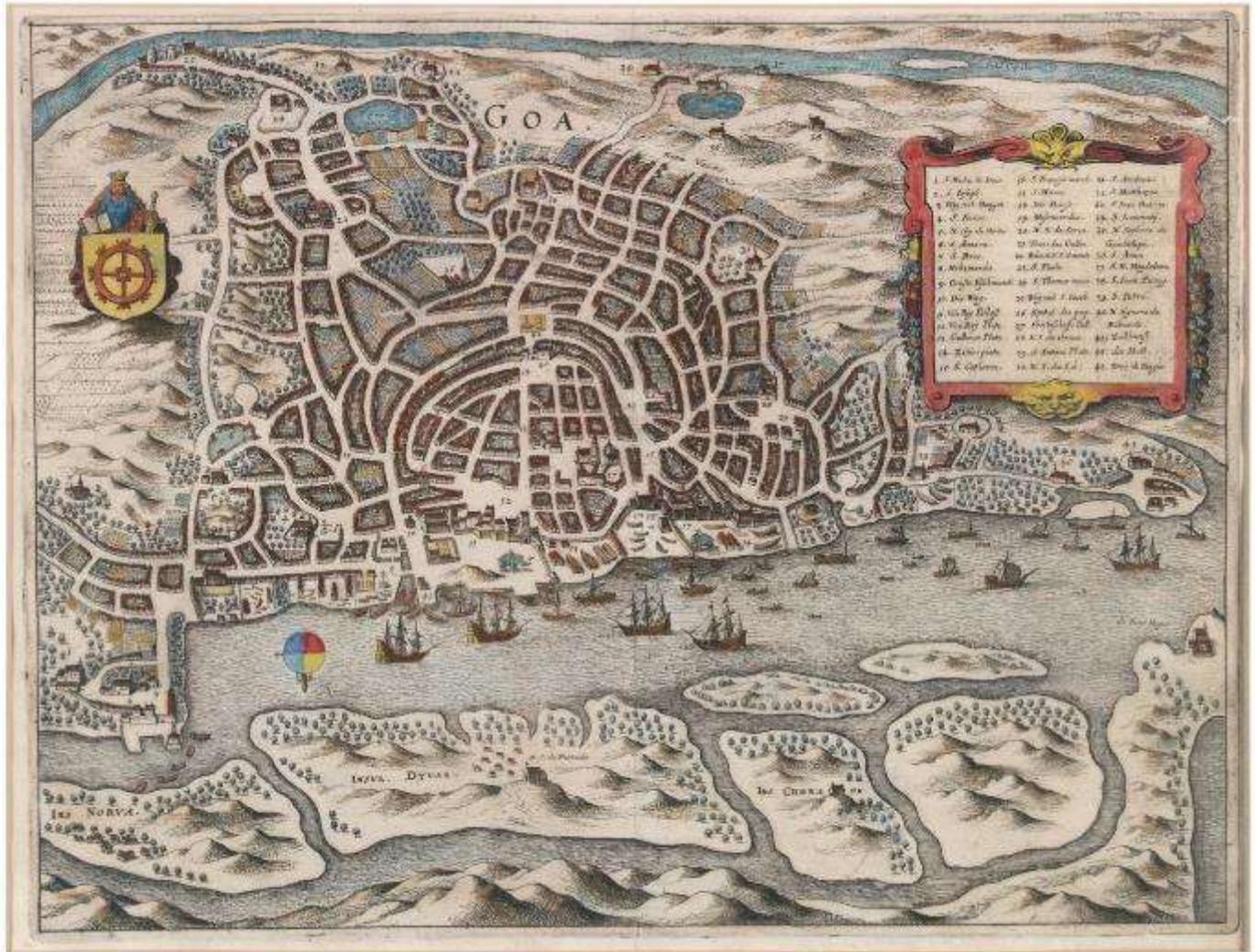
Convents, with their enclosures, needed a large amount of space and therefore they were often built on the periphery of the built-up city, where empty land was available. When the city grew, some of them were incorporated into the urban fabric, whereas others became obstacles to the growth of the city, and remained in their outlying situation. In the city of Goa, in the late sixteenth century, the Dominican, the Carmelites, the Jesuits, and the Augustinians convents, with their *terreiros*, were close to the limits of the city, in the east, the south, and the west. The only convent in a more central location was São Francisco, which had replaced the great mosque.

The existence of *terreiros*, or *campos*, on the periphery of walled towns, often associated with the city gates, was a characteristic of Portuguese cities. In the sixteenth century plan of Braga, in Portugal, one can see a number of these outlying *terreiros*, used for markets and festivals, still without the formal organization they would acquire in latter years. Usually, these spaces were dominated by churches and convents, in relation to which they were organized. As the city grew, these *campos* became the new squares of the expanded city.

Churches with their *adros* were located in different neighbourhoods, fulfilling their role of rotulas of the city structure at a local scale. Amongst these, the chapels of Nossa Senhora do Monte, Santo Amaro and São Lázaro on the eastern part of the city, Nossa Senhora da Luz on the south, and the chapels of Santo André, Nossa Senhora da Graça, and São Pedro on the west. They were focal points in relation to which the streets were oriented and elements of reference of the neighbourhoods in which they were located, sometimes of the whole city. Other chapels, located further out in the open countryside, were meant to fulfil this role later on, becoming focal elements for new urban developments if the city grew in their direction. Amongst these, São Brás, São Tomé-o-Novo, São Mateus, São João Baptista, São Lourenço, Nossa Senhora de Guadalupe, Santa Ana, Santa Maria Madalena, São João Evangelista.

The riverside of Goa, occupied by the vast area of *Ribeira* was one of the areas where the Portuguese invested the most. The original functions of the *Ribeira* were kept and consolidated and along the different quays were built, amongst other buildings, the rope factory, the new customs house, the foundries, the main Hospital, the Mint, the jails and the church of Chagas. This became the actual new centre of the city, which culminated in the transference, in 1554, of the Viceroy's palace to the Sabaio's fortress in the *Ribeira*, mimicking Lisbon, where a similar transference of the Royal palace had occurred in the early sixteenth century.

The *Ribeira* was subdivided in four different compounds. First, coming upstream from the bar, one reached the *Ribeira Grande*, “the workshop of the city, for here were the arsenal and the gun foundry, the mint, the naval dockyard, the offices of the *Vedor da Fazenda* (Comptroller of the Treasury) and also the elephant stables” (3). The church of the Cinco Chagas was also located here. To the east of *Ribeira Grande* lay the *Cais de Santa Catarina* (St. Catherine’s Quay), with the fish market. On its western side was located the Archbishop’s prison and on its south side was the Chapel of São Martinho and, overlooking the river, the Royal Hospital, run by the Jesuits. Next to St. Catherine’s Quay was located the *Ribeira das Galés*, where galliots and foists were built, and which was also used as a landing-stage. The largest and most important of the compounds that made up the *Ribeira* of Goa was the *Terreiro Grande*, or Quay of the Viceroy, in front of the Viceroy palace, between the palace and the Mandovi River.



GOA, Georg Braun, Museu de Angra do Heroísmo.

3. THE SQUARES AND *TERREIROS* OF GOA

Terreiro Grande, Bazar Grande

The *Terreiro Grande* was “the centre of the official life of the city, containing as it did the Viceroy’s palace and its dependencies (...). Here stood the *Alfândega* or Custom’s House (...), the *Bagançal*, or the great go-down, where the incoming cargo was stored; here, too, was the *Peso*, or weigh-house where the goods were put on scales. Equally functional was the *Tronco*, or the civil prison (...). But by odds the most important structure in the area was the Vice regal Palace itself” (4). To the east, across a narrow creek, was located the *Bazar Grande*, the great market of Goa.

Terreiro Grande was the equivalent of other maritime or riverside squares of Portuguese cities, which developed next to the intersection of the first street that run parallel to the river or the seaboard, with the main street that run perpendicular to it, often beyond the city limits towards the interior. These squares were usually associated with some of the city’s most important buildings. That is the case, amongst others, of the main squares of Ponta Delgada, in the Azores islands, of *Ribeira Grande*, in the islands of Cape Verde, of Rio de Janeiro in Brazil, or Lisbon in Portugal. In many of these cities, these squares were developed between the marginal street and the river, or the sea. Sometimes, a building or a series of constructions stood between the street and the square. That was the case of Goa, as well as of Lisbon, before the earthquake. In both cities, the Royal and the Vice-royal palaces had similar locations.

Terreiro do Vice-Rei

From the *Terreiro Grande*, across the Arch of the Viceroy, one entered the old city through another square, the *Terreiro do Vice-Rei*, or Palace Square. This was located behind the Viceroy Palace, which made up its north façade. The Viceroy Palace was built against the old city walls, and the square lay within these walls. *Terreiro do Vice-Rei* was indeed an enlargement of the street that run east to west, parallel to the river, and it belonged to the type of squares that, in Portuguese walled-in towns, were built just inside the city gates, usually associated with a larger *terreiro* located outside. This duality was present in Goa, with the associated *Terreiro Grande* and *Terreiro do Vice-Rei*.

The Arch of the Viceroy and the Palace Square marked the beginning of *Rua Direita*, the main street of Goa, which run perpendicular to the river. This was one of the main axes of the city, running north to south until the old limits of the city and beyond into the hinterland. Its course was punctuated by several squares.

Square of Misericórdia, Terreiro do Pelourinho Velho

The duality of *Terreiro Grande* and *Terreiro do Vice-Rei* was mirrored, on the south side of the city, with the duality of the Square of Misericórdia, inside the south city gate, and the *Terreiro do Pelourinho Velho*, outside. The square of Misericórdia was located at the site of the principal gate of the Moslem city. In this square, in addition to the Misericórdia, stood the church of Nossa Senhora da Serra.

The building of the Misericórdia protruded into the street, making it the focus of *Rua Direita*. This was a design strategy employed in Portuguese urban layouts: buildings would be purposefully implanted out of alignment, in such a way as to become more visible and offer themselves as focal points of street perspectives or other views one wished to emphasize. Together with the squares to which they were usually associated with, these buildings punctuated singular points of the urban fabric, like the end or the rotation of important axis, important intersections or the articulation of different sectors of the urban fabric.

Just across the city gate stood the *Terreiro do Pelourinho Velho*, surrounded by shops. Usually, this association of two squares followed a similar pattern: a smaller square on the inside, associated with more formal buildings and functions, whereas the square or *terreiro* on the outside was larger, less formally organized and often associated with merchant activities. This was a well established pattern in Portuguese cities, reproduced in Goa.

Square of Pelourinho Novo, Square of Nossa Senhora da Luz

Rua Direita continued beyond the *Pelourinho Velho*. Halfway along this last leg of *Rua Direita*, and located marginally to the left of this street, was the small square of *Pelourinho Novo*. *Rua Direita* finished in the small square – little more than an *adro* – in front of the church of Nossa Senhora da Luz, which marked the southern limit of Goa. This small square, and the limit of the built-up city were further announced by a *cruzeiro* located in front of the church, on the perspective of the street. This north-south axis linked the city to the hinterland, and went on through the countryside, punctuated at intervals by other churches or chapels. One last urban event was the square in front of the church of Nossa Senhora da Luz.

Terreiro do Sabaio

Returning to the old city limits, if one stood on *Rua Direita* facing south and took a turning to the right two blocks after the *Terreiro do Vice-Rei*, one would enter another square, the *Terreiro do Sabaio*, associated with some of the most important institutional buildings of Goa: the palace of the Inquisition facing *Rua Direita* – which had previously been the palace of the Sabaio and later the palace of the Viceroy – , the Sé or Cathedral of Santa Catarina, the Archbishop's Palace, the *Casa de Câmara* and the *Casa dos Contos* or treasury. The old *Terreiro do Sabaio*, before the Portuguese, had probably been larger, flanked by the palace of the Sabaio on one side, and the mosque – later replaced by the Franciscan convent – on the other side. The Cathedral would have been built in the centre of the *Terreiro*.

This was the institutional square of the city, dominated by the Cathedral. Fittingly, it stood next to the intersection of the main north-south axis – the *Rua Direita* – and the east-west axis that started at the eastern city gate and exited the old city on *Terreiro de São Francisco*. Although this was not a unique situation, this square had a singular characteristic. In Portuguese cities, different squares were usually associated with different functions, and in most cases the Cathedral square was separated from other civic squares. This was not the case in the *Terreiro do Sabaio*.

Terreiro de São Francisco, Terreiro dos Galos

The convent of São Francisco was built next to the Cathedral, on the site where Goa's main mosque had stood, just inside the old city gate. Outside, was located the *Terreiro de São Francisco*. To the south, next to it, also outside the city walls, was located the *Terreiro dos Galos*, dominated by the church and the Jesuitical convent of Bom Jesus. Both these *terreiros* had probably their origin in the Moslem city, being consolidated as urban squares with a religious content by the Portuguese.

Terreiro de Santo António

Further out, located upon a hill – the *Monte Santo* – and defining the western limit of the city, was the *Terreiro de Santo António*, surrounded by several religious buildings, including the nunnery of Santa Mónica on one side, and the convent of Santo Agostinho on the other.

Terreiro de São Paulo, Terreiro de São Domingos

The *Terreiro de São Paulo*, next to the Jesuitical college of São Paulo, located in the south-eastern part of the city, and, further north, close to the *Bazar Grande*, the *Terreiro de São Domingos*, associated with the convent of São Domingos, were on the eastern side the outermost squares of sixteenth century Goa.

4. THE ROLE OF SQUARES IN THE ORGANIZATION OF THE PORTUGUESE CITY

One may conclude that the squares played an important role in the reorganization of the city of Goa. Within the old limits of the city, the *Terreiro do Sabaio* grew in importance by means of the implantation of a number of new institutional buildings, either in the *terreiro* or close by. Other urban spaces acquired a greater importance, as well. That was the case of the open spaces associated with the city gates. The *Terreiro do Vice-Rei* acquired a greater status after the Viceroy moved in there and, at the other extreme of *Rua Direita*, the square of Misericórdia, gained a greater distinction with the construction of this building, which articulated the square and *Rua Direita*. The *terreiros* located outside the city gates became ordered squares associated with the construction of convents, like the *Terreiro de São Francisco* and *Terreiro dos Galos* in the west, or associated with other functional or symbolic roles, like the *Terreiro do Pelourinho Velho* in the south, a market square where the symbol of municipal authority stood.

The outlying areas of the city were developed by the Portuguese from the beginning. Whereas one may find a geometrical logic in the urban layout of the old city and in the organization of its various components, in these outlying areas of expansion topography was the main element that structured the urban fabric and the formal logic of these new urban areas has to be found primarily in the physical characteristics of the territory. Topography suggested the locations of singular buildings, the directions and the implantation of the main roads and the sites for the development of squares. These became the main elements for the structuring and hierarchization of the city. Three large squares defined the limits of this territory: the *Terreiro de São Domingos*, in the east, the *Terreiro de São Paulo*, in the north-east, and the *Terreiro de Santo António*, in the west. Each sector of the city was organized in relation to them.

The Portuguese city was always the synthesis of two different components. One erudite component, that arose from a set of rational principles and was translated into geometrical layouts, which were usually called planned, and one vernacular component, that arose from a close relationship with the territory and was usually translated into non-geometrical layouts, usually called organic. Different cities were more or less regular depending on historical circumstances, the topography, the resources available or the social actors involved. In Goa, one has a singular juxtaposition of these two components, in which the more regular corresponds to the pre-existing Indian city, whereas the less geometrical corresponds to the areas developed by the Portuguese. In these outlying areas, religious buildings and their squares, located and developed in close relationship with the natural characteristics of the site, played a determinant role as focal points in the organization and hierarchization of the city structure.

Notes

- (1) José Nicolau da Fonseca, *An Historical and Archaeological Sketch of the City of Goa*, p. 127.
- (2) *Ibid.*, p. 145.
- (3) Bois Penrose, *Goa – Rainha do Oriente. Goa – Queen of the East*, p. 55.
- (3) *Ibid.*, pp. 61-63.

BIBLIOGRAPHY

- CORTESÃO, Armando; MOTA, Avelino Teixeira da – *Portugaliae Monumenta Cartographica*, 5 vols. Lisboa, 1960.
- FONSECA, José Nicolau da Fonseca – *An Historical and Archaeological Sketch of the City of Goa*. Bombay: Thacker & C^o, Limited, 1878. Reprinted 2006.
- GARCIA, José Manuel – *Cidades e Fortalezas do Estado da Índia. Séculos XVI a XVII*. Lisboa: Quidnovi, 2009.
- LINSCHOTEN, Jan Huygen van – *Itinerário, Viagem ou Navegação para as Índias Orientais ou Portuguesas*. Lisboa: Comissão Nacional para as Comemorações dos Descobrimentos Portugueses, 1997.
- MENDES, A. Lopes – *A Índia Portuguesa*. Lisboa: Sociedade de Geografia de Lisboa, Imprensa Nacional, 1886. Reprinted 1992.
- PENROSE, Bois – *Goa – Rainha do Oriente. Goa – Queen of the East*. Lisboa: Comemorações do V Centenário da Morte do Infante D. Henrique. Comissão Ultramarina, 1960
- ROSSA, Walter – *Cidades Indo-Portuguesas*. Lisboa: Comissão Nacional para as Comemorações dos Descobrimentos Portugueses, 1997
- SILVEIRA, Luis – *Ensaio de Iconografia das Cidades Portuguesas do Ultramar*. Lisboa, [1956]
- TEIXEIRA, Manuel C. – *A Forma da Cidade de Origem Portuguesa*. Lisboa, Ceurban, <http://cartografiaurbana.ceurban.com>
- TEIXEIRA, Manuel C. – *As Praças na Cidade Portuguesa*. Lisboa: Livros Horizonte, 2001

LIST OF CARTOGRAPHY

GOA, Georg Braun, [16--], Museu de Angra do Heroísmo.

1712 DEMAND AND CIRCULATION ANALYSIS OF FISHERY RESOURCES AS FOOD IN JAPAN

ABSTRACT

In this study we analyze the food distribution industry in Japan, and focus the eel resources in the domestic food market. We have 19 species of eel in the world. Japanese has the history by which eel resources were put on as edibility from the past, and they use Japanese eel (*Anguilla japonica*). *Anguilla japonica* is one of the eel species that lives around East Asia, and that is designated 'vulnerable.' Eel resources are natural resources. We capture young eel in estuaries to use as the food resources, and cultivate them to raise. Recent years, although edible use has been increasing in East Asia countries such as China, it is said that about 70% of the world eel resources are consumed in the Japanese market. Japanese eel is now very popular as a food, and it has been eaten by the recipe called spitchcock for three hundred years. However, recent years the catch volume of Japanese eel is drastically decreasing, and the eel resources are concerned about exhaustion. The purpose of this study is to build a flow model of eel resources in the food market of Japan, and estimate the demand function of the eel resources as a food. From the result of our study, we discuss the management policy of eel resources considering the balance between supply and demand of Japanese eel in the domestic food market of Japan. If the supply and demand balance of eel resources in Japanese food market and the influence on price are clarified, we can concretely discuss the measures of the eel resource management in the market of Japan, which can be taken according to the change in captured amount of natural glass eel.

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1116 GOOD FISHING, BAD GOVERNANCE: LESSONS OF TRANSFORMATIONS FROM COASTAL GOA

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ABSTRACT

Goa, currently a State on West coast of India is a *de facto* maritime territory bordering Arabian Sea. Sea and Rivers have not only been channels of its various Political Conquests in history but are also volatile and dynamic spaces of regional conflicts played out due to various dominant, ecologically hostile political and economic ambitions. At the core of challenge to the State powers and the elite economic projects is Goa's widespread fisher people engaged in variety of forms of successful oppositions in the past and fierce ongoing resistance that deserves serious academic attention.

This paper traces and evaluates conflicts on coastal Goa divided in two categories *intra-fishing conflicts* and *inter-fishing conflicts* unfolding in watery territories of Goa. Intra-fishing conflicts are contested amongst fishermen based on sustainability factors that determine types of fishing nets and types of fishing techniques in sustainability induced State banned territories. State role enmeshed in ambiguity as the defender of sustainable fishing practices and as promoter of unsustainable fishing practices will be critically examined based on evidence and field data. *Inter-fishing conflicts* represents confrontations between fishing and other competing industries such as *tourism* desiring to use water for water sports, marinas and casinos, *mining* aiming to transport ore through barges from rivers where fishermen carry on fishing, *sand mining* that digs to sell river sand for *real estate*, *Coal import* for steel plants threatening life and livelihood of fishing community along with others, and raging conflict over Goa's six rivers after Indian Government brought them under the National Waterways Act 2016 creating tyrannical legal architecture for dredging and fencing of rivers sounding warning to fishermen to benefit *Shipping* and *tourism* industries.

The large scale state wide protests over rivers have witnessed participation beyond fishermen with other people too involved. The threats inherent in the legislations itself releases draconian signals for the future of not only fishermen but also other actors too. This understanding has helped to evolve a large network of interest groups, public groups and media to mount a formidable challenge to the State plans at various levels.

Historical analysis method is adopted to treat textual documents while interview techniques are deployed for data gathering purpose. The paper will conclude with lessons of grassroots actions that have triggered important political awareness across Goa as important contributor offering credible challenge to bad governance in place.

1. INTRODUCTION

Goa's ecology has shaped its identity. Rivers flow downwards from the mountains of Western Ghats Forest into Arabian Sea often through plains and around islands forming river systems with their tributaries covering several kilometers. The river system includes Tiracol, Harmal, Mandrem, Chapora, Baga, Mandovi, Zuari, Sal, Saleri, Talpona and Galgibaga¹⁸⁰. Out of these eleven river nine has river basins¹⁸¹ People ever since they settled in this territory that is currently known as Goa has always interacted with Rivers and the Arabian Sea for various reasons. In fact livelihood itself got shaped by Rivers, Arabian Sea and connected Mountains together with plains and reclaimed land on the banks of rivers known as Khazan lands. Fishing and cultivation on riparian lands¹⁸² was most common interactions with Rivers that has come under attack with bad governance leading to constant breaches, flooding of paddy fields in riparian lands. In some villages people even cultivated paddy in the middle of river like in Vantem village in Sattari in the middle of potable water flowing Mhadei river that is known as Mandovi. This practice is known as Puran Shethi and is discontinued after river was dammed in 2005 to augment water.

Besides fishing and cultivation people also interacted with rivers while in journey across river in canoes and later on in launches and ferry boats before bridges were constructed. Still this practice continues. People and particularly soldiers interacted with rivers for warfare purpose. Soldiers guarded river banks as they were also international borders invaders often had to negotiate fortified banks of Arabian Sea and rivers. Notably Goa's Forts are located at these sites signifying conflicts of past involving various kingdoms and fiefdoms, empires and nations that staked their claims on Goa. The Seat of Power too has been located at various coastal venues in Goa of various rulers. Places such as Chandor, Ela¹⁸³, Panjim which are sites of Seats of Power of various rulers in Goa are all located on different river banks of Goa. Wind powered ships were source of navigation for the purpose of war, peace and commerce. Few rivers that flow into Goa have their source in neighboring States of Maharashtra and Karnataka and there are disputes on potable water sharing. One of them is Madhei river water diversion by Karnataka government¹⁸⁴. Diversion of rivers are known to have impact on fisheries¹⁸⁵. In addition commercial fishing itself globally is known to have wider ecological impacts¹⁸⁶.

¹⁸⁰ See Alvares (2002) Pp 13-17

¹⁸¹ See Sonak (2014) Pp 41-42

¹⁸² Riparian lands are lands adjacent to river

¹⁸³ Ela was a regional seat of Power of Adil Shah rule till Portuguese defeated his armed forces and began ruling from the same place from November 25, 1510 till plague forced to relocate to Panjim after few centuries. Its currently known as Old Goa located on the banks of Mandovi River.

¹⁸⁴ See Sonak (2014) Pp 40-61

¹⁸⁵ See Drinkwater (1994)

¹⁸⁶ See Moore and Jennings (2000)

However in the entire maritime context people who are indulging in fishing are mostly silent in history of Goa for they did not know to write their history and caste wise they were classified as Shudras¹⁸⁷ who were historically denied education. 'Shudras' is a Sanskrit word that mean slaves as per text of Manusmriti¹⁸⁸ imposed on fishers and others due to historical process of caste hierarchy formations through conquest of one set of native people who are referred as Shudras. So even if fishers struggled their initiatives did not find place in written history for they were not considered as subject of history. Fisher people's occupations and livelihood has ecological identity while caste has imposed another identity as slaves. However with the Introduction of Constitution of India¹⁸⁹ and annexure of Goa to India, the rule of manusmriti has been theoretically abolished¹⁹⁰ and principle of equality¹⁹¹ enforced. However it is tragedy that even the scholars continue to refer to fisher people of Goa as Shudras¹⁹². Goa's movement of fisher people especially against mechanized fishing is well known and has some scholarly attention¹⁹³. This paper moves interior intensely to trace fishing related conflicts in Goa's rivers.

2. RIVER FISHING AS SOURCE OF REGIONAL CONFLICTS

Even though Goa's fishing conflicts in Arabian Sea are well known its river based fishing that has come into increased public attention over the past five years with consistent articulations of concerns by fisher people on the banks of River Zuari. The paper is based on participant observation method since 2014. However qualifier is needed:

We must remain ready to revise our judgment, not only in the light of new factual information but also on the basis of further critical reflection¹⁹⁴.

Writing is based on primary data in the form of letter written by fisher people on the Zuari Coast to various government authorities mainly to the Directorate of Fisheries, Government of Goa. In this sense factual issues are well known to the Goa Government. This paper is only a trigger for further reflection and more importantly action. The conflict scenario of Zuari river that also serves as political boundary between the two districts: North Goa and South Goa. There are two types of conflicts classified based on the nature and dynamics involved.

2.1 Intra-fishing conflicts

The intra-fishing conflicts are amongst those engaged in fishing but with different nets and techniques.

2.1.1 Mechanised Trawlers

One conflict is well known: mechanized boats carrying on fishing in rivers. The magnitude and intensity of this conflict is indeed huge affecting entire coast of Goa. Mechanised trawlers coming closer to the shore and carrying on fishing led to depletion of fish, damage to the ecology and loss of livelihood to the coastal fisher people who carried on fishing on non mechanized canoes without trawling in co-operative manner. After protected agitation by the fisher people¹⁹⁵ led by late Mathany Saldanha¹⁹⁶ the Government of Goa framed law named Goa, Daman and Diu Marine Fishing Regulation Act, 1980. However it came in force only on 7th July 1981¹⁹⁷ when even Department of Fisheries was not formed and notifications was signed by Under Secretary (Forest and Agriculture). On the same day Mechanized fishing within five kilometers from shoreline was banned. Notification read:

In exercise of the powers conferred by clause (h) of section 2 of the Marine Fishing Regulation Act, 1980 (3 of 1981), the Government of Goa, Daman and Diu hereby specifies an area of 5 kilometers from the coast in the sea along the entire coastline of the Union Territory as the 'specified area' for the purpose of the said Act.¹⁹⁸

Simultaneously State banned Mechanised fishing vessels in a 'specified area' of five kilometers. Government order read:

In exercise of the powers conferred by sub-section (1) of section 4 of Marine Fishing Regulation Act, 1980 (3 of 1981), the Government of Goa, Daman and Diu having regard to the need to conserve fish and to regulate fishing on a scientific basis, hereby prohibits fishing with mechanized fishing vessels in the specified area declared as such under Government Notification No. 2-1-81-FSH (iii) dated 7-7-1981.

Explanation:- "Mechanised fishing vessels" means a fishing vessel propelled by mechanical means¹⁹⁹.

Earlier²⁰⁰ Indian Fisheries Act, 1897 was applied in Goa from 1st February, 1965 clearly was not serving the needs of he agitating fisher people against mechanized trawlers. This also indicate that from 19 December 1961 to 1st February 1965

¹⁸⁷ See Somayaji and Coelho (2017)

¹⁸⁸ See Jha (2009)

¹⁸⁹ See <https://www.india.gov.in/my-government/constitution-india/constitution-india-full-text>

¹⁹⁰ Article 23, Constitution of India

¹⁹¹ Article 14, Constitution of India

¹⁹² See Somayaji and Coelho (2017) Pp 204

¹⁹³ See D'Cruz and Raikar (2004)

¹⁹⁴ See Taylor (2011) Pp 263 -264

¹⁹⁵ See Somayaji and Coelho (2017) and D'Cruz and Raikar (2014)

¹⁹⁶ Mathany Saldanha was a leader of the fisher people of India and was associated with National Fish Workers Forum at all India level. In Goa he was associated with Goenchea Ramponkarancho Ekvott (Goa Fishers Unity). He was elected to the Goa Legislative Assembly and served as Minister of Tourism, Fisheries and Environment till his death on 21st March 2012. For more information see Sakhardande (2013)

¹⁹⁷ See Gaunekar (1981a)

¹⁹⁸ See Gaunekar (1981b)

¹⁹⁹ See Gaunekar (1981c)

²⁰⁰ See Balkrishnan (1965)

Goa fishing was without any legal regulations. This period duration amounts to three years one month and eleven days. Prior to 19th December 1961 it was Portuguese rule and only scanty references²⁰¹ are available for the kind of laws prevalent during colonial regime such as ban on nylon fishing nets and specific size of fishing nets thereby allowing smaller fish to escape along with strict enforcement of law extend of burning of seized nylon fishing nets.

The passing²⁰² of the Goa, Daman and Diu Marine Fishing Regulation Act 1980 has a specific mandate to frame rules to protect small scale fishing people under Section 4 (2) (a) that reads:

The need to protect the interest of different sections of persons engaged in fishing, particularly those engaged in fishing using traditional fishing crafts such as catamaran, country craft or a canoe.

There is also mandate to for conservation. Section 4 (2) (a) empowers State to frame rules to wards:

the need to conserve fish and to regulate fishing on scientific basis.

Both the above provisions of law are sufficient legal backing to protect small scale traditional fisheries in Goa.

2.1.2 Purse Seine fishing

Many fishing boats use Purse Seine nets in Zuari river that contributes to massive depletion of fish stock as well as drastically reduced fish catch to those using Gill net fishing. A study published by British Ecological Society point out interesting aspect²⁰³:

Gears like purse seines are used to capture free-swimming (pelagic) fish in the water column. This gear is capable of taking perhaps 400t of catch per single deployment.

This amount of catch is more than total yearly catch of the traditional fisher in Zuari River. One fisher pointed out in an interview to this author:

Here in Zuari they came without fear, they don't have to navigate too much in river as it is small. They can get fish faster while if they go out in Sea they have to release longer net. It's not like that in river, here in Zuari where they release shorter net and catch bumper catch. And they have fish finder screens inside their boats. They can know the existence of fish at a particular spot but they cannot identify the variety of fish. Screen shows tiny dots indicating fish. If the fish is bigger in size then dots are bigger in size. Then these boats encircle with their nets around fish.

The Study also points out facet of this encirclement²⁰⁴:

The circle enclosed by some purse seines can have a diameter of over 600 m and the base of the net is drawn closed to enclose the shoal.

Further it must be noted that Government has power to restrict the size of mesh of fishing nets. Section 7 reads:

The Government may having regard to the nature and mode of fishing and the need to conserve fish and to regulate fishing on a scientific basis by an order notified in the Official Gazette regulate or restrict the size of mesh of a fishing net.

This is very important to note; as one of prevailing conflict in Zuari River is that traditional fishers complained about the small size fishing nets used by fishing boats engaged illegally in trawling as well as purse seine nets causing damage to the ecology and depletion of fish stock of river that is known for breeding of fish.

State authorities have enough powers to enforce its laws when violations takes place, yet it is seldom done. Here is what the Section 18 state:

The authorized officer may, if he has reason to believe that any fishing vessel is being or has been used in contravention of any of the provisions of this Act, or of any order or rule made thereunder or any of the conditions of the license, enter and search such vessels and impound the same and seize any fish in it.

Further it must be noted that in order to implement this law notified rules²⁰⁵ in 1981. Rule 3 (1) prohibits fishing with net operated from a mechanised boat:

No person shall take fish in inland waters with a net operated from a mechanised boat

Rule 3 (2) deals with penalty for the offenders:

If any person is found taking fish in inland waters with a net operated from a mechanized boat, the net alongwith the mechanized boat shall be confiscated by the Director or any other officer authorized by the Government in this behalf which shall be without prejudice to the penalty which may be under rule 14.

There is also proactive element in the rules for Fishing in Inland Waters. Rule 3 (3) provides that

The director or any officer authorized by the Government may carry out the patrolling of the inland water to detect any violation of the rules.

In spite of such tight laws illegal fishing in Zuari has flourished. Several fisher people continuously has filed compliant before Director of Fisheries, Secretary to Fisheries who is the Administrative head of the fisheries department in Goa, to

²⁰¹ See Somayaji and Coelho (2017)

²⁰² See Sharma 1981

²⁰³ See Moore and Jennings (2000) Pp 11

²⁰⁴ See Moore and Jennings (2000) Pp 11

²⁰⁵ See Gaunekar (1981d)

the Minister of Fisheries. Governments changed with times but problem of illegal fishing threatening very livelihood of the fisher people and danger to the river ecology has remained.

Observations in Zuari River reveal that even after thirty six years of the enactment of this law enforcement is pathetic. River is included within the definition of Inland Waters which reads as per Rule 2 (f):

"Inland Waters" means a creek, river upto the boundary where it meets the Sea, canal, stream or any other water including stationary water collected in a paddy field or Khazan lands.

There are routine violations of this law. Its illegal because of two reasons. The first: mechanised fishing is banned in inland waters. In case of Zuari river both trawlers and purse seine boats are mechanized fishing vessels. "Mechanised fishing vessels"²⁰⁶ means a fishing vessel propelled by mechanical means. "Mechanised fishing" means *fishing by a boat which uses mechanical power for actual fishing operations* as per Rule 2 (g) of Goa, Daman and Diu Fisheries Rules, 1981. This definition is surrounded with ambiguity as Goa Fisheries department has partly funded several traditional small scale fishers in Goa through subsidies fuels costs as well as purchase of fiber canoes fitted with outboard motors that functions on Petrol or Kerosene. As a result most of the boats in rivers are mechanized and fishers are dependent upon State subsidies.

In 2016 Director of Fisheries Dr. Shamila Monteiro attempted to enforce this rule and told traditional fishers who are registered with department and recipients of subsidies as illegal because they filed several complaints against banned trawlers and purse seine boats fishing in Zuari river. One leader of the fisher Union narrated this incident to this author in Konkani. Here is an English translation

Due to our repeated complaints against illegal fishing Director of Fisheries Dr. Shamila Monteiro targeted us and told us that we cannot use out board motor to go for fishing in Zuari. You'll have to row and go in the waters. I answered her "we don't have any problem with anyone fishing in Zuari coming with outboard motors. Our problem is not on their mode of navigation but kind of fishing nets they use and kind of fishing techniques they deploy in Zuari. Both Trawler nets and purse seine nets are banned for use in rivers. If they want they can come and do fishing like how we do by using Gillnet. You objecting our mode of travel to Sea also makes us question your mode of travel. Why don't you instead of using car to come to the office daily shift to walking? Director got angry on us.

The Second reason why it is illegal is due to use of banned fishing nets. As Per the Rule 10 use of nets with certain mesh sizes are prohibited. Rule 10 (1) states:

No person shall use a net the mesh size whereof is less than 24 mm. for catching fish and 20 mm for catching prawns

There is no accountability on the size of nets used by Trawlers and purse seine boats in Zuari River who are prohibited in the first place to enter rivers for fishing. Oral narration to author by one fisher revealed that net size used by Purse Seine boats are below 12 mm. there by catching fish life very small in size. Gillnet fishers use different mesh sizes in Zuari estuary within limits prescribed by law. One study has documented nine mesh sizes in Zuari river. 30 mm, 36 mm, 40 mm, and 46 mm for mix catch, 52 mm and 60 mm for mixed catch of big size, 120 mm for crabs and catfish, 160 mm for Seabass and snappers, and 200 mm for Rays (footnote).

Legal ambiguity has been eliminated as far as use and site of various fishing nets in the license itself. In Form "E" issued under sub-rule (12) of rule 11 instructions are printed to this effect²⁰⁷:

(a) The Rampon operators including the non-mechanised traditional fishing crafts shall operate freely without any restrictions. However, waters upto a distance of 5 kms. From the shore shall be reserved exclusively for those operating the rampon nets and non-mechanised traditional fishing craft and no other type of vessels shall be allowed to fish within a distance of 5 kms, from the coast and inland waters.

(b) Mechanised fishing vessels shall operate beyond 5 kms. Line from the coast.

When rules are clear cut as above the question of violations is a sign of bad governance in Goa. Gillnet fishing is preferred fishing practice for Zuari estuary as per the scientific study²⁰⁸. It reported:

The results suggest that this estuary is an immature developing ecosystem and it has adequate strength in reserve to adjust perturbations. Simulations of relative changes in biomass for major fishery groups under two different fishing effort scenarios indicate that gradual increase of fishing effort in gillnet fleet through motorisation will be ecologically sustainable for this estuary.

2.1.3 Politics of River Patrolling

Zuari River has ongoing fishery but is facing certain hitch. According to study²⁰⁹:

The gillnet fishery represent majority of the landed catch. The region holds a medium fish landing centres like Siridao, Cakra, Odxal, Bambolim and Nauxim which lands about 1000 tonnes of fish every year...However the intrusion of mechanised vessels into the coastal zones as well as the exposure of motorised fishermen beyond 5 km have created a critical social concern in fishing operations and resulted in fishing conflicts... recently the fisheries department has introduced a fisheries patrolling boat and become functional since October, 2014.

206 See Gaunekar (1981c)

207 See Gaunekar, N.P. (1981d) FORM, "E"

208 See Sreekanth, G. B (2016)

209 See Sreekanth G.B. et al, (2015)

However in spite of introduction of fisheries patrol boat, conflicts has not ceased. Ground investigations revealed the following about patrolling in Zuari:

- a) Patrolling in Zuari river is shared by Department of Fisheries and the Coastal Security Police.
- b) Often both the departments – Police and Fisheries - has been responsive in attending to calls of the fishers from Zuari river as there has been several lapses in the form of delayed response resulting in continues illegal fishing.
- c) There been cases of complete non-response to fisher's calls by police citing brake down of patrolling boat or lack of fuel for boat or boat is busy elsewhere.
- d) Penalty imposed on booked vessels for illegal fishing is negligible and suspension period is short. No fishing vessel proved in illegal fishing has faced cancellation of its license.
- e) Political pressure from officers in State administration and politicians to allow illegal fishing to continue and keep patrolling boats standstill.

The above five points were particularly intense from 2013 up to 2017. Fishers from Zuari coast filed several complaints with Fisheries department and Police; complaining about illegal fishing but due to political patronage to the illegal fishing fisheries administration itself in Zuari river remained in collapsed state. As far as fisheries are concerned governance in Goa was bad.

Pressured by continues complaints from Fishers Goa Fisheries department in early January 2017 extended the ambit of Goa, Daman and Diu Fisheries Rules, 1981 and empowered eleven more officials to act against illegal fishing in Goa²¹⁰. This includes:

1. Deputy Director, Directorate of Fisheries
2. Superintendent of Fisheries, Directorate of Fisheries
3. Assistant Superintendent of Fisheries, Directorate of Fisheries
4. Fisheries Officer, Directorate of Fisheries
5. Police Inspector
6. Police Sub-Inspector
7. Assistant Police Sub-Inspector
8. Head Constable
9. Mamlatdar
10. Joint Mamlatdar
11. Block Development Officer (B.D.O)

Situation improved in 2017 after the elections. The new minister²¹¹ who took the department took some very bold and dramatic steps soon after taking over charge of department in March 2017. After studying the department for few months he rolled out series of steps to restore administration and political will to check illegal fishing in Zuar river. Here are some of the steps Goa Fisheries Minister initiated from September 2017.

- a) Served 48 hours notice to the Director of Fisheries and other officers of the fisheries department citing that fishermen from Zuari have phoned him to complaint about rampant illegal fishing in Zuari and it must be stopped.
- b) Suspended Director of Fisheries Dr. Shamila Monteiro and gave charge of the department to Secretary Fisheries, Govind Jaiswal, I.A.S. for six months. Meanwhile Dr. Monteiro was transferred as Officer On Special Duty (OSD) in the office of Director General of Police (DGP).
- c) Acted strictly against trawler fishing vessels indulging in illegal fishing in Zuari by way of administrative action and media statements.
- d) After fishers mobilized (in mid November 2017) and got the local Member of Legislative Assembly²¹² from Talegao Constituency to oppose illegal fishing in Zuari accompanying in the Secretariat for joint meeting with Town and Country Planning Minister²¹³ and the Fisheries Minister. Fishers were given two weeks time by the two ministers to act and also promised to change law to increase penalty for those caught in illegal fishing.
- e) After two weeks Fisheries Minister acted on illegally fishing purse seine boats in Zuari River, compounded one boat and gave media statements against illegal fishing in Zuari River November 2017 end. Ministry of Fisheries also cancelled VAT and Fuel subsidies of the fishing boats reported by Coastal Security Police and Fisheries department Patrolling boat though according to law their fishing licensed should have been cancelled.

The above five steps to a great extend reduced illegal fishing in Zuari both by Trawlers and by Purse seine boats. Illegal fishing however has not stopped completely. Here is way it still continues:

210 See Monteiro (2017)

211 Vinoda Palyenkar

212 Jennifer Monserrate

213 Vijay Sardessai

- a) On holidays like Good Friday there was massive illegal fishing by 35 purse seine boats in Zuari river. There was no response to Fishers' telephonic calls from Police as well as Fisheries department and fisheries administration resembled collapsed again in 2018.
- b) Night fishing by trawlers is rampant every night between 8.00 pm to 3.00 am. According to information furnished by fishers between four to five trawlers are carrying on this activity that is both ecologically damaging to Zuari estuary and legally banned.
- c) One purse seine boat are carrying on illegal fishing daily evening from 3.00 pm onwards.

State government has not been successful if eliminating illegal fishing totally though it has made some sincere efforts. In March 2018 Fisheries department has a new Director²¹⁴ and the challenge of illegal fishing is huge and fisheries department has to put its act together to stop it. A study has pointed out that if illegal fishing by mechanized boats in Zuari River is not stopped then it will have will have negative impacts on the populations of resident species, semi-resident species

and migrant species in the coastal system²¹⁵ besides law and order problems as like emergence of unrest amongst fishers.

2.2 Inter- fishing conflicts

Inter-fishing conflicts represents tensions and confrontations between fishing and other competing industries. This creates additional burden on fishing communities that are already burdened with issues if illegal fishing as discussed so far in this paper. Short introductions to various inter- fishing conflicts are attempted here to know these additional burdens imposed by political and economic system in place.

2.2.1 Tourism

Goa's tourism promotion has now come to aggressively target rivers in multiple ways. Ground study reveals interesting trend. Water surface is used for water sports, docking of off shore casino boats, plans for marinas to park yachts of the financially privileged jeopardizing fishing communities to a great extent. This section takes a bird's eye view of the various tourism related issues that are in direct confrontation with fishing communities in Zuari River.

2.2.1.1 Water Sports

In 2013 Government of Goa issued permissions to a corporate to start water sports activities in Zuari river. Department of Fisheries granted No Objection Certificate (NOC) to Aquasail Distribution Company Pvt Ltd. *Aquasail* has an agreement with Goa Hotels and Club Private Limited (GHCPL) inked in 2011 for profit sharing and space sharing. Aquasail to use premises of five star hotel Grand Hyatt at Zuari river front, conduct water sports activities in Zuari river and share earnings with GHCPL. When boats entered Zuari river fishers' livelihood got disrupted. They petitioned Director of Fisheries and permissions were revoked for nine months. Zuari estuary being a breeding site for fish noise began to push away the fish. Nets of fishers began to get cut off by water sports boats²¹⁶. One fisher from the Zuari river puts it succinctly:

Fishermen there in Zuari put out Gill nets in the morning and pull back in the evening. These nets gets entangle with under water fans of water sports boats and gets cut off.

Cutting of nets certainly creates a financial loss to fishers but impact transcends fishers to reach fish. Another fisher points different dimension:

Water sports boats causes leakage of oil from their engines. Their oil deeps into water and reaches river bed. Fish then does not get oxygen to breath. Fish food spaces get damaged. Fish then moves to some other location. Some fish dies with oil leakage, with oil odors, we have seen fish dying in river due to this reason. When fish gets affected with oil, it rotates around itself.

Power politics at play is rather glaring. One fisher put it in an interview with this author:

When we fishermen are there actively fishing it was duty of the Fisheries department director to consult us prior before granting NOC. She has not consulted us at all. NOC was given in secrecy with Ministerial influence. They tell us that we have orders from above (Delhi) to grant NOC to Water sports. We refused to accept this reasoning. We went to Fisheries department and met Director. We asked as her as to why they are telling us that orders have come from Delhi when the elections are in Goa and how come these rules are coming from Delhi? She told me that I am speaking too much. I retorted back to her saying that she is the one who is compelling me to talk too much. Every decision making is in Goa and how can orders come from Delhi? We told her that we will never allow Water sports boats in Zuari because that is the breeding spot of fish at Nauxim and we carry our fishing there.

In November 2017 Fishers called for the revoking of permissions granted to the water sports in Zuari to Aquasail (no body else has permissions for water sports in Zuari). Their requested was complied neither by Captain of Ports nor by Department of Fisheries whom they petitioned. Then in February 2018 they wrote to the Minister of Fisheries to initiate action against director of fisheries for ignoring their letter²¹⁷ on water sports. In March 2018 first two weeks Director of Fisheries called two meetings with fishers. Second meeting included Scientists from Indian Council of agricultural

214 Vinesh Arlekar

215 See Sreekanth G.B et al (2015)

216 See Rodrigues (2017)

217 Fishers of Zuari correspond with the State Authorities under the names 'Bharat Mukti Morcha' and 'Shree Sahntadurga Fishermen co-operative society'.

Research, and National Institute of Oceanography. Decision that was arrived at is to carry on scientific study of fish breeding sites in Zuari and only then to ban water sports.

2.2.1.2 *Marinas*

In May 2000 Government of India brought Zuari River under the jurisdiction of Mormugao Port Trust (MPT)²¹⁸. Then in 2010 MPT leased out 1,00,000 square meters each of river fronts of Zuari to two corporate Yatch Haven (Goa) Private Limited, and Kargwal Constructions Private Limited. One site belongs to Nauxim- Bambolim Panchayat and second site belongs to Sancoale Panchayat jurisdictions provoking intense protests. Words of opposition resonates in fishers:

We are the fishermen and they should have consulted us but they did not. We are 120 fishermen in our organisation itself but still they ignored us. We they came to know about it from other sources. Then MLA Vishnu Surya Wagh came to support us against Marinas. Francis Silveira too came and had joint meeting with us in Nauxim. It was very good meeting. After that protest meeting in Nauxim Marinas stopped and till now there is no sign of them. We will not allow these Marinas to be installed under any circumstances.

Technical analysis has pointed out various flaws in conceptualizing of marinas in Zuari river²¹⁹. However it is important to know the perceptions of threats from Marinas from local fishers themselves. One fisher responded:

First of all our people do not know exactly what is the meaning of marina. I heard that marina mean a big company will construct boats/ships and dock boats/ships from outside, they will dredge the river. When ships will navigate in river we will not be able to put our nets for fishing. This will impact us most.

Another fisher had more insightful picture of how marinas could impact fishers in Zuari:

When we put our nets in river it does not remain static in one place. It flows. And if marinas were there then our fishing nets would have gone and touched the parked boats. We would face lots of hardships if marinas are installed. It is loss for us. There will be no fish available. Look at the example of Panjim under the bridge, there are no more tisreos there. Entire river Mandovi from Miramar to bridge used to be full of tisreos, they are untraceable now.

According to his perception this has happened because of stationing of Casinos in Mandovi river:

2.2.1.3 *Casinos*

Gambling is promoted in Goa to attract tourists and all the casino boats are located in River Mandovi. Although there are Court cases involvement of fishers against casinos is minimal. However fishers from Zuari shore who also used to come for fishing in Zauri has narrated that Shell fish *Tisreo* has gone extinct in Mandovi. Here is his narration:

It is because of stationing of casino boats in Mandovi river, their oil leaks in river. Oil is bad of life in river and so tisreos have gone untraceable. Also there is direct release of sewage into Mandovi river in Miramar and Campal. There is one such outlet near Kala Academy. One Ramponkar from Aivao, Dando has told fisheries Minister Palyenkar to stop letting out of city sewage into river near Kala Academy. Minister is aware of this and has promised to stop it. Fish dies with sewage and oil release in river. Fish gets no food to eat or fish moves further away due to pollution.

The above concerns of fishers on floating casinos if addressed calls for removal of these boats from Mandovi river.

Recently government announced that public comments on the State plans to shift Casinos from Mandovi into Zuari. Zuari fishers opposed. Here is one argument:

If casino boats are installed then we will not be able to carry on fishing activities. If, all the six boats are shifted to Zuari then where we would be going for fishing? Fish habitat is the same that they wanted to station casino boats on Bambolim shore. It is a breeding site for fish. Casinos would have released sewage into river then our fishing nets would have got entangled with casino boats, its all round disruption and there would not been any fish left in Zuari.

Fishers from across the river Zuari, from Vasco too opposed shifting of Casinos in Zuari river and finally they have stayed in Mandovi.

2.2.2 *Mining*

Goa State Pollution Control Board was created in 1988. Very first meeting was held on October 05 chaired by the Chief Secretary of the newly formed State of Goa. Out of the six areas that are listed as deserving Board's attention three are relevant to note from the minutes here²²⁰:

1. *Mining Industry being a major polluting industry in Goa*
2. *Pollution of inland waterways by movement of barges and other vessels*
3. *Education of masses on the aspect of prevention of pollution*

It is inland waterways being polluted by barges that has impact upon fisheries and fishers of Zuari river. Barges are used in Goa to transport ore from hinterland to MPT for export purpose. Some barges also import Coal to industrial plants located in hinterland of Goa particularly in North Goa's Vedanta Plant in Amona village. It's a transportation of ore through barges using Mandovi, Zuari, Cumbharjua and Mapusa river that pollution of inland waterways of Goa occurs. According to insights ground insights barges not only pollute rivers through leakage of oil but also conflicts with fishing nets in river. Mining companies has filed complaints before Captain of Ports and with Director of Fisheries to keep fishers

218 See Rao (2000)

219 See Rodrigues (2017)

220 See Parulekar (1988)

away from the river as they obstruct barge transportation and delay in operations. One fisher commented in while interviewing:

Barges passage is same as our fishing venues. The difficulties arise when we put our fishing nets in river and if barge happen to come. We are unable to quickly remove our nets from the river because barge is approaching. We put lighted torches on barges to indicate our fishing nets so that they can move slightly sideways. If the staff of barges awake then they oblige otherwise they go over our fishing nets. That time our net gets torn up completely. At the Siridao shore water is shallow, so if barges go over our gill net it definitely tears up.

Besides direct conflicts like these there are also problems of pollution of rivers particularly through dumping of ore in River. One Fisher narrated his observations:

They do dump remaining ore in Zuari while returning from MPT. Some of Coal blocks are small while other are big, they get entangles with our fishing nets. Barges we have seen many times throwing left over ore in Zuari river near Siridao coast where it is shallow.

In addition to this fishers observed large amount of fish life dead every time barge pass though river as the bottom of it scrapes on riverbed and disturbs breeding fish life in Zuari estuary.

2.2.3 Sand mining for real estate

Sand mining is being carried on in rivers of Goa, particularly Chapora river and Mandovi where it is intense. Supply of sand goes mainly for real estate constructions etc. While constructions are booming there has been increasing public discomfort rising from the visible impact on marine river ecology and fishing. According one study²²¹ sand mining has prowess to destroy the cycle of ecosystem. In Goa there are also additional reports of police intimidation of those who complain about illegal sand extraction in Mandovi river²²².

2.2.4 Goa's rivers as National Waterways for Shipping and Tourism

In March 2016 Government of India through an Act of Parliament included Goa's six rivers – Chapora, Moira/Mapusa, Mandovi, Cumbharjau, Zuari and Sal - as national waterways without holding any consultation with any of the democratic decision making bodies. There was no discussion on Goa State Legislative Assembly, Goa Cabinet, Any of the Panchayats. Goa Chief Minister Laxmikant Parsekar secretly consented to the Central Government to include Goa Rivers as national waterways and conveyed to Central Government through Captain of Ports. Only known consultation was in 2010 that too by IWAI only with select few: Goa Chamber of Commerce and Industry (GCCCI), Mormugao Port Trust (MPT), and Captain of Ports and most importantly Goa Barge Owners Association (GBOA). According to information posted on the website²²³ of IWAI, they were invited to Goa by mining connected interests.

This decision granted control of Goa's rivers to the Inland Waterways Authority of India (IWAI). According to its past Chairman Amitabh Verma²²⁴, Inland water transport expansion is for two reasons: Cargo transportation in cheap manner, and for tourism. Government of India then went aggressively campaigning for this purpose. IWAI approached for permissions before Expert Appraisal committee to dredge three rivers (Mandovi, Cumbharjua and Zuari) of Goa on behalf of 228 mining barges as per the minutes of 24 October 2018 meeting²²⁵. Treating rivers as 'Highways' for transportation ignoring everything else including those who carry on fishing in rivers is colonial and is acknowledged with regard to European settlers in New Zealand and use of Whanganui river in section 69(17)(c) of Te Awa Tupua (Whanganui River Claims Settlement) Act 2017²²⁶. Crown has apologized in section 70 of this law. And India is launching similar initiatives and turning colonial against its own people. It's truly a paradox unfolding. However in case of Goa ruling elites has already been conceived as colonialists subjugating native people. Ruling elites includes those carrying on mining aggression on ecology and people on mass scale including corporate. In fact mining companies has been historically accused of promoting through political back up to Portuguese who ruled over varied Geographies of Goa for 451 years and 24 days from November 25, 1510 to December 19, 1961. Mining began in 1929 with Portuguese granting first lease of total 710 leases covering nearly 30 per cent of Goa's Geography. However it is unlikely that Portuguese has conceived damage that it could inflict on ecology including on marine ecology through barge transportation of iron ore and manganese.

3. PUBLIC DISSENT OVER GOA RIVERS AS NATIONAL WATERWAYS

The Fishermen perceive themselves as first casualty of getting Goa's rivers as National Waterways as they were not consulted before taking this decision neither by Government of Goa nor by government of India. Here is one narration from fisherman:

We were not consulted. It is wrong on the part of the State to ignore us. We are fishing in river and others are fishing in other rivers. Without consulting us they do whatever they want. Parrikar²²⁷ is doing whatever he wants to, but he should consult public as public has elected him. They say they will dig all six rivers of Goa. We told them that we will not allow you'll to dredge and will hit the streets in protest. Our leader Agnelo from Vasco told us that they will go on dredging mouth of Zuari.

221 See Ashraf et al (2011)

222 See link <http://bharatmukti.blogspot.in/2016/04/police-attempts-to-pressurize-sanjay.html>

223 See link <http://iwai.nic.in/showfile.php?lid=145>

224 See Verma (2016)

225 See <http://bharatmukti.blogspot.in/2017/08/228-mining-barges-behind-tormenting-of.html>

226 See Links <http://www.legislation.govt.nz/act/public/2017/0007/latest/096be8ed81520106.pdf>

227 Parrikar refers to Manohar Parrikar, Chief Minister of Goa

First they will dredge the mouth and then they will come dredging inside the river. They must be stopped right away. They should not be allowed to dredge.

Dredging is one of the main activities to be undertaken by IWAI to sufficiently deepen rivers for large ships to navigate through as current depth is not sufficient and on low tide barges cannot even navigate and has to be halted. Fishers are up disturbed about this. One fisher expressed about dredging:

If river is dredged then we will get no fish at all. Dredging will end all food stock available for fish to feed upon. After dredging everything will change. It will be very difficult for us to survive as feeding stocks of fish will be removed from river. Fish will not be able survive in river after that. Secondly if they give depth of 40 to 50 meters to rivers then both side edges will face risk of caving in and houses on coast will be shaken up. Gradually edges will descend into river. Its hardship for us in all sides; from threat to our fishing activities as well as threat to our habitat, and this is going to affect all the people of Goa.

Scientific study²²⁸ on dredging confirms assertions for fishers of Zuari River. It has been found that marine ecology and coral reefs are negatively affected in situations of dredging of rivers even though there may be differences due to site specific differences in evaluations. Rivers of Goa that has intense fishing activities are bound to get affected due to dredging of rivers and this is also widely held view in the State of Goa against State projects and plans for rivers to benefit tourism and shipping, mining and coal transportation.

Public dissent on rivers has spread across the State of Goa. Nearly 100 Panchayat Gram Sabhas (Village Assemblies of citizens) has passed resolutions against inclusion of Goa's six rivers as National Waterways. Various organizations has opposed it and several politicians has been confronted over the issue. Several objections has found their way to various government offices such as Directorate of Fisheries, Captain of Ports, Chief Minister, Governor of Goa, IWAI office in Gurgao and Ministry of Shipping in Delhi, Prime Minister's office in New Delhi and other places of importance. Documents ultimately find their way in the office of Captain of Ports and are accessible to Public via Right to Information Act 2005 (RTI).

This issue of Rivers has found its way very deep amongst people and is preparing to gather momentum for a major political revolt in the State of Goa. On April 27, 2018 major confrontation broke between protestor and the State Government over the issue of Rivers as national waterways, Regional Plan-2021, Outline Development Plan (ODP), Planning and Development Authorities (PDA) Coal handling with opposition led by Indian Armed Forced retired officer naming corrupt politicians publicly. Situation for has further turned out to be tensed as Government of India has proposed to reduced Coastal Regulations Zone (CRZ) to 50 meters from the shoreline to facilitate commercial hotels on river fronts.

The direction the opposition is finding is unusual. It has called for the scrapping of Town and Country Planning Department, Introduction of New law that opposition has already drafted and scrapping of Regional Plan 2021, stoppage of Coal Handling at MPT, Salvaging of fish in rivers from "nationalized rivers", and scrapping of PDA all over Goa. Issue of fishermen and rivers has found integrated in wider political consciousness of the State of Goa with ever consolidating opposition.

4. CONCLUSION

Fishing and Fisher's determination to speak out and struggle in spite of all the odds at hand has pushed Goa State into tremendous political churnings. However without restricting to issues there is a need to question the asymmetries ingrained in the very process of State formation including Annexure of Goa to India through conquest. There is a need to re-visit the archives of history to freshen up the collective memory of the people and the scholars who neglect watershed event in the life of Goa: Liberation that is contested through every dissent. It is unlikely that any long term solution for problems faced by people of Goa would emerge without questioning nature of democracy and nature of freedom and without understanding most significant debate Goa at United Nations Organization in December 1961²²⁹. The question of Regions Development of Goa in intricately linked to the available avenues of freedom whose spaces shrinking spaces in subtle manner needs scholarly attention as without spaces for articulations any kind of development at Regional level is an exercise in tyranny. Fishers of Goa in General and those of Zuari River are facing tremendous pressures from the forces discussed in this paper.

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REFERENCES

- Ashraf, Muhammad Aqeel, Mohd. Jamil Maah, Ismail Yusoff, Abdul Wajid and Karamat Mahmood (2011). Sand mining effects, causes and concerns: A case study from Bestari Jaya, Selangor, Peninsular Malaysia, *Scientific Research and Essays* Vol. 6(6), Pp. 1216-1231. Online accessed on May 01, 2018 from web links: <http://www.academicjournals.org/journal/SRE/article-full-text-pdf/15F6D4120209>
- Alvares, Claude (Ed.) (2002). Fish Curry and Rice: A Sourcebook on Goa, its ecology and life-style, The Goa Foundation, Mapusa.
- Balkrishnan, S (1965). Law department Notification L.D. 2/65, *Government Gazette*, Series I, No. 2, January 14.

²²⁸ See Erfteimeijer et al (2012)

²²⁹ See http://www.un.org/en/ga/search/view_doc.asp?symbol=S/PV.988

- Cunha, T.B (1958) Portuguese Occupation of Goa supported by Indian Merchants, in Free Goa, July 25, reproduced in Tombat, Nishta, Tristao De Braganza Cunha (1891-1958) and the rise of Nationalist consciousness in Goa, Appendix three, Ph. D dissertation, Goa University, Goa, 1995.
- Erftemeijer Paul L.A, Bernhard Riegl, Bert W. Hoeksema and Peter A. Todd (2012). Environmental impacts of dredging and other sediment disturbances on corals:A review, *Marine Pollution Bulletin*, 64, Pp. 1737-1765 accessed online on May 01, 2018 from web links: <https://www.sciencedirect.com/science/article/pii/S0025326X12001981>
- D’Cruz, S and Raikar A.V(2014) Ramponkars in Goa: Between modernization, government and the Deep Blue Sea. *Economic and Political Weekly*, 39(20), 15-21 May, Pp 2048-2050.
- Drinkwater, Kenneth F. and Kenneth T. Frank (1994). Effects of river regulation and diversion on marine fish and invertebrates, *Aquatic Conservation: Freshwater and marine ecosystems*, Vol. 4, 135-151 (1994).
- Gaunekar, N.P (1981a), Forest and Agriculture Department Notification 2-1-81-FSH(i), *Official Gazette*, Series I, No.15, July 09. Government Printing Press, Panjim
- Gaunekar, N.P (1981b), Forest and Agriculture Department Notification 2-1-81-FSH(iii), *Official Gazette*, Series I, No.15, July 09. Government Printing Press, Panjim
- Gaunekar, N.P (1981c), Forest and Agriculture Department Order 2-1-81-FSH(iv), *Official Gazette*, Series I, No.15, July 09. Government Printing Press, Panjim
- Gaunekar, N.P (1981d), Forest and Agriculture Department Notification 1-34-73-FSH/Vol.II The Goa, Daman and Diu Fisheries Rules, *Official Gazette*, Series I, No. 18, July 30, Government Printing Press, Panjim.
- Jha, Janardhan P (2009). Manusmriti (Bhasha-Tika), Sidharth Books, Delhi.
- Monteiro, Shamila (2017). Directorate of Fisheries Order no. DF/ENF/ORDER/2016-17, *Official Gazette*, Series II, No. 41, January 12, Government Printing Press, Panjim
- Moore, Geoff and Jennings, Simon (2000). Commercial fishing: the wider ecological impacts, British Ecological Society, Cambridge University Press, Cambridge.
- Parulekar, A.A (1988). Minutes of the First 1st meeting of the Goa State Pollution Control Board, accessed online on May 01, 2018 from web link: <http://goaspcb.gov.in/Media/Default/Minutes%20of%20Board%20Meeting/1minutes.pdf>
- Rodrigues, Sebastiao Anthony (2017). Destruction of fishing in Zuari River: A ground view, in George Goldy (Ed.) *Journal of People’s Studies*, People’s Literature Publication opc Pvt. Ltd., Khargar.
- Rodrigues, Sebastiao (2014). A Status of Adivasis/Indigenous Peoples Mining Series – 1 : Goa: Land, Mining and Indigenous Peoples: An Overview, Aakar Books, Delhi in association with The Other Media, New Delhi. Accessed on May 01, 2018 from web link: http://theothermedia.in/downloadables/SAIP_Reports/SAIP_Mining_Series_1_Goa.pdf
- Rao, K.V. (2000). *The Gazette of India (Extraordinary)*, Part II, Ministry of Shipping, New Delhi.
- Sakhardande, Prajal (Ed.) (2013). Mathany Saldanha: the legend (Hero of the subaltern), Broadway publishing House, Panjim
- Sharma, U.D. (1981). The Goa Daman and Diu Marine Fishing Regulation Act 1980, *Official Gazette*, Series I, No. 50, March 12, Government Printing Press, Panjim
- Somayaji, Ganesha and Coelho, Joana P (2017). Fissures of Blue Revolution: The Ramponkar’s response to Mechanised fishing in Goa, *Social Change*, 47(2), Pp 200-213, Sage Publications.
- Sonak, Sangeeta M (2014). Environment and Development: Goa at Crossroads, Broadway Publishing House, Panjim.
- Sreekanth, G. B (2016). A trophic model for describing the impacts of fishing in Zuari estuary, South west coast of India, *103rd Indian Science Congress*, Mysore University, Mysuru, Karnataka, Vol. 103, January.
- Sreekanth G.B, Manju Lekshmi N, Narendra Pratap Singh (2015). Fisheries profile of Zuari estuary, *International Journal of Fisheries and Aquatic Studies*; 3(2), Pp 24-34
- Taylor, Paul. W (2011). Respect for Nature: A Theory of Environmental Ethics, Princeton University Press, Princeton and Oxford.
- Verma, Amitabh (2016). Revolution in Offing on Inland Water Transport Front, *Corporate India*, Pp. 40-41, May 15.

RS03.6. Environmental Issues

1107 DOMESTIC WATER TAX: A STUDY TO CONTROL MISUSE OF WATER, PINGLA BLOCK, PASCHIM MEDINIPUR, W.B.

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ABSTRACT

We are ignoring the significance of water for our life. Increasing demand due to fast and multidimensional development along with the modernization the water has been over looked. Anthropogenic activities caused the pollution of surface water bodies which has increased the dependency on the underground water. Less rainfall and recharging of ground water along with the over exploitation of ground water have forced ground water level to go down abnormally. Ground water is a major source of drinking water in India. Ground water health is deteriorating with the time. In the present study Pingla Block, Kharagpur sub-division, Paschim Medinipur, West Bengal has been taken. The total area of Pingla Block is 224, 48 Sq.km. The temperature varies from 43°C to 7° C and the average rainfall is about 1750 mm. The population of Paschim Medinipur is 5943300 (Census 2011) which is unevenly distributed among 7600 inhabited villages. Naya village is a unique Indian village which falls in Pingla Block. Naya village is also famous for 'Pot Chitra'. 41 lakhs households have their own drinking water source out of 01 crore 37 lakhs rural households in West Bengal. 43 lakhs households have to cover a distance not less than ½ k.m. for collecting drinking water. Data shows that Indian village women waste 15 crore working days for the purpose of collection of drinking water and in terms of money Rs. 1000 Crore has been lost per year. Water is obtained for agriculture from the ground water which results the fall of ground water level to 110 meter in April 2015. Present study reveals, ground water exploitation has increased for various needs. Very erratic rain fall, increasing demand of water, over exploitation, decreasing surface water bodies and their pollution, poor recharge of ground water have not only caused the fall of ground water level but also dried up dug and shallow bore wells. To provide safe drinking water to the village people Central Government has introduced 'Village Level Operation and Maintenance' (VLOM) System. It is suggested that for proper use and to minimize the misuse of water there must be water tax which will also help to execute VLOM system properly. Still today there is no water Tax. A survey has shown that maximum quantity of water is wasted by poor and illiterate persons. Awareness about water and fear of water tax will definitely generate a positive movement in the direction of controlling the misuse of water and also to minimize water problem.

Key Words : Domestic water tax, VLOM system, Misuse of water.

INTRODUCTION

Water, Whom are you made for ? This question has variegated answer. The Bushman community of South Africa replies that the water belongs to those who live beside the water bodies. But this water does not belong to them permanently as they have to migrate some other place. Same question asked to any farmer community of all over India, we can have different answer. They will say that the pond and wells situated in the village belongs to all but these pond and wells are situated in side the own boundary that will be possessed by the head of the family. When this question is asked to any Govt. officer of any country, he will answer that water bodies made by the Govt. belongs to common people but any time the right of the people can be restricted by the Government. If this question is asked to officers of Coca Cola Company, they will answer that they can use the ground water and underground water occurring in their leased area, according to their needs and in their own way .Actually by asking this question from Bushman (South Africa) to Coca Cola Company, It is discovered that how men uses as it is their own property.

All types of natural water sources including river water are a precious gift of nature. Yet it is never bought by any businessman or monarch. Water was never sold in the historic period by any businessman or monarch. But in the present age of globalization it is being sold by renowned business man. In present time people are misusing drinking water. If they are not made conscious about the values of water, water business will be biggest business in India in coming day. People are not only misusing drinking water but also polluting it in an unscientific way. As a result these people have to make a domestic budget for buying drinking water in the beginning of the month in near future. From the above discussion we may arrive at conclusion after Koffi Anna that our world will experience the World War – III for nothing but water. If Government brings domestic drinking water under taxation, people will understand the real value of water.

It is said that life originated in water according to our religious and mythological books, and it is also believed that life will end with water. Comments have also made that the III rd world war will be for water. With the multidimensional developments and modernization along with the increase in the population the demand and use of water has been tremendously increased. In present situation all over the globe water scarcity may be observed. In the world about 2.7 billion people face water problem at least for one month every year. The water available in India per capita was 3000 m³/year in 1951 which decreased to 1800 m³/ year in 2010 and still it is decreasing. Due to lack of awareness and mismanagement the surface water bodies have been polluted. Although the deep water tables are not affected by pollution due to anthropogenic activities but shallow, hand pumps, dug wells etc. yields polluted water. With the development of the conscious about health in the people the use of bottle packed water has been developed.

Water ATM is gradually coming up. In India in 11 states water ATM has been successfully launched. Till 2015 about 2800 water ATM have benefitted 70,000,000 people. Due to pollution of surface water bodies people who were using the surface water for their common use, now unable to use. This has resulted the extra pressure on the supply water.

STUDY AREA

The Pingla Block is included in Kharagpur sub – division of Paschim Medinipur district of West Bengal. The block is enclaved by Kharagpur – II and Narayangarh block in west, Debra block in north, Sabang block in south and part of the Purba Midnipur district in east. The Pingla Block is dominated by rural population and it has 184 villages. The nearest Railway station is Radhamohanpur but the road is not good. So it is easy to come from Balichak railway station and it is about 12 k.m. The Pingla Block is included in the Survey of India Topographical sheet no. 73 N/11 and it's extension is 22°12'58"N to 22°20' N latitude and 87°29'22"E to 87°43'36" E longitude. The total area is about 224.48 km² with a general slope towards SE and S direction (5° gradient). It is in the 17 m elevation.

SOURCES OF DATA & METHODOLOGY

Primary Data: Primary data is collected from:

1. Field Survey: Primary data were collected from the observation method and consultation with village people.

The lack of published literature on Pingla Block especially about the water is one of the important handicaps. So to overcome this problem available literature were consulted and certain important point are noted and kept for the discussion with the people who are residing near the over head tanks and ponds during the field work. Several questions have been asked to the local people relevant to the over head tanks, to know detailed about the drinking water problem. Fields photographs have been taken and local people gave several informations related to over head tanks. Viable discussion with the local people was made to know various aspects about the over head tanks, especially about the utility of over head tanks and also the water problems.

2. Secondary data: Data were collected with the help of Topographical Sheet and published ground water prospects map prepared by NRSC (ISRO) Department of Space, Govt. of India.

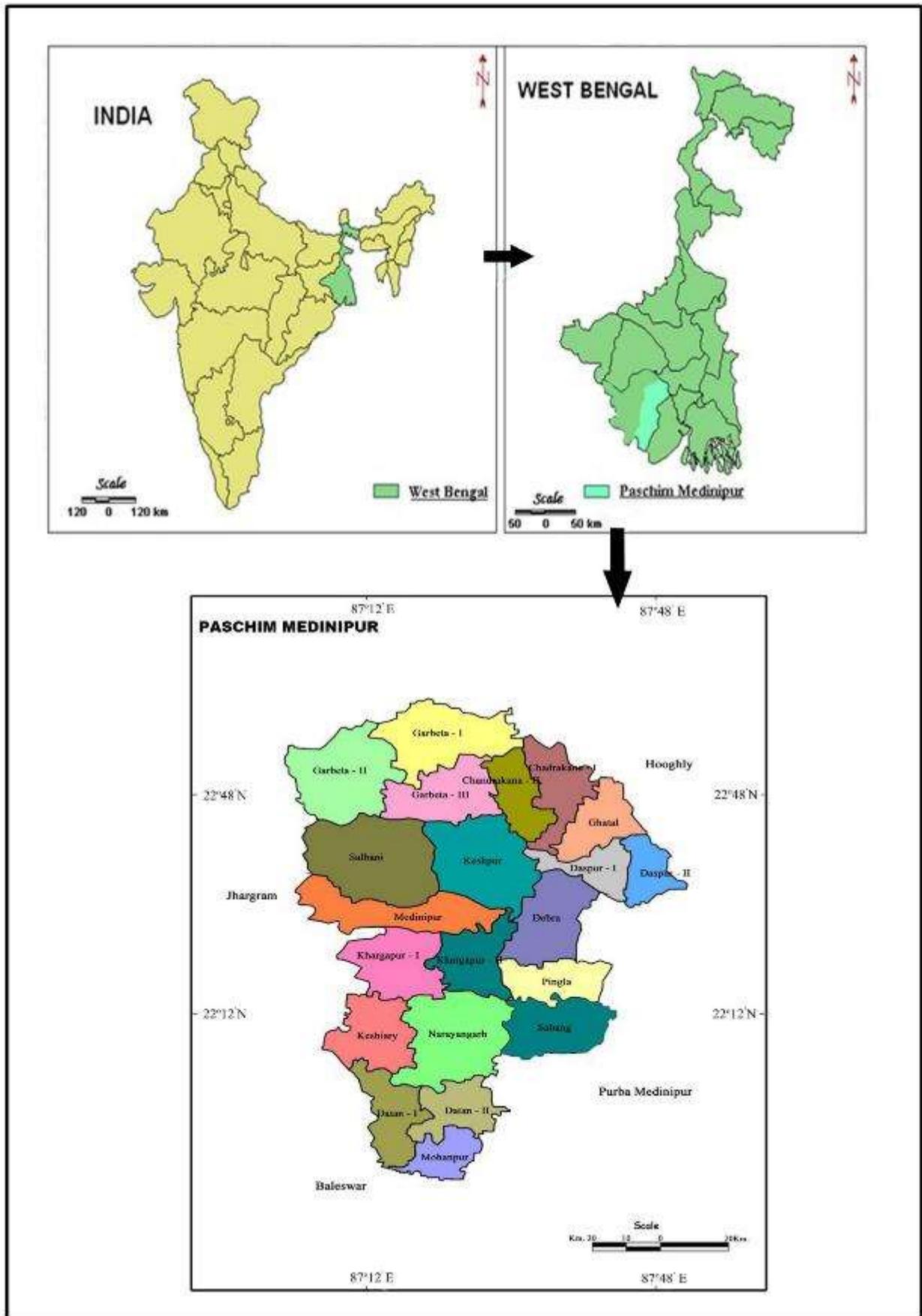


Fig.1. LOCATION MAP

CLIMATE

The Pingla Block falls under tropical climate, winter season occupy from November to February, from March to May period is included in summer season and rain occurs commonly in the period between June to October. This area experiences average maximum temperature about 34.76°C in June and the minimum temperature is 13.37°C in January. Average temperatures of January is 22 °C , February is 24 °C , March is 28 °C , April is 30 °C , May is 30 °C . The average rainfall annual is 1750 mm.

DEMOGRAPHY

According to the census 2011 total population of Pingla Block has 1,94,809, in which male is 99,988 and female is 94,821. Scheduled Castes population includes 16,428 in which male is 8,338 and female is 8,090. Scheduled Tribes population is 19332. In which male is 9,788 and female is 9,544. Total worker is 99,286, in which male is 62,452 and female is 36834. For agriculture related work more than 40,000 people are engaged in which some workers work for 3 to 4 months.

OCCUPATION

Drinking water is mostly obtained from the stored groundwater which accounts for about 40% of our total water with demands. The people of Pingla Block are mainly engaged in agriculture. The other works which they do includes fishery, diary, poultry etc. Surfaces as well as groundwater are mostly used for agriculture. But the agriculture mostly rice (Amon, Boro and Ause) is almost totally depends on the groundwater. Rice is produced three time in a year.

An ancient art still alive in the village as Naya (Patachatra) . In this very earlier stage about 60 years back, people prepare these colorful paintings on paper supported old cloths. These they show slowly and explain the story with dialogue or song. The story may from our religious matter or may be for entertainment. They were very poor and were doing this for their food and other requirements. Lots of struggles had been made for their survivals and also for this art. Now with the recognition in the international market it is gradually flourishing.

PRESENT DOMESTICS WATER TAX STRUCTURE

There is no water tax till the day.

PIPED WATER SUPPLY SCHEME (PWSS)

Public Health Engineering Department (PHED) has lodged 11 schemes, which covers the 8 panchayat. Normally these tanks are filled twice in a day. Water of 1st layer is not suitable for drinking purpose because of pollution due to anthropogenic and agricultural activities. After 2011 Public Health Engineering Department introduces several overhead water cemented tanks for supply of hygienic drinking water. There are 11 over head cemented tanks, in which commissioned is 7 (PWSS) and ongoing is 4 (PWSS). 1,15,600 people of 93 villages under eight panchyat of Pingla Block, namely 1. Kusumda, 2. Dhaneswarpur, 3. Jamna, 4. Kshirai, 5. Gobardhanpur, 6. Maligram , 7. Karkai and 8. Jalcjak are getting supply water till the day. Maximum local people do not use the supply water because they have their own tube well and hand pump. They commonly face Jaundice, Diarrhea disease. People are not aware of the quality of the water of 1st layer which they are using till today.

OBSERVATION

The Pingla Block is dominated by agriculture hence people commonly have cows and buffaloes. A good quantity of milk is produced. Its some quantity is locally consumed and 'chhana' is prepared from the rest. This area cater the needs of 'chhana' is used for sweets and other delicious foods.

Water is not an acquit problem in Pingla Block because good quantity water is available. Along with the surface water maximum people have their own borings. General depth of boring(1st layer) is 70 feet . Overhead tanks present in the area regularly supplying the water to the people but people are not using the water strictly for drinking and cooking purposes but it is used very carelessly for other works for which this water is not needed at all. Supply pipe is not maintained properly ,which gives many a time polluted water because of inflow of polluted water from the joints and cracks present in the supply pipe. Water supply project mainly implemented for drinking purpose but some people make the water in nonsensical way for example cleaning, bathing of cow, gardening and vegetables etc.. Some thickheaded and illiterate person do not stop tap after collection of water. At many places it is also noticed that to fill their bucket quickly they break the tap , so water goes waste.

In 2018 Govt. of West Bengal introduces a rain water harvesting project in Pingla Block, which is situated at Pingla Thana Mahavidyalaya, Maligram , Pingla, Paschim Medinipur. This rain water harvesting project will be fruitful for water recharging in surrounding area in near future.

SUGGESTIONS

- i) Supply pipes should be checked regularly to repair the damages well in time.
- ii) Awareness about the significance of water and its conservation may help to solve some extent to save the water from pollution and wastage.
- iii) Implementing water tax may help to save the water and this will also increase the fund of the project. The collected money may be utilized for the improvement of the water supply system

- iv) They use any amount of supply water without any restriction. Loss of supply water due to evaporation, flow and percolation. This water loss can be controlled by lodging water tax in logistic way may be installation of meter as it is present in many other places.

REFERENCES

- Adhikari, R.N., A.K.Singh, S.K.N.Math, P.K.Mishra and K.K.Reddy , “ Response of Water Harvasting Structures on Ground Water Recharge Process in Red Soil of semi Arid Region of Andhra Pradesh.” Journal of Indian water Resources Society, Roorkee, Uttarakhand, vol. 28, No. 2, April, 2008, pp-1-5.
- Ghosh, Dipak, " Census of India 2011 Administrative Atlas West Bengal" Office of the Register General & Census Commissioner, India , June 2012.
- Ground water prospects mapping for Rajiv Gandhi National Drinking Water Mission-Technical Manual ; NRSC ; 2008
- Guha, A., 'Jaalar Adhikar' , Manab Adhikar : Nana Dik , Progrssive Publishers, Kolkatta, 2015, pp. 305-351.
- Maity,D., Kuity, D.P. and Maity, D.K., 2006 : Needs the water tax in the present society : A study in and around Naya Village , Paschim Medinipur, W.B. Vistas in Geol. Res. Spt. Pub. In Geo. 14, pp.182-186.
- Masters, Gilbert M. and Ela, Wendell "Introduction to environmental engineering and science", PHI Learning Pvt. Ltd. 2008, 708p.
- Mishra, Archana. "Watershed Management" Author Press, Laxmi Nagar, Delhi-110092,2001, pp-221-226.
- Radhakrishna, B.P., How much groundwater is escaping into the sea ? Jr.GSI, 48, July,1996 , pp. 1-2.
- Radhakrishna,B.P." Are We Conserving our Water Resources?" Gol.Ju.Vol.67 ,GSI, Bangalore,2008, PP. 463-467.
- Rai, V.K. "Ground Water Resource Development in India: Problems and Prospects", National Geographical Journal of India, Varanasi, Vol. 52, pts. (3-4) Sep. -Dec., 2006, pp-145-154.
- Rain Water Harvesting and Conservation , Manual, Govt. of India, Nirman Bhawan, New Delhi, 2002.
- http://censusindia.gov.in/2011census/MDDS_Directory.aspx
- <http://www.censusindia.gov.in/pca/SearchDetails.aspx?Id=385843>
- <http://www.wbphed.gov.in/resources/hgmMap/gwm73j11.pdf>
- <http://www.wbphed.gov.in/en/hgm-maps>
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- https://wbdwsip.org/resources/docs/DWQAP_EAST_MEDINIPUR.pdf
- <http://www.wbphed.gov.in/en/pages/manuals-and-guidelines>
- <https://ncog.gov.in/urbanportal/login>

1792 ECONOMIC CHARACTER OF DATA GAPS IN THE ILLNESS STUDIES OF DEMENTIA

ABSTRACT

Data Gaps arise due to lack of awareness of society and state to realize the implications of immensities of fast progressing mental health problems due to multiplicity of causes. This paper looks at dementia related issues in a fast changing world. Dementia is a chronic or persistent disorder of mental processes caused by disease or injury. Conventionally, it was thought of as a medical condition especially affecting elderly people, causing cognitive impairments, destroying socio economic stability of households. However, research showed multi dimensional causes impacting it. This paper looks into the data gaps that impact economic planning for its mitigation. Presently dementia healthcare services require a rebalancing act with more emphasis on community health care. This would increase ability /capacity, limit the increased costs associated with scaling up coverage of care and coupled with the introduction of care pathways improve the coordination and integration between agencies and professionals at both macro- and micro-levels. Cost for dementia treatment is difficult to account for, in terms of opportunity cost foregone or Cost-of-illness (COI). The principal aim is to measure the economic burden of illness to society. This study mainly aims at analyzing the data gaps in the cost of illness analysis of Dementia. For this purpose, correlation between the cost of healthcare and the per capita GDP of a country is analyzed as to provide a first level methodological way to show how data collection exercises can be attended to.

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1795 PROSPECTIVE IMPACT OF LAND COVER CHANGE ON THE PROVISION OF THREE ECOSYSTEM SERVICES IN OURIKA WATERSHED, HIGH-ATLAS MOUNTAINS OF MOROCCO

ABSTRACT

Ecosystems preservation is important for a consistent provision of ecosystem services. In Ourika watershed, High- Atlas Mountains of Morocco, human pressures through fuelwood harvesting and overgrazing has led to a decline of vegetation and by consequence to high rate of erosion and water flows, generating frequent and intense floods. Ecosystem services, mainly carbon storage, sediment retention and water yield are negatively impacted. The quantification of these services and their potential evolution can help decision makers to plan for future development of the watershed. This study deals with the evaluation of these services at the current state of land cover, and how they can evolve in the future with respect to four land cover scenarios. InVEST (Integrated Valuation of Ecosystem Services and Trade Offs), a decision support system, was used to perform this evaluation. The current land use map for the Ourika basin was used to assess these services for the present and for four land use scenarios, based on degrees of forest cover restoration, were used to model future ecosystem service provision. The scenario generator tool, which is a part of the InVEST, helped to develop maps of future land-use. Four spatially explicit land-use scenarios were generated for the year 2030: a business as usual scenario, catastrophic scenario, an ideal scenario and a concerted scenario. The results show that the watershed suffers presently from a great soil loss and sediment exports, while the capacity of sediment retention is low. The vegetation cover was able to retain more sediment while the non-vegetated areas showed more soil loss and sediment export. Carbon storage is lower in the watershed and less important compared to the contribution of other ecosystem services. In general, the water yield is higher in the watershed since evapotranspiration is low at the forest zones. For the future, the results show that the ideal scenario is able to retain the most sediment and produce the lowest water yield. In summary, the study shows that ecosystem services are highly affected by the land cover change. This study will be useful for policy-makers and stakeholders for better planning and management of ecosystem services in order to ensure the best welfare of the population.

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RS03.7. Environmental Issues

1339 SPATIAL ANALYSIS OF SUSTAINABILITY OF EAST KOLKATA WETLAND**Biraj Kanti Mondal**Assistant Professor of Geography, Netaji Subhas Open University, Kolkata, West Bengal. E-mail: birajmondal.kolkata@gmail.com**ABSTRACT**

Wetland is one of the most productive ecosystems of the earth and it has immense importance to maintain the biodiversity and ecological balance of the biosphere. The wetland covered area of the globe is dropped by almost 6% in last two decades. The fact is that wetlands have not been given due importance that they deserve and they are being degraded due to lack of appreciation of their role. The East Kolkata Wetlands which is extended up to the Bidyadhari and Matla River confluence, effected frequently by the human encroachment along with the dynamics of Hugli, Bidyadhari and Matla River. East Kolkata Wetlands (Ramsar Site) act as an absorber basin for huge amount of contaminants drained from the Kolkata Metropolitan City. The degradation and transformation of wetlands is a slow poisoning risk made us think about its past history and hopes and doubts about its future. Reclamation of land for agriculture, aquaculture and urban expansion occur which threatened different sites of this wetlands since last 20 years. Likewise, huge population pressure, rapid growth and their increasing economic demands, the wetlands area has been victimised by different ways as an aftermath. Therefore, an in depth study was attempted for the spatial analysis of the sustainability of the East Kolkata Wetland and ten selected blocks of North and South 24 Parganas districts of West Bengal. Geoinformatics is the key solicitation technique to recognize the spatial pattern of change detection of the East Kolkata Wetland.

Key words: Wetland, spatial pattern, change detection, geoinformatics

INTRODUCTION

Environmental degradation associated with development and population explosion is a cause of concern in the present day context. Environmentalists, scientists, economists are very much concerned about the environmental consciousness of wetland that has emerged in the context of development debate. Wetland ecosystem provides goods and services to the society and play vital responsibility in maintaining environmental sustainability. Wetlands, which have multiple utilities is essential to maintain the biodiversity and ecological balance of the biosphere. This unique part of environment is considered as one of the most productive ecosystem of the earth, from environmental as well as socio-economic point of view. But the paradox is that wetlands are being degraded due to lack of appreciation of their deserving role. There are a large area of wetland expands towards the eastern fringe of Kolkata and extended up to the Bidyadhari and Matla River confluence covering part of North and South 24 Parganas. The sustainability of the wetland areas is being pretentious adversely not only by the dynamics of Hugli, Bidyadhari and Matla River but also by the human infringement. Most of the wetlands area (swamps, marshes, lake) of the globe has dropped by nearly 6% in last 20 years. The East Kolkata Wetlands, recognized as a Ramsar Site, is one of the most significant parts of West Bengal. This wetlands act as an absorber basin for gigantic amount of contaminants drained from the Kolkata Metropolitan City. Therefore, an in depth study was endeavour to swot up the spatial analysis of transformation and deprivation of the East Kolkata Wetland and the wetlands extended in ten selected blocks of North and South 24 Parganas.

Definition of Wetland

According to the Ramsar Convention definition (1971) of wetland is *"areas of marsh, fen, peat land or water whether natural or artificial, permanent or temporary, with water, i.e. static or flowing, fresh, brackish or salt including areas of marine water, the depth of which at low tide does not exceed six meters"*. Later in addition to that Ramsar site committee add *"may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six meters at low tide lying within wetlands"*. Ramsar is the first modern global inter-governmental treaties on the conservation and sustainable use of natural resources. This convention on wetlands (Ramsar, Iran, 1971) has come to widely known as the "Ramsar Convention".

STUDY AREA

The present study is concentrate on East Kolkata Wetland along with the wetlands of surrounding 10 selected blocks of North and South 24 Parganas. Haroa, Minakhan, Deganga, Barasat-II and Rajarhat blocks of North 24 Parganas were included in the northern part whereas in the southern part Canning-I & II, Bhangar-I & II, Sonarpur blocks were taken into consideration. The present study area extended to 22°10' 00" North to 22°50' 00" North and 88°20'00" East to 88°50' 00" East latitude and longitudinally.

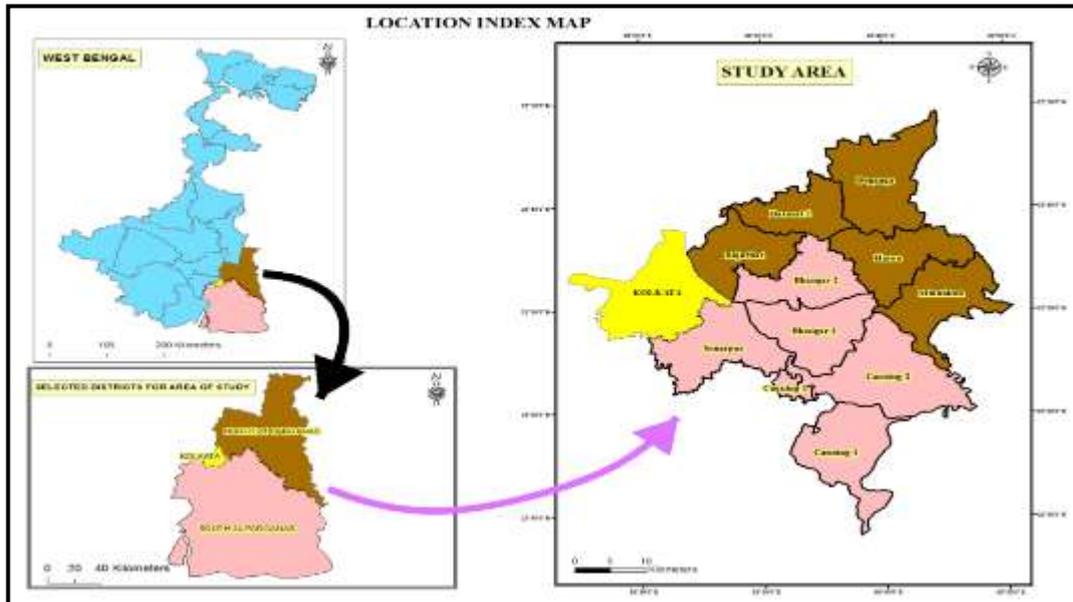


Fig. 1

OBJECTIVES

The prime objective of the present study is to analyse the degradation of wetlands of the study area. The specified objectives are:

- a. To depict the wetland transformation of the study area.
- b. To find out the change detection and degradation of wetlands of the study area.
- c. To evaluate the cause-effect relationship of various aspects of changing wetlands.
- d. To revise up the impact of population dynamics to alteration scenario of wetlands.

DATABASE AND METHODOLOGY

The present study was emphasized on the RS and GIS data from Toposheets and satellite images to find out the bona fide picture of the wetlands of East Kolkata wetland and its surroundings study area. The concrete primary survey was conducted to find out the grass root level scenario along with the consideration of recent satellite image (2012). The Remote Sensing and GIS techniques were applied for the preparation of maps along with the statistical analysis. The detail of the database is mentioned below:

- a. **Topo sheets (SOI):** 79^B/₆, 79^B/₇, 79^B/₁₀, 79^B/₁₁ (Surveyed in 1958-59 and 1959-60)
- b. **Satellite Images:** LANDSAT TM 10 Jan., 2001 and IRS P6 LISS IV data (No. 108-56, Date: 5 Feb., 2012)
- c. **Census Data:** Village level census data of 2001 and 2011 of the 10 blocks
- d. **Software Used:** Arc GIS, MS WORD, MS EXEL
- e. **Primary survey:** Questionnaire survey and photographs

SPATIAL ANALYSIS OF WETLAND

Scenario of 1960s: The scenario of 1960s was done by the on screen digitization from the four SOI topo sheets surveyed in the period of 1958 to 1960. The wetlands of the 10 blocks were marked out minutely. This includes wetlands of different sections, like:

- a) Natural Wetland, Inland (Include Swamp, Bil, Tank)
- b) Pisciculture, Aquaculture land (Include Fishery, Bheri)
- c) Lake

Scenario of 2001 and 2012: In the year 2001, the wetland area was misshapen as we found in the LANDSAT TM data/image of 2001. The wetland area was supplementary customized and rather changes drastically in 2012.

The phase-wise analysis of spatial changes in wetland is prepared to validate the transformation of wetland from 1960 to 2001 and 2001 to 2012 (fig.2). In 2012, most of the study blocks along with the EKW the wetlands are condensed and malformed to aquaculture whereas it is initiated to amplify in Haroa and Canning-2 block.

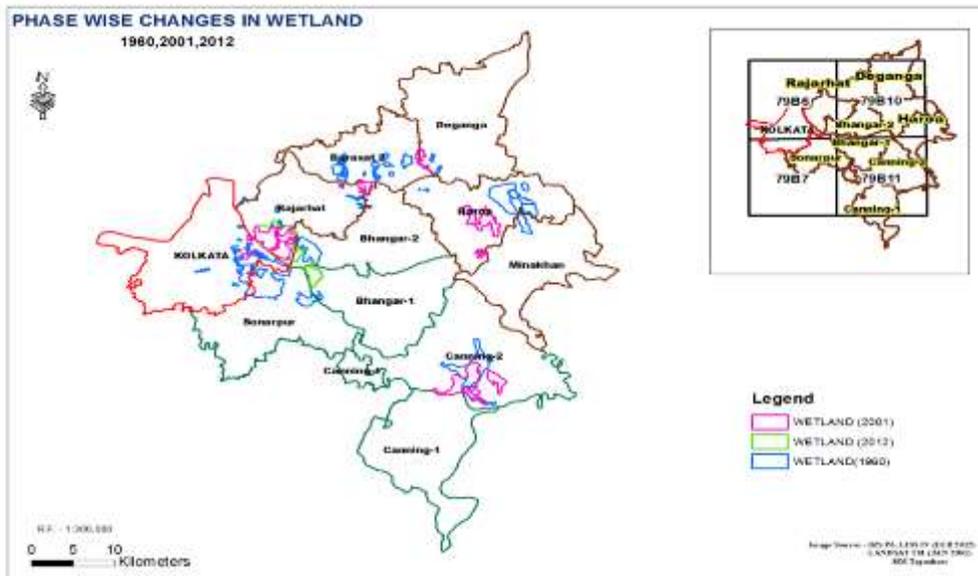


Fig.2. Source: Prepared by the author

The map of phase-wise changes in aquaculture/Pisciculture represents the alteration of wetland in the study area and it has been increased in Canning-2 from 1960 to 2012 (fig.3). It has also been distorted in Minakhan, Haroa, Barasat-2 with escalating value. But, in EKW, the area has been abridged periodically with larger proportion. In Haroa, Minakhan, Bhangar-2, Canning-2 block fishery covers the larger area in 2012. But, in 2001 the fishery was found in greater quantity in Barasat-2, Minakhan and Haroa block.

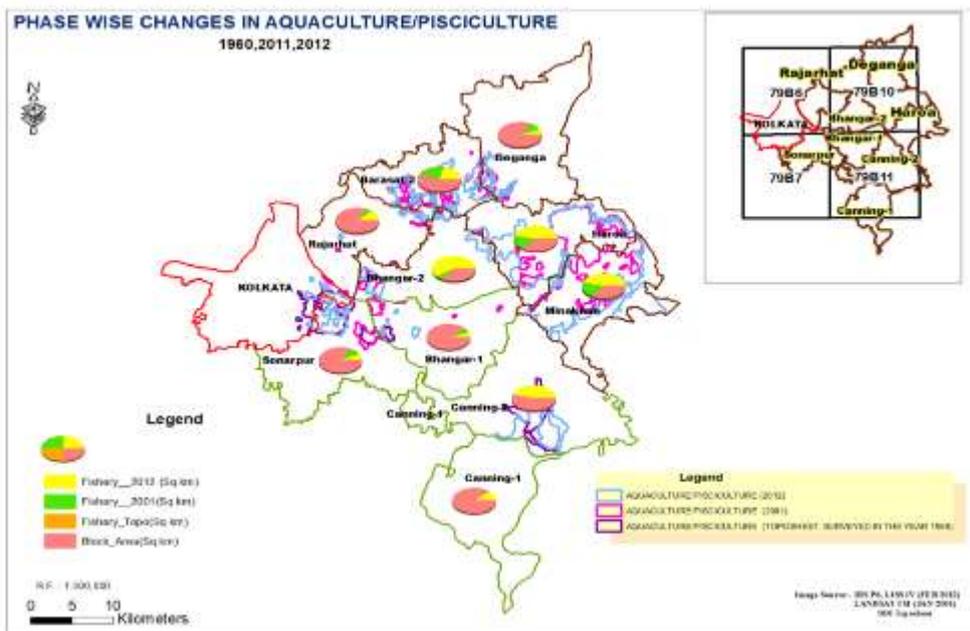


Fig.3

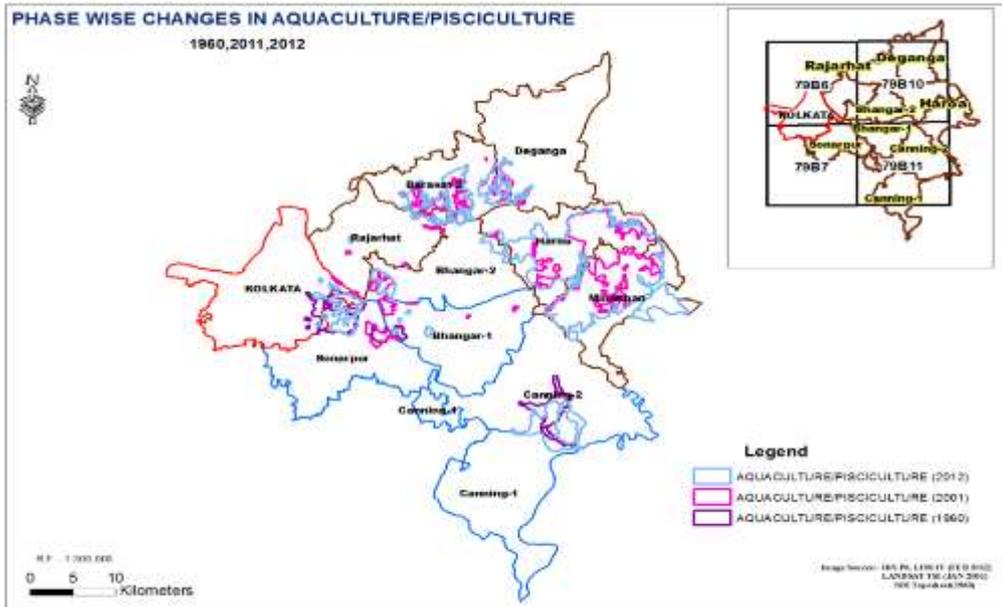


Fig.4

The map (fig.4) represents the phase wise changes in aquaculture/ Pisciculture. In 2012, Minakhan and Haroa block covers outsized quantity for aquaculture. In 2001, the area was found utmost in Minakhan, Haroa and Barasat-2 block.

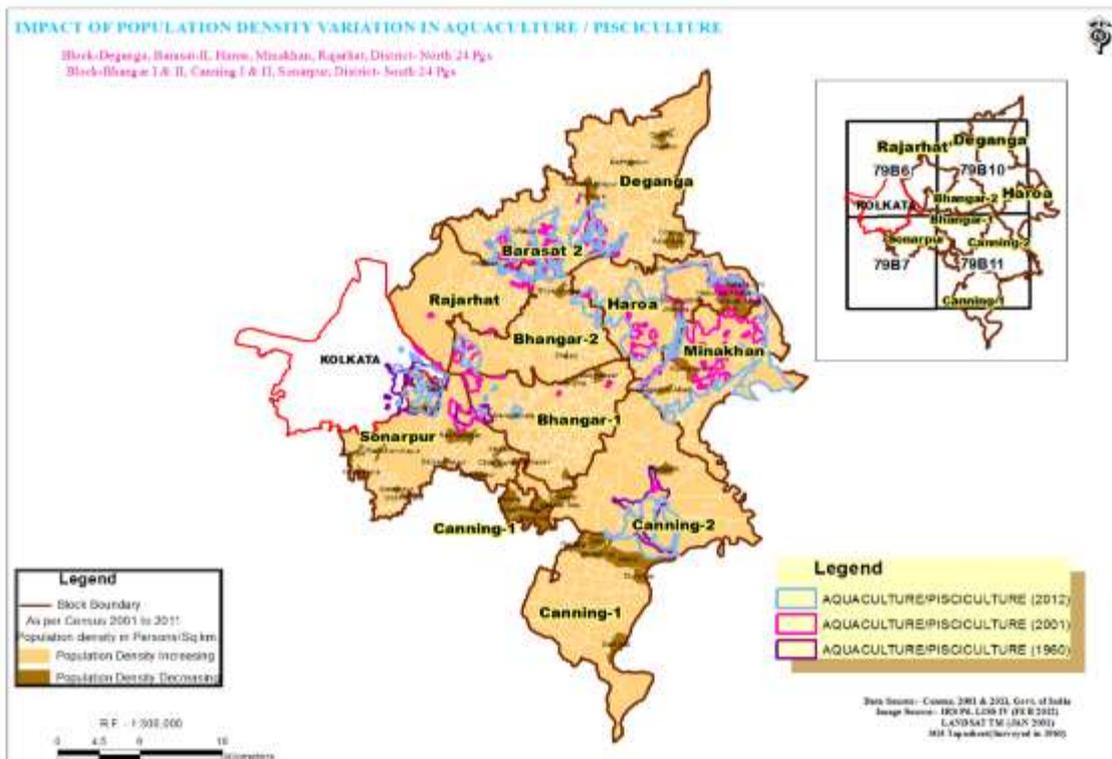


Fig.5

The map (fig.5) represents the changes of aquaculture or Pisciculture from 1960 to 2012 mostly due to increase of population density of the study area. The aquaculture or Pisciculture of the part of Kolkata, Canning-2, Minakhan, Haroa, Barasat -2 are mostly affected. In canning-2 the aquaculture area has increased drastically.

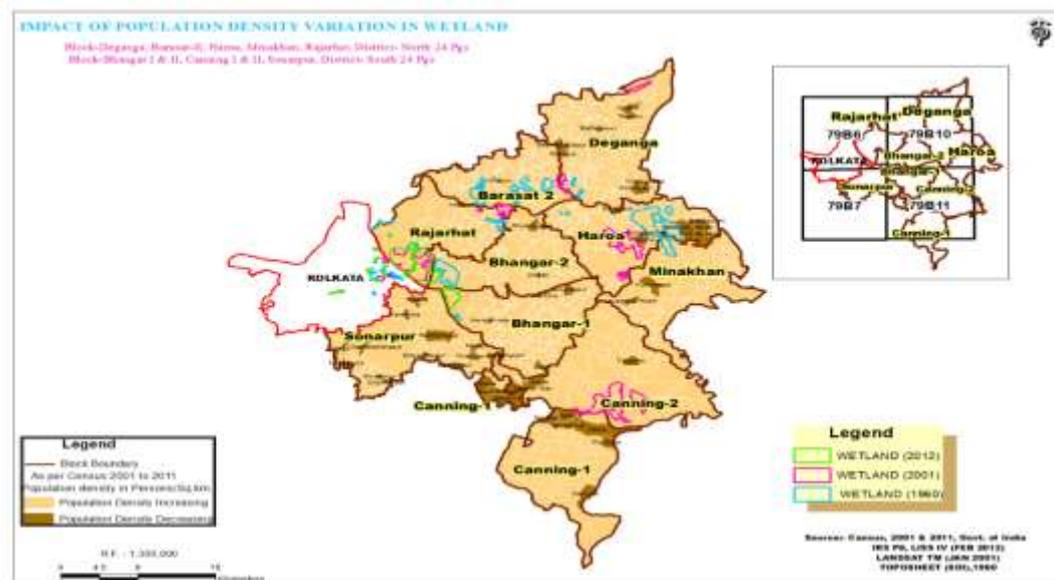


Fig.6

The map (fig.6) indicates the collision of population dynamics on the transformation of wetland in the study area. The wetland area is reduced in Haroa, Barasat-2 blocks, whereas, in is increase in Rajarhat, Canning-2 block from 1960 to 2012 due to the changes of population density dynamics over the area.

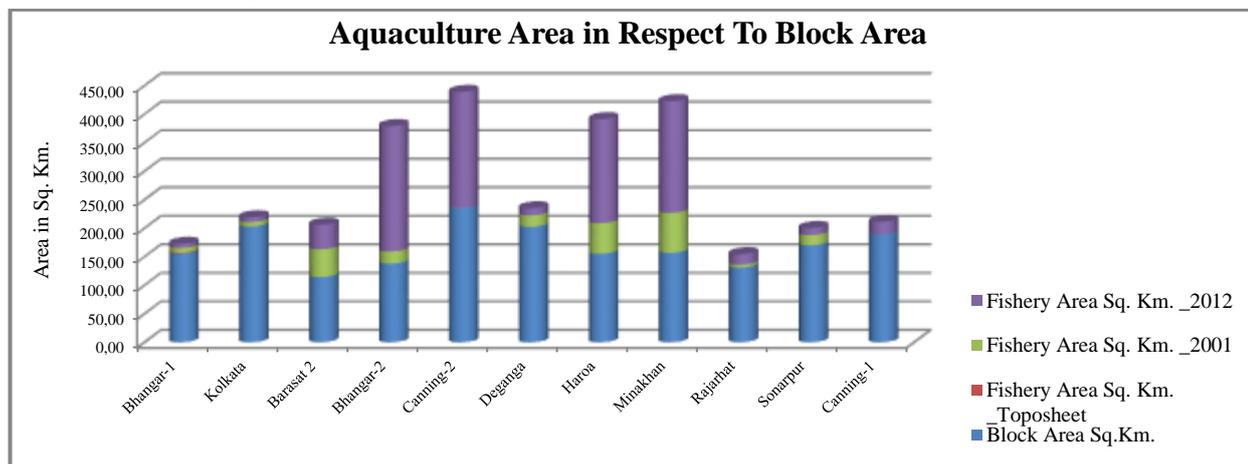


Fig.7

There is an appreciable increase in the aquaculture in Bhangar-2, Canning-2, Haroa and Minakhan blocks (fig.7). Other blocks have not experienced by such drastic changes in aquaculture area. The entire thematic maps and graph represent the cause-effect connection of wetlands and demographic character of the study area. The demographic attributes is somehow associated impolitely with the changes of wetlands openly or obliquely and sustainable stature of the area along with its socio-economic atmosphere.

EAST KOLKATA WETLANDS (EKW) AT A GLANCE

The EKW has become the ‘Kidney of Kolkata’ and its covers an area of 12,500 hectares. In August 2002, the EKW area was recognized as a ‘Wetland of International Importance’ by the Ramsar Convention for its uniqueness as a waste recycling region (WRR). This protected area, encompassing approximately 125 sq. km., includes sewage-fed fisheries, agricultural lands, horticulture, garbage dumping fields and some built-up areas (Kundu et al. 2008). However, only the wetlands encompass approximately 40 sq. km. (Information Sheet on Ramsar Wetlands 2002), of which about 45.93% area is manmade wetlands. This EKW provides goods and services to the society and therefore comprehensive and comparative assessment of the value of land vis-a-vis of this wetlands is utmost important to us. East Kolkata Wetland Management Authority (EKWMA) is entrusted with the statutory responsibility for conservation and maintenance of this wetlands area.

Area and Proportion of East Kolkata Wetland

The area and proportion of wetlands in the EKW area is tabulated below. Bhangar police station occupied the utmost proportion (36%) of EKW followed by the Sonarpur (35.50%).

Table 1: The area and its proportion under EKW under different police stations:

Police Station	Area (Hectares)	Percentage (%) Area
Bhangar	4548.58	36.00

Sonarpur	4416.83	35.50
Bidhannagar (S)	2100.00	17.00
Tiljala	1426.73	11.50
Total	12492.14	100.00

Source: Basu A. (2013)

The primary survey conducted in the area (in Rajpur Sonarpur Municipal Area, 2017) shows decreasing trends of wetland area. In most of the study area, the transformation and conversion of wetlands for the sake of development are strongly noticed. The fisheries, locally known as Bheris vary between 50 and 150 cm in depth and 0.4–0.5 sq km in size (Ray Chaudhuri et al. 2008), are mainly recharged with sewage water during 270–300 days of the year through the regulator gate at Bantala. The EKW includes around 254 sewage-fed fisheries and the conversion of some fish farms (bheries) are tabulated below:

Table 2: The conversion of some fish farms of EKW:

Name of the Bheries	Present Status
Bidyadhari Spill Cooperative Fisheries	Vidyasagar, Laboni B.S. market
Kakrimari	Atomic Research Centre
Boro	Baisakhi, Digantika
Daser	Mayukh Bhaban
Nortala Khas	Salt Lake
Kansar	Baisakhi housing
Bager	Jhilmil
Kajar	Industrial Estate
Hansar	Industrial Estate

Source: Basu A. (2013)

The EKW has been described as ‘one of the rare examples of environmental protection and development management where a complex ecological process has been adopted by the local farmers for mastering the resource recovery activities’ (Kundu *et al.* 2008) by the Ramsar Convention on Wetlands. However, in effect of land conversion and encroachment, the total area of the East Kolkata Wetlands has reduced significantly compared to the past. Moreover, unavailability of reliable wetland status data is also aggravating the problems of management of EKW.

Land use Pattern of EKW

The land use category of EKW was occupied by the water body, agricultural area, garbage farming area and settlements (Fig. 8) and it has changes very frequently over time. The pattern of land use along with the area in hectares is given below:

Table 3: The land use pattern of EKW

Land use	Nature	Area (Hectares)
Water body	Water body oriented area	5852.14
Agricultural area	Agricultural land	4718.56
Garbage farming area	Productive	602.78
Settlement	Urban/Rural	1326.52
Total		12500.00

Source: Kundu *et al.* (2008)

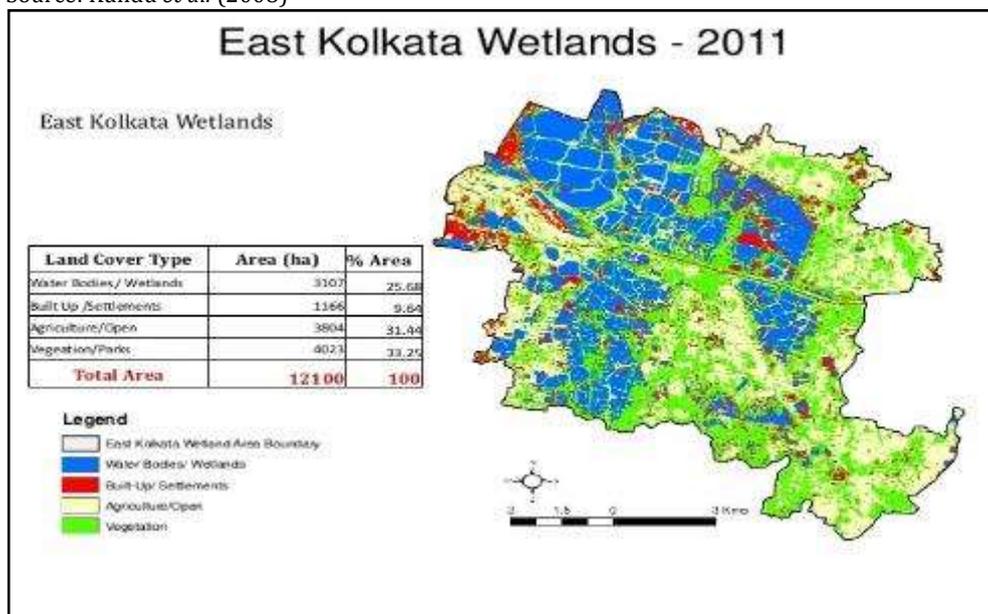


Fig. 8

Source: www.iwmi.org

The land use types of EKW are shown the graph (Fig.9) and it stated that the agricultural lands occupied the higher proportion (38%) after the water body which occupied almost 47% of the area. Rural and urban settlement holds about 10% and their encroachment in the wetland area threatened its protection and conservation. The primary survey in Sonarpur block in the Rajpur Sonarpur Municipal area reveals that due to huge population pressure (growth rate almost 30 % in 2011 census) the land use pattern is rapidly changed. Sky kissing buildings are taken place of wetlands and greenery in the region. Moreover, most of the respondents are stated (Fig. 10) that housing is the culprit for wetland conversion rather than industrial development, agricultural development or development of super markets in the area. Therefore, it reveals that non-agricultural cause also strong affect the wetland area for their conversion which hampers the environmental sustainability.

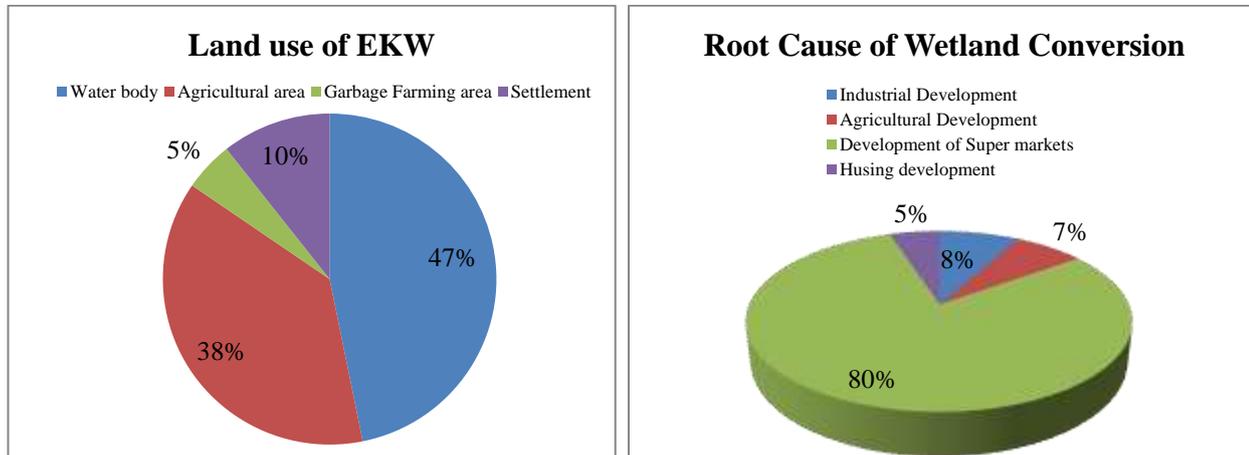


Fig. 9 Fig. 10

Root Cause recognized

The present study is also able to find out some of the root causes of such wetland transformation and conversion of wetlands which are listed below:

- a) Increasing population pressure.
- b) Direct human interventions by reclamation of land for agriculture and utilization of pesticides.
- c) Encroachment of urban settlement threatening the wetland area and its health.
- d) Transformation of wetlands into aquaculture.
- e) Increasing rate of siltation in the wetlands decreasing the volume of water.
- f) Uncertain wastewater supplies into the wetlands.
- g) Tendency of public agency to encroach upon the wetland area for development related activities, like locating commercial hubs, industries or public utilities.
- h) Pollution by the unregulated industries in the adjacent area by adding their untreated effluent into wetland.
- i) Poor quality sewage reduces quality of nutrients and induces a higher toxic load.
- j) Absence of the proper policy and regulatory mechanism.

MAJOR FINDINGS

- a) The study area contains huge wetlands in different form and most of them are associated with Hugli, Bidyadhari and Matla River. Huge swamp area was found in and around river. The sewerage water of the land area particularly the Kolkata Metropolitan area was passing through several canal to the river.
- b) Barasat-II, Haroa, Minakhan, Rajarhat, Canning-II, Bhangar-II blocks have the maximum wetlands.
- c) Some part of the wetland area was converted to aquaculture in recent times.
- d) Some wetland area was encroached by population, and somewhere it was completely vanished.
- e) Anthropogenic effects are the root cause for such transformation of wetlands.
- f) The increasing population density was found as a major cause of concern regarding the reduction of the wetlands.
- g) Some of the wetlands were replaced by the human settlements. Rapid growth of sky-kissing buildings in the study area is support the truth that difficulty was increasing to protect the wetlands from the developers and real estate agents.
- h) Most of the wetlands of the entire region were not conserving properly. Moreover, the various regulations for the conservation of wetlands are often flouted.

RECOMMENDATIONS

- ✓ The pollution of the aquatic environment should be control by bleaching and cleaning the wetlands with lime, potassium and organic material like cow dung.
- ✓ Need dredging work to remove siltation particularly in dry parts of the bils. Reduction of soil degradation particularly in the wetland areas is also necessary.
- ✓ Pension schemes for old fishermen, improve pisciculture and water quality management etc become essential to aware the locale so that they are willing to conserve the wetlands. Arrangement of adequate training for fish-farming in saline environment to protect the wetland area.
- ✓ Need development of eco-aquaculture to strengthen the wetland's environment.
- ✓ Human encroachment in the wetland area should be restricted.
- ✓ The East Kolkata Management Authority should be more active to protect its deformation and conserve the wetlands properly.

CONCLUSION

Wetlands play vital responsibility in maintaining environmental sustainability. The wetland of the study area is no exception. It acts as the soul of city to maintain the ecological balances as well as sustainability of its environment. Thus, wetland conservation is an important issue, which needs to be addressed through protection, catchment area development, siltation control and pollution control. Therefore, full implication of the values and losses of wetlands to be undertake in perspective of attempt for its conservation and development by government and non-government organisations. The critical analysis of the wetland issue with the help of geoinformatics have informed us about the recent threats and menaces of environment, caused particularly due to the anthropogenic activities and have also laid down the potentialities of 'Sustainability' as a concept in promulgating awareness about dealing with the such maledictions. The recent observations and findings have revealed a complex array of problems and issues facing by the wetlands community in the perspectives of sustainability. It is hope that the findings, analysis and recommendations made in these present study on wetland may also be helpful to the environmentalist, scientists as well as policymakers in order to frame policies and introspect into the different ways of protecting the environment through a more sustainable approach.

REFERENCES

- Anon (1999): National Aquaculture Association: U.S. Aquaculture and Environmental Stewardship. <http://www.natlaquaculture.org/EnvirPaper.htm>.
- Barbier, E.B., Acreman, M. And Knowler, D. (1997): Economic valuations of wetlands – A guide for policy makers and planners, Ramsar Convention Bureau.
- Basu A, (2013): Wetland Fisheries Vis-a vis Development'. Geospectrum, acb publications, Kolkata, pp 198-210.
- Chattopadhyay, B., A. Chatterjee and S.K. Mukhopadhyay (2002): Bioaccumulation of metals in the East Calcutta wetland ecosystem. Aquatic Ecosystem Health and Management, 5(2): 191- 203.
- Dudley, R.W., Panchang, V.G. and C. Newell. (1998): AWATS: A net-pen aquaculture waste transport simulator for management purposes. In: Nutrition and Technical Development of Aquaculture. pp. 215-228.
- Ghosh Dhrubajyoti (2005): Ecology and traditional Wetland Practice: Lessons from Waste Water Utilization in the East Calcutta Wetlands, Worldview.
- Goldburg, R., and T. Triplett (1999): Murky Waters: Environmental effects of Aquaculture in the United States. <http://www.edf.org/pubs/Reports/Aquaculture>.
- Government of India, Census Report (2001)
- Government of India, Census Report (2011)
- Gupta, G (2007): Urban waste water: Livelihoods, health and environmental impacts in India: The case of East Calcutta Wetlands.
- Kundu, N., M. Pal and S. Saha (2008): 'East Kolkata Wetlands: A Resource Recovery System through Productive Activities', Proceedings of Taal 2007: The 12th World Lake Conference.
- Muir, J., C. Brugere, J. Young, and J. Stewart (1999): The solution to pollution? The value and limitations of environmental economics in guiding aquaculture development, Aquaculture Economics & Management. 3(1): 43-57.
- National Remote Sensing Centre (NRSC). Satellite Images.
- Ray Chaudhuri, S., S. Salodkar, M. Sudarshan and A.R. Thakur (2008): Integrated Resource Recovery at East Calcutta Wetland – how safe is these? International Journal of Agricultural and Biological Sciences, 2: 75-80
- Survey of India, Toposheet
- Tisdell, C. (1999): Overview of environmental and sustainability issues in aquaculture. Aquaculture Economics & Management. 3(1): 1-5.

1497 THE ROLE OF URBAN MOMENTUM IN URBAN TRANSFORMATION OF NORTH 24 PARGANAS DISTRICT, WEST BENGAL, INDIA

ABSTRACT

Urban areas are dynamic in nature and they respond to every dynamic need of urban society. Urban area changes because life does change. Urban form does adapt the changes with various characteristics of changing socio economic structures of urban lives. Often this change creates transformations in urbanicity. Urban transformations are taking place at a rapid pace; it aims to social, economic and spatial quality of post modern societies. Some time transformation does occur with a momentum. Each and every urban centre has a dynamic momentum of its own. This paper aims to compute the momentum of urban centres of North 24 Parganas district of West Bengal in India. Three types of parameters i.e. socio-economic, commercial real estate and future proofing capacities like education, innovation and environment etc. were considered as main indicators to predict the momentum value of urban centres of this district. After going through in detail understanding about the present dynamic conditions on different types of urban centres in North 24 Parganas district, this paper includes only Municipal towns for analysis. It shows that emergence of huge numbers of sub-urban centres and outcome of tertiary sector’s economy mostly affect the momentum of urbanicity of this district.

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1574 RESIDENTS PERCEPTION, PRACTICES AND ATTITUDE TOWARDS SOLID WASTE MANAGEMENT IN THE CITY OF KRISHNANAGAR

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INTRODUCTION

Due to the rapid growth of population and the non renewable resources decreases and disposal of effluent and toxic waste indiscriminately increase, these are the major environmental issues posing threats to the existence of human being (Allen et al; 1997). The most common problems associated with improper management of solid waste include disease transmission, fire hazards, odour nuisance, atmospheric and water pollution, aesthetic nuisance and economic losses (Jilani et al).

Waste management is a global environmental issue which constitutes a very significant problem in today's world. The environment is heading towards a potential risk due to unsustainable waste disposal. There has been a significant increase in solid waste generation in India over the years to nearly 500 grams per persons per day as a worldwide problem it is becoming more and more complex day to day (Singha et al., 2011).

According to World Health Organization (W.H.O) any unwanted, useless discarded material that is not a liquid or gas, that arising out of man's activity which is not free flowing is called solid waste.

As per the report of the Ministry of Urban development (MoUD) and Pollution Control Committees/State Pollution Control Board that in India 1,00,000 MT of Municipal solid waste was generated daily and 1,27,486 TPD (Tones per day) solid waste is produced during 2011-2012 in our country, but only 89,334 TDP (70%) of municipal solid waste is collected and 15,881 TPD (12.45%) is treated or processed (CPCB, 2012). The current population of India is 1.252 billion (2013) and it will continue to grow at the rate 3-3.5% per year and per capita waste generation increased 5%. Due to the growing amount of solid waste generation and cost effective management process the Government is under pressure to effectively and fruitfully handle the solid waste (Rathor et al., 2010). It can be said that in India management of municipal solid waste is going through a carping phase for poor collection, insufficient transportations, unavailability of suitable facilities to disposal and treat So the disposal of municipal solid waste is a one of the central parts of solid waste management.

LOCATION AND HISTORY OF THE STUDY AREA

The study area Krishnanagar is a municipality, and an administrative headquarter of Nadia district. The latitude of Krishnanagar is 23°04'N to 23°24'N and longitude is 88°05'E to 88°31'E. It has an average elevation of 14 meters (45 feet). Krishnanagar located at the left side Ofjalangi River, (locally known as "Khore" about 9 km above its junction with the "Bhagirathi". The town is well connected by road to different parts of the state and also a railway junction. Krishnanagar municipality was established on 1st November 1864 (Garrett, 1910). It is one of the oldest municipality in West Bengal as well as in India. The town had an area of 7 km², and its population was only 24547 in 1901. In 2001, the areal coverage of Krishnanagar increased to 15.96 km², and the population also grew rapidly to 139110. In 2011, there were 24 wards in the municipality, but the population increased to 153062, and the density became 9590 persons/km². Besides, the enormous population pressure of its own, thousands of people visit the district headquarters for various administrative, social, and economic reasons.



Fig 1: Location of the Study area

STATEMENT OF THE PROBLEM

Solid waste management is an essential part of urban society and it also a fundamental key to environmental sustainability and susceptibility. The common observed problems in this area are:

- The waste collection capacity is less in comparison with the amount of waste generation in the municipality.
- There is a shortage of manpower, machinery, and equipments and trained staff.
- There is only one facility for re-using or re-cycling process in this study area Krishnanagar.
- Lack of private sector participation or involving of community based organization.

- Insufficient fund allocation for processing and dumping is a challenging problem in this area.
- There is no segregation of solid waste such as plastic, kitchen waste, metal, others etc.
- Lack of public awareness about the need of solid waste segregation.
- Lack of proper dumping facilities in this area. A dumping site is located near the river Jalangi which degrade the river water quality. Once a river Anjana flow through the municipality has become a shallow Khal due to solid waste dumping by the stack holder of the municipality.

OBJECTIVES

- To find out the nature and typology of the solid waste in this municipality.
- To find any relation between population and household in respect of inter ward disparity of generation solid waste.
- To find about the awareness of the people in respect of solid waste and evaluate the ward wise aesthetic environment and criticality by the perceptual study in this study area.

METHODOLOGY

A perception based questionnaire was formed to collect data about ward wise solid waste generation, collection process, awareness and used to collect information from the household of Krishnanagar Municipality. The data thus obtained were compiled and processed to assess the capability of data for strategic planning of solid waste management.

A. Data Entry

The spatial data and attribute data are entered into a database to create maps and analysis by Arc map 10.3.1 software. This includes photos, ward boundaries, quantity of waste, waste generation etc.

Thematic Mapping

Thematic maps show the distribution pattern of a particular theme objective. Thematic mapping involves data classification methods, which is known as the most common method for manipulation of data. Perceptions of people have been systematically analysed and give weight to them. Mean and standard deviation set the class breaks in the units of standard deviation above and below the mean. The method of natural breaks uses a computing algorithm to minimize the difference between data values in the same class and to maximize the difference between classes. For the present study, natural break classification techniques were used to classify the waste generation for thematic mapping.

RESULTS AND DISCUSSION: QUALITATIVE AND QUANTITATIVE ANALYSIS OF SOLID WASTE:

There are many categories of MSW in Krishnanagar such as food waste, rubbish, commercial waste, institutional waste, street sweeping waste, industrial waste, construction and demolition waste, and sanitation waste. MSW contains recyclables (paper, plastic, glass, metals, etc.), toxic substances (paints, pesticides, used batteries, medicines), compostable organic matter (fruit and vegetable peels, food waste) and solid waste (blood stained cotton, sanitary napkins, disposable syringes) (Jha et al., 2003; Reddy and Galab, 1998; Khan, 1994). The quantity of MSW generated depends on a number of factors such as food habits, standard of living, degree of commercial activities and seasonal variability. Data on quantity variation and generation are useful in planning for collection and disposal systems. The amount of MSW generated per capita is estimated 300 to 500 gm daily. The amount of MSW generated per capita is estimated to increase at a rate of 1–1.33% annually (Pappu et al., 2007; Shekdar, 1999; Bhide and Shekdar, 1998).

Types of solid wastes	Description	Sources
Food waste (garbage)	Wastes from the preparation, cooling and serving of food, market reuse, waste from the handling, storage and sale of meat and vegetables.	Household, institutions and commercials such as stores, hotels, restaurants, markets etc.
Bulky wastes	Large auto parts, tyres, stoves, refrigerators, other large appliances, furniture, tree branches etc.	Hotel, auto mobile centres,
Construction and demolition wastes	Lumber, roofing and shedding scrapes, crop residues, broken concrete, pipe, wire, insulation, paper, cardboard, cartons, wooden boxes, plastics, rags, cloth, bedding. Leather, rubber, grass, Metals, Tin can, metal foils, stones, bricks, ceramics, crockery, glass bottles etc.	Construction and demolition sites, repairing sites, shopkeeper, market, automobile repairing centres etc.
Dead animals	Small animals: cats, dogs, poultry, etc. Large animals: cow, buffalo	
Street waste	Street sweepings, dirt, leaves, animal droppings. Contents of litter receptacles, dead animals.	Streets, alleys, vacant lots, etc.
Industrial waste and sludge	Solid waste resulting from industrial processes and manufacturing operations such as food processing wastes, boiler house cinders, wood, plastic and metal	Factories, brick fields, automotive service centres.

	scraps and shaving, etc. Effluent treatment plant sludge of industries and sewage treatment plant sludge, septic tank.	
Hazardous wastes	Pathological wastes, toxic wastes, hospital wastes	Household, hospitals, institutions, industrial stores.

Table 1. Types of solid wastes present in krishnanagar municipality

Ward wise study of Krishnanagar municipality shows that there are very peculiar situation about the nature of solid waste generation. Door to door study shows that a very decent amount of solid waste is produced by the household every day in this municipality. The range varies from 300 gms to 600gms/capita every day. Table 1 shows us different kind of solid waste producing nature in this municipality. Most of the solid wastes are domestically based. As some important transport routes meeting point is Krishnanagar, automobile sludge and any automotive waste also generated on a regular basis. With the normalized value of ward wise solid waste generation data (weekly basis) the wards were divided the whole municipality into 5 groups, fig. 2 and from the table 2 it is observed that the total waste generation ratio is higher in ward no 24, 5, 6 and 8 whereas 1,3,4,10,18 no wards are falling in the second higher order group. In the rest of the wards solid waste generation record is comparatively lower than these words. Mainly the market area location, different district level administrative offices like district collectorate, district magistrate office, municipal, and post office is the main cause for huge number of population influx in those wards. The Ward wise nature of variability about the generation of solid waste weekly basis is known from table 2. Ward wise census data (2011) show us that the density of population is high in ward 1 and 6 whereas household density is high in ward no 1 and 6 and 19 but the nature of solid waste generation normalized value shows that these wards fall under moderate nature in respect of solid waste generation. It shows no relation between the population density or household density and the waste generated in these wards. Coefficient of determination ($R^2 = -2.46$) between population density and waste generation and household density and waste generation ($R^2 = -2.55$) implies that there is no significant relation between the variables.

KRISHNANAGAR Municipality	WARD NO	Per Capita Waste Generation (kg/day)		Average Per Capita Waste Generation (kg/day)	Ward wise Population distribution	Ward wise household distribution	Ward wise Waste generation kg/day	Ward wise Waste generation Tons/week	Ward wise waste generation Tons/month
		Min(kg/day)	Max (kg/day)						
POPULATION (2011-CENSUS) 153052 CLASS-I CATEGORY- G (130,0000- 199,999)	1	0.32	0.54	0.43	8157	2008	3507.51	3.88637	118.02
	2	0.31	0.51	0.41	7077	1655	2901.57	3.19843	95.97
	3	0.34	0.63	0.49	8285	2020	4059.65	4.475	134.28
	4	0.35	0.59	0.47	8995	2017	4228.12	4.6007	139.85
	5	0.50	0.89	0.60	7811	2050	4685.8	5.18609	155.01
	6	0.48	0.73	0.61	7417	1803	4524.37	4.98728	149.66
	7	0.39	0.68	0.54	4973	1281	2685.42	2.90017	88.82
	8	0.45	0.67	0.56	7704	1845	4314.24	4.75563	142.7
	9	0.48	0.79	0.64	4844	1195	3100.16	3.41734	102.54
	10	0.35	0.67	0.51	8288	1922	4216.68	4.64809	139.47
	11	0.32	0.65	0.49	5058	1295	2478.42	2.73199	81.98
	12	0.34	0.54	0.44	6741	1759	2968.04	3.2695	98.11
	13	0.45	0.89	0.57	4980	1321	2838.6	3.12902	93.89
	14	0.35	0.79	0.57	5374	1391	3083.18	3.37658	101.32
	15	0.29	0.64	0.47	5048	1260	2372.56	2.6153	78.48
	16	0.34	0.79	0.57	5905	1531	3400.05	3.74791	112.46
	17	0.30	0.65	0.48	6628	1537	3180.48	3.50588	105.20
	18	0.39	0.78	0.59	6122	1411	3011.98	3.98153	119.47
	19	0.44	0.76	0.60	4715	1237	2829	3.11844	87.50
	20	0.34	0.77	0.56	3499	949	1959.44	2.15991	64.81
	21	0.40	0.70	0.55	4211	1056	2316.05	2.55301	76.61
	22	0.35	0.70	0.53	4652	1218	2455.56	2.71781	81.55
	23	0.29	0.75	0.52	4800	1244	2498	2.75137	82.56
	24	0.22	0.67	0.45	11739	3017	5282.55	5.82301	174.73
Total Avg Per Capita Waste Generation (kg/day)	Avg. generation of solid waste at krishnanagar municipality 0.53(kg/day)				Total=153062	Total=38052	Total=79484.23 kg/day	Total=87.62 Tons/week	Total=2622.96 tons/month

Table 2: Ward wise waste generation

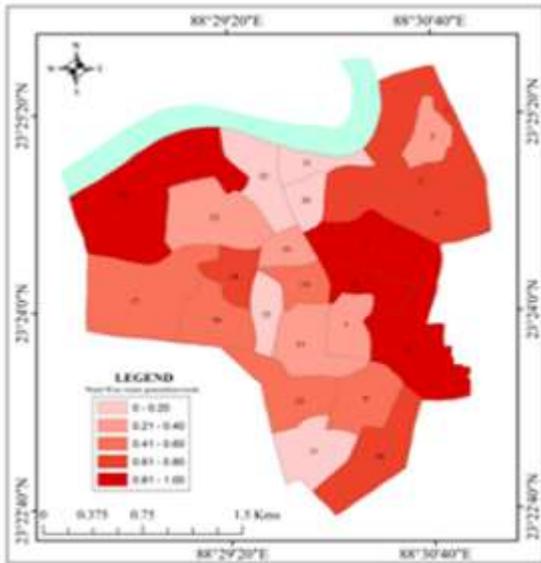


Fig 2: Ward wise waste generation



Fig 4: Landuse map

Ward wise survey conducted to locate the exact location of the bins in the municipal area. There are two kinds of bins, mobile bins and walled public bin. 25 Mobile bins which were given by “MISSION NIRMAL BANGLA” to the municipality in 2014. The Ward wise survey finds that there are only 11 bins are in a working condition. The rest of the bins are not in proper condition. These bins are mainly seen in the govt.hospital area, and in busy road side or in market area only. Walled public bins or vat were constructed by the municipality in some of the wards road side places. These bins are open in nature and causes the filthy smell to the surrounding neighbours.

Public perception about the bin is most unpleasant. Different perception about bins has been identified, including solid waste management processes in the municipality. It is quantified by giving score on the nature of the cleanliness of the bins.

Fig.3 shows that there are a very few number of public bins and vat in each ward. As a result of this, the public is generally prone to through their waste materials into the roadside. Nevertheless bins could not be emptied in a proper way regular on basis also. Survey shows bins or vat overflowed by waste materials as the municipality does not clean the bins in regular basis.

Municipal day by day waste collection process is not adequate here. Perception study shows in only few of the wards like 13,12,6 and 19 have the municipal door to door collection (though it is limited in few wards only) process by special types of tri-cycle van. As a result all the households they either dumped their solid waste in their respective home area or throw the materials into the vat. As the vats are few, most of the cases they even throw the materials on the open road, or elsewhere without knowing the environmental polluting fact. This causes a serious problem to the environment. The aesthetic view is totally absent in this municipality.As a result of very few of the waste vat or dumped station in the municipality causes a habit of the people, they dumped the waste particles everywhere, beside the road, at the pond side, Khal or canal side and riverside. As a result of this the water quality in pond, Khal is significantly affected. Khal side garbage dumping prevalent here as a result Anjana river became a degraded canal which flowed through ward no

24,17,16, 15, 13,12 and 11. Shaktinagar hospital located in ward no 11 besides of Anjana Khal. Pathological materials are thrown into the Khal very often by the hospital authority. The roadside, the canal side slum area also generates huge amount of solid waste which directly causes environmental pollution. In bejikhali area slums in ward no 15, the open defecation prevalent in and around Anjana Khal. This scenario is also prevalent other than slum besides of road or besides of the pond. Land use map helps us to show the actual frame of the location of the slum and the most prevalent waste generating area in the municipality. People used to dump solid waste in and around in the roadside area most of the time. People's perception about bin shows us a significant nature of the cleanliness and, other than the aesthetic view of the wards. From the perception study of the household it is clearly visible that the public bins don't get clear every day by the municipality. Some of the vats are clear only in a month. Generally marginal wards are getting a very low amount of services in respect of clearing vats. At the survey time it is often seen that most of the waste bins are filled and overflowed by the wastes, a typical bad odour coming out which most of the household raised voice over it. Generally waste pulling tractors are engaged in this work. Only 3 tractors are in working condition and there are only 35 labourers who are working by getting only 110 rupees per day basis in managing this huge solid waste. It is also a cause which reflects that waste bins are not clean daily by few amount of labour.

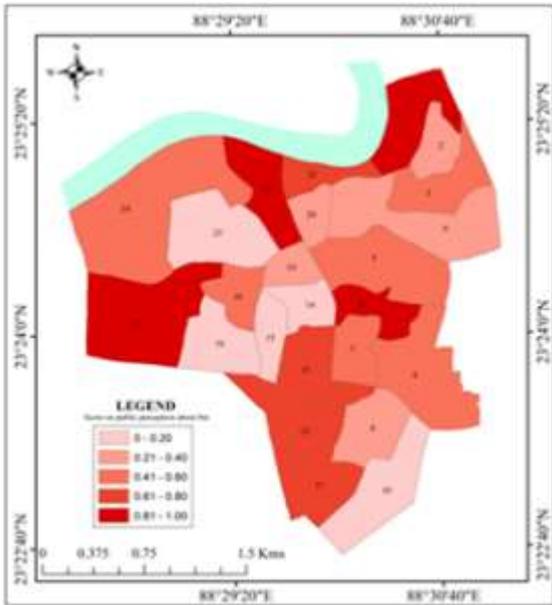


Fig 5: Perception about bin of the Household

In respect of waste generation, perception study (Table-3) generates a significant view about the nature of the wards which reflects the awareness level of the population in the municipality. In a few of the wards municipality waste bucket has been given to the household, but it has been observed that the waste bucket is used for water storage bucket. All the waste material deposited along the roadside where any kinds of waste bin exist.

It reflects the low awareness of the people in those wards

Different types of perception based weekly basis score card generated by different awareness oriented factors. Fig 6 shows that the near central business district wards like 20, 4, and 6 no wards people's awareness level is pretty low. Literacy level is also a significant factor for reducing the awareness level in those wards.

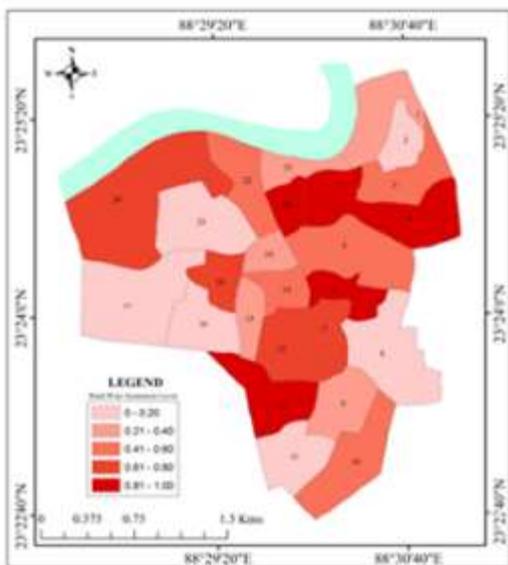


Fig-6 Ward wise awareness level

- Study the statistics of the quantity of waste generated in different areas of planning, waste management in a more precise manner.
- Analysis of further requirement of recyclable waste bins for any specific land use or any area.
- Study of improvement in the system due to proposed waste segregation and analysis to see if there is any requirement of segregation of waste into further more categories and how adoptable can it be.
- The study of revenue generation by the composting the organic waste and selling the recyclable waste would give the statistics about the economic response to the proposal of segregation of municipal waste. Further improvements can be suggested in the planning policies.
- Utilizing the manpower of rag pickers by providing them with work responsibilities in the waste management system and giving a secured livelihood and a social status in the society.
- Route planning for waste collection vehicles can be done and implementations of vehicle tracking systems like GPS on the vehicles calculate waste collection timings.

The main aim is to provide good SWM facilities to the citizens which could maintain a healthy clean and sustainable environment.

REFERENCES

- Agrawal A., Pandey R., Agrawal M.L. (2013) "Water quality surrounding to MSW dumps of Raipur city-A case study." *Recent Research in Science and Technology* 2013, 5 (5): 07-11
- Agarwal A., Singhmar A., Kulshrestha M., Mittal, A.K. (2005) "Municipal solid waste recycling and associated markets in Delhi, India." *Resources, Conservation and Recycling*, 44 (1), 73-90.
- Bose, Anu and Ian Blore (1993): "The Economics of Solid Waste Management in Calcutta", *Nagarlok- Urban Affair quarterly*, Vol-XXV, No2, pp. 32-47.
- Chhetri, Bishal (2010)," Solid Waste Management: Status and Some Improvement Initiatives In Gangtok", *The Journal Of Historical And Cultural Review (Bi- Annual)*, Vol 1, No 2 and Vol2, No1, 2, pp. 94-98.
- Census of India, 2011. Provisional Demographic Data of Krishnanagar City 2011.
- GiyasuddinSiddique and SandipTah (2007): "Solid Waste Disposal and Management in Barddhaman Town West Bengal", *Geographical Review of India*, Vol-69, No4, December 2007, pp. 386-393.
- Mwanthi, M.A., Nyabola, L.O., & Tenambergen, E.D. (1997). The present and future status of municipal solid waste management in Nairobi. *International Journal of Environmental Health Research*, 7, 345-353.
- Paul, S. (2012). Location Allocation for Urban Waste Disposal Site Using Multi-Criteria Analysis: A study on Nabadwip Municipality, West Bengal, India. *International Journal of Geomatics and Geosciences*, 74-87.
- Sharholy, M., Ahmad, K., Mahmood, G., & Trivedi, R. (2008). Municipal solid waste management in Indian cities – A review. *Waste Management* 28, 459-467.
- Jilani, T., 2002. State of Solid Waste Management in Khulna City, Unpublished Undergraduate thesis, Environmental Science Discipline, Khulna University Khulna, 25- 85.
- Usha P. Raghupathi (2002); "Solid Waste Management: Status and Some Improvement Initiatives in Selected Cities", *Urban India*, Vol-XXII, No2, pp. 12-45.

1739 URBAN ECOLOGICAL CRISIS IN A HIMALAYAN TOWN: A CASE STUDY OF MIRIK, WEST BENGAL, INDIA

ABSTRACT

At the beginning of the 20th Century, less than 15% of the world’s human population lived in urban areas. Today, more than half do. Between 1980-2010, the world’s population increased by 2.4 billion and half of that growth took place in cities (UN, 2009). By 2030, demographers expect global population to increase by another 2 billion with nearly all of that population increase in urban areas of developing countries due to urban migration and high birth rates. In this perspective, the future for our next generations will be predominantly urban and this provides immense challenges in the planning, management and sustainability of urban areas (UN-Habitat, 2003). Urbanisation has affected all geographical regions with variable impacts – but it challenges sustainability in ecologically sensitive locales – this paper is an attempt to assess the ecological crisis in a small town located in the Darjiling Himalayas in West Bengal, India. Early ecologists simply defined ecology as the study of organism and their environment. But urban ecology has evolved as a unique field of study through the integration of several disciplines that investigate the ecological and human dimensions of urban ecosystems. Urban ecology is a constantly evolving discipline that can help us to identify and face the challenges that an increasing urbanization will impose on essential ecological systems, locally and globally. The latest advances in urban ecology conceive cities in comprehensive and systematic ways where socio-economic and biophysical dynamics merge in an evolutionary process. The concept of creating sustainable cities has become a major focus of urban ecology research. With this understanding, ecologically sensitive. The selection of the Mirik town in Darjeeling district has been made with a specific objective in mind. The Himalayan and Sub-Himalayan region constitutes a rich ecological heritage of the country. The urban regions of the ecological zone have evolved historically for tourism demands of the population. The exquisite beauty and rich biodiversity attracts a large number of domestic and international tourists and the pressures of this tourist flow falls directly upon the small towns which host them. Development of transport and communication networks, rapid growth of hotels and other tourist attractions have created pressures upon the ecological capacities of these towns. The changes in the ecological parameters of these towns have never been studied in a holistic manner. This study is primarily aimed at the analysis of two major aspects, the status of ecological degradation and the rate of urban ecological degradation between core and periphery areas of the town and examines its spatial, social, economic and environmental impact by analysis of primary and secondary data as well as Geographical Information System (GIS) and Remote Sensing (RS) techniques.

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RS04.1. Infrastructure, Transportation and Accessibility

1237 SPATIAL EQUITY OF ROAD INFRASTRUCTURES. AN ANALYSIS OF THE PORTUGUESE ROAD CONSTRUCTION PROGRAM BETWEEN 1991 AND 2011

ABSTRACT

Road infrastructure investments are believed to improve regional competitiveness given the enhancement of accessibility they offer and increase social welfare and regional cohesion. Investments in road infrastructure have been promoted as means to increase spatial equity. The notion that equity over space should be taken into account in the planning and policy-making process has been strengthened as it has been found to govern the distribution of a number of these broader effects. The methodological framework for evaluating equity in transportation policy has been shaped by several indicators ranging from more complex indicators like the Gini coefficient to simpler approaches that include variance, mean absolute deviation, etc. This approach for measuring spatial equity of accessibility is insufficient due to two main reasons. First, it doesn't take into account the limitations imposed by geography and the actual foundations of network development. The evolution of road networks is mainly based on the extension or growth of the existing network. A geographically central location would always be more accessible than a peripheral location. The omission of geographical limitations leads to misinterpretations, as it does not realistically represent highway allocation capabilities. It would never be possible for a peripheral location to have the same accessibility as a central one. This difference cannot be directly linked to inequity in the allocation of transportation infrastructure. This paradox results in an unrealistic definition of spatial equity as it does not express geographical differences. A second source of misconception is related with the fact that equity impacts are mainly estimated assuming a static environment. The dynamic effects of accessibility on population growth will not be incorporated, resulting in biased conclusions about the equity appraisal. The focus of this paper is to define a framework to address these shortcomings concerning the effect of accessibility indicators in the equity evaluation procedure. To achieve these objectives a set of accessibility indicators including economic potential, weighted average distance, and cumulative opportunities are built. We use data from Portugal for 3 different periods – 1991, 2001 and 2011. In the last 20 years Portugal embarked in an ambitious road construction program aimed at increasing regional cohesion. We estimate the aforementioned accessibility indicators for the 3 periods and respective equity levels, and compare them with accessibility indicators assuming equal population distribution and direct distance travel times to have benchmarks to account for the geographical limitations and population uneven distribution. Preliminary results indicate a decrease in spatial equity due to population uneven growth. Its intensity is dependent on the type of accessibility indicators. This highlights the pitfalls of not incorporating population forecasts in accessibility analysis. They also indicate the role of geography in preventing perfect spatial equity, illustrating the limitations of infrastructure policies. These and other results and their implications will be discussed and contrasted with the policy objectives which supported the road construction program. The obtained results and its implications will be discussed, and contrasted with the policy objectives put forward in the official documents which supported the road construction program.

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1271 DOES TRANSPORT INFRASTRUCTURE LOWER THE REGIONAL ECONOMIC DISPARITY IN DEVELOPING COUNTRIES? THE CASE OF NEPAL

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ABSTRACT

The impact of transport infrastructure in regional economic development is a largely studied issue. Recent studies reveal that developing countries need a large amount of investment in infrastructure to cope with their demand. There is an urgency to understand how transport infrastructure investment impacts regional economic development in the case of developing countries. Despite a long and growing body of research in academic fields such as regional science, economic geography, planning and development economics, one of the major issues remains unresolved: Does transport infrastructure investments lower the regional economic disparity in developing countries?

New Economic Geography (NEG) theory suggests that transportation cost is a major determining factor for the concentration or dispersion of populations and economic activities in a location that in turn shapes regional economic development. According to NEG theory, cities in developing countries, which have better transport access, emerge as larger hubs that determine the size of the cities. A city with 'superior access', transport infrastructure 'peter out' with distance, attracts both consumers and producers and emerges as a primate city. The size of cities positively correlates with the regional income per capita, because of agglomeration benefits and economies of scale.

In order to understand the role of transport infrastructure in urbanization- and regional economic development processes in developing countries, we analyzed the change in transportation cost and a population of cities since 1961. We used intercity travel time, a calculation based on the design speed, length of sections and pavement type as an indicator of the quality of infrastructure (transportation cost). Next, we computed hubness and accessibility indices of cities defined by gravity model and a function of transportation cost, to compare among cities. Computation of the GINI index helped us to measure regional income inequality.

With this study, we empirically tested the ability of core mechanisms of NEG theory to explain longitudinal patterns in transport infrastructure investment, urbanization and regional economic development in developing countries. Results of our Nepal study show that (1) cities with higher hubness and accessibility did not all grow into a big city and (2) a region that has larger urban population can have a higher regional income per capita but some other regions can have higher regional GDP without containing a city. These findings have major implications for the applicability of NEG theory, which is still often the dominant theory behind reports of important institutions, such as the OECD and World Bank.

Keywords: Transport investment; developing countries; regional economic development; new economic geography.

1 INTRODUCTION

The impact of transport infrastructure in regional economic development is a largely studied issue but yet inconclusive. Focusing on the issues of developing countries need more research. In the developing countries, on the one hand, in more urbanized areas; there is massive rural-urban migration, rapid growth in city size and increasing incomes, and exploding travel demand, which current transport infrastructures are not able to accommodate. On the other hand, in more peripheral areas, where any transport means, like roads, are yet to be realized, people are struggling to access food, health, education, and other basic resources, services and markets. For instance, in rural communities in Nepal, one of the major causes of food insecurity is high transport cost for food (NFSMS 2016). At the same time, local agriculture products from these areas (for instance, apples from remote regions of Nepal) rot in the field due to a lack of road access to the market. These rural areas of developing countries have little opportunity for the economic activities.

Transporting goods and services to and from the peripheral areas is relatively very costly. Because of a higher cost of producing goods and services, investment is less attractive in non-connected or poorly connected regions. Thus, while as a result of the specular dynamics, urban or semi-urban areas enjoy higher economic growth, attracting people and private investment, rural areas feel the stagnation or, in some places economic decline. Consequently, the regional income inequality becomes more extreme.

A large and growing body of literature has investigated on the impact of transport investment on economic development. There is a general consensus that transport investment facilitates economic growth, however, in a well-connected region with a good quality of infrastructure might have an only limited impact (Banister and Berechman 2000; Piet Rietveld and Bruinsma 1998; Lakshmanan 2011; P. Rietveld et al. 2001). Transport connectivity can create the environment for urbanization, a growth of employment density and economic growth in a location (Lin 1999; Cervero 2001; Motamed, Florax, and Masters 2014; Kasraian, Maat, and Van Wee 2015; Kasraian et al. 2016). There is also a debate on various issues, such as the regional economic impact of transport infrastructure investment. The regional inequality might be bigger between the high-speed railways and expressways connected and non-connected regions (Vickerman 1997; Ortega, López, and Monzón 2011; Kim, Lee, and Park 2013; Yin, Bertolini, and Duan 2015; Jin, Wang, and Liu 2004; Roberts et al. 2010; Hou and Li 2011). Various studies focused on developing countries argued that one of the bottlenecks of economic growth is inadequate transport infrastructures (Bhattacharyay 2010; Dash and Sahoo 2010; Sahoo and Dash 2012; Sharma and Vohra 2009; Ghani, Goswami, and Kerr 2012; Alder 2014; Ndulu 2006; Nedozi, Obasanmi, and Ighata

2014). Infrastructure is argued to be a necessary but not a sufficient condition to achieve the economic growth (World Bank 1994).

Despite a long and growing body of research in academic fields such as regional science, economic geography, planning and development economics, one of the major issues remains unresolved: 'Does infrastructure investments lower regional economic disparities in developing countries?' The aim of this study is to understand how most dominant theory the NEG can explain the transportation investment, urbanization and regional economic development in the context of a developing country. In the following section, a brief introduction of the NEG theory is presented. Three hypotheses based on NEG theory particularly from the paper from (Krugman 1993, 1996), and other NEG theorist (Fujita and Mori 1996) and Ideas from the World Development Report 2009 published by the World Bank (World Bank 2009), are formulated to test the mechanism of the theory. In the method and data section, the operationalization process is introduced. Section 4 presents the results from the case study of Nepal. The paper closes with the discussion and conclusion in the final section.

2 THEORY

Study on economic development in a space has a long history since Von Thunen (1826). Interest is expanding these days from economic geographer and mainstream economist to urban and regional planners. A key question in regional economic development is 'Why some regions are economically prosperous whereas some regions lag behind within a country's boundary? After long negligence of this issue in mainstream economics, Krugman (1991) introduced New Economic Geography (NEG) for the explanation of 'how a country is divided into the industrialized core and agriculture periphery within a neoclassical framework. In the late 1990's Evolutionary Economic Geography (EEG) has been discussed by Boschma and Lambooy (1999) first and proposed a theoretical framework by Boschma and Martin (2007) under the disequilibrium framework and Generalized Darwinism. However, the EEG is still developing. Despite some critical views from geographers (for example Ron Martin and Sunley 1996; R Martin 1999), the NEG has been the dominant theory for the case of regional development analysis (for example World Bank 2009; OECD 2009) however, empirical studies are still limited. The developing countries, where infrastructure development policy has been influenced by the international donors such as the World Bank, has been using the NEG (for example World Bank 2009). Therefore, we prefer to choose the NEG to test in the case of developing country, Nepal.

The new economic geography (NEG) theory answers as to why a country is divided into industrial core and agriculture periphery and the causes of regional income disparity within a boundary of a country. The main argument of this theory is regional concentration and diversion of economic activities happen in locations because of the interaction of economies of scale with transportation cost (Krugman 1991b). According to Krugman (1998), the regional concentration or divergence of economic activities is a result of "tug of war" between centripetal and centrifugal forces. Centripetal forces are market size effects; labor market and external economies (lower average cost including transportation of input and output materials etc.) while land and other immobile factors and other external diseconomies (higher average cost etc.) are the centrifugal forces. The relative strength of centripetal forces determines the concentration of economic activities in a location (ibid).

After Krugman first introduced the new economic geography in 1990's this theory has evolved considerably. Krugman (1996) argued that the NEG is more relevant to the developing countries to understand the urbanization and uneven regional growth. Based on the NEG, particularly from (Krugman 1993, 1996), and other NEG theorist (Fujita and Mori 1996) and Ideas from the World Development Report 2009 published by the World Bank (World Bank 2009), three hypotheses have been developed to test the relevance of the NEG in the context of developing countries.

Hypothesis 1: The size of the cities is determined by their Hubness.

The transportation cost between locations determines which place (transportation node) can be a Hub (Krugman 1993). The transportation hub agglomerate (attracts) firms and labor. Krugman explains with the help of figure 1. In general, given three locations (nodes) are entitled to produce and consume both goods and services. A node can emerge as a big city from where transportation cost to the other locations is lowest. For example, if the transportation cost between nodes 1 and 3, 1 and 2 are lower than the cost between nodes 2 and 3; node 1 can be a transportation hub.

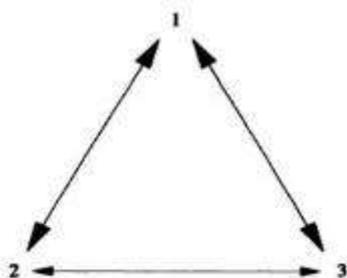


Figure 1: Krugman (1993)

The main mechanism of the hub formation is "the interaction between transportation cost and increasing return in production leads to the indigenous formation of Hubs" that is cities (Krugman 1993). According to Fujita and Mori (1996), port and other transport nodes have an extra advantage of access. Transportation nodes dominantly grow as compared

to non-transport nodes. Eventually, non- node cities get absorbed by the cities in the transportation nodes. The World Bank report 2009 which is based on the 'New Economic Geography' argued that cities are located near the most efficient transport systems.

Hypothesis 2: A city in a developing country, which is most accessible (superior access), emerges as a big city.

If one of the cities has better access with respect to the other cities, it leads to a concentration of population in the 'superior access' city(Krugman 1993). In developing countries, transportation cost is higher if one moves away from the big (capital) city because roads often 'peter out quickly' away from such city. This transportation system centered to the single city promotes the concentration of economic activities in the primate city. Because of Hub effect of a single city, most of the production and consumption of goods and services are concentrated in the primate city(Krugman 1996).

Hypothesis 3: Regional inequality exists because the region that contains bigger city has a higher GDP per capita.

Uneven urban distribution and the growth of cities lead to the regional inequality. In developing countries, the region that contains big city has higher regional GDP per capita (Krugman 1996).

3 METHODS AND DATA:

3.1 Hubness Index

Krugman (1993) defines Hub as a place from where transportation cost is a minimum. Hubness is a measurement of a city in terms of transportation cost between cities. Transportation cost is the cost of transporting goods or raw materials, commuting cost of workers between two locations (Krugman 1993, 1996). Transportation cost is a function of distance which impacts accessibility as expressed from a geographical point of view, in terms of length, travel time, economic cost or amount of energy required(Rodrigue 2017). Therefore, lower the transportation cost greater the Hubness. The major determinant of transport cost is infrastructure, that is, remoteness and poor quality of infrastructure isolate the locations(Limao and Venables 2001).

Hubness of each city is measured by the simple formula of accessibility index. Travel time is taken as a proxy measure of transportation cost. Travel time is based on the infrastructure quality and design speed. This formulation is widely used for accessibility measures for example(F. Bruinsma and Rietveld 1993, 1998; Spiekermann and Wegener 2006; Spiekermann and Neubauer 2002). Here we term the Hubness index of a node as:

$$H_i = \sum_{i \neq j} \frac{1}{t_{i-j}}$$

Hi= Hubness index of a city i

ti-j =Travel time between city i and j

Travel time depends on the quality and design speed of transport infrastructure. Travel time is estimated based on design speed of the roads. Average travel time of a public transport vehicle is estimated based on the sample survey of some sections of national highway and through expert interviews. Hubness index is calculated in time series to understand the change in hubness, city size and regional economy.

3.2 Accessibility index

The city from where larger markets are accessible is an accessible city. That is transport cost to the larger market is minimum (Krugman 1993, 1996). A form of accessibility indicates the opportunities available to the people and firms that are affected by the impedance (transportation cost). That is, more distant market (city) reduced the opportunity (Linneker and Spence 1992; F. Bruinsma and Rietveld 1998; Gutiérrez 2001). Accessibility index compares the advantage of locations that depends on the quality of transport infrastructures (Hansen 1959; Linneker and Spence 1992; F. R. Bruinsma, Rietveld, and others 1997; F. Bruinsma and Rietveld 1993; Vandenbulcke, Steenberghen, and Thomas 2009) We term the Accessibility Index of a city as:

$$A_i = \sum_{i \neq j} \frac{P_j}{t_{i-j}}$$

A_i= Accessibility index of city i

P_j= Population of destination city j

t_{i-j}= Travel time between city i-j

This formulation has been proposed and used by (F. Bruinsma and Rietveld 1993, 1998; Spiekermann and Wegener 2006; Spiekermann and Neubauer 2002) to measure the accessibility of each agglomeration. The bigger city will have a greater

opportunity to the people and firms. Therefore, the population is taken for comparison among cities. The impedance (transportation cost) affects the accessibility of the opportunity. That is distant city has less opportunity.

4 THE CASE OF NEPAL

Nepal is a least developed country in South Asia with the population of 28.7 million (in 2017, estimated based on 2011 census). In 2017, the average GDP per capita income was US\$ 853(Economic Survey-2016/17, MOF, Nepal). Transport Infrastructure in Nepal is in a developing stage. There were 259 Km all-weather roads out of 624 Km in 1956, prior to the start of the planned development process in Nepal. People were living all over the country in numerous scattered villages. With the gradual expansion of roads, people have migrated to the transportation nodes and formed numerous cities. There were 238,275(3% of national population) people residing in 6 urban settlements (Kathmandu Valley considered as a single settlement) in 1952; most of them were border- towns having an easy access to the Indian cities. The border towns were growing up to supply imported and exported goods to and from the inland hills and mountains through walking or mule routes. Only two roads connected the inland hill urban centres to the southern border towns in 1961. As road construction started from East to the West in the southern plain first and South to North in the hills and mountains later, cities gradually grew along the highway alignment. By the end of fiscal year 2015/16, the National Highway had expanded to 4670 Km that includes 3380 Km of paved roads and 7500 Km of feeder roads including 3300 Km paved roads (DOR, 2016). These roads connect the 217 designated urban areas.

4.1 The data

According to the 2011 census, 17.1% population resided in the 58 designated municipalities. After the declaration of additional municipalities in 2014 and 2015, the total urban population reached 40 % in the 217 designated urban areas. In March 2017, the local level restructuring commission further increased the number of municipalities to 293. However, the declaration of municipalities being political in nature, many declared municipalities are in spirit rural settlements. Therefore, we have taken only the cities declared until 2015 and having a population greater than 50,000 while including at least one city from each regional unit. Total of 25 cities have been selected for the analysis- of them, 21 cities have a population greater than 50,000 and 4 are regional urban centres that are not included in the group of greater than 50,000. Nepal is divided into 15 regional units based on 3 ecological regions and 5 development regions. Figure 2 shows the 15 regional units including the regional urban centre.

**NEPAL
15 REGIONS AND THEIR LARGEST URBAN CENTRES**

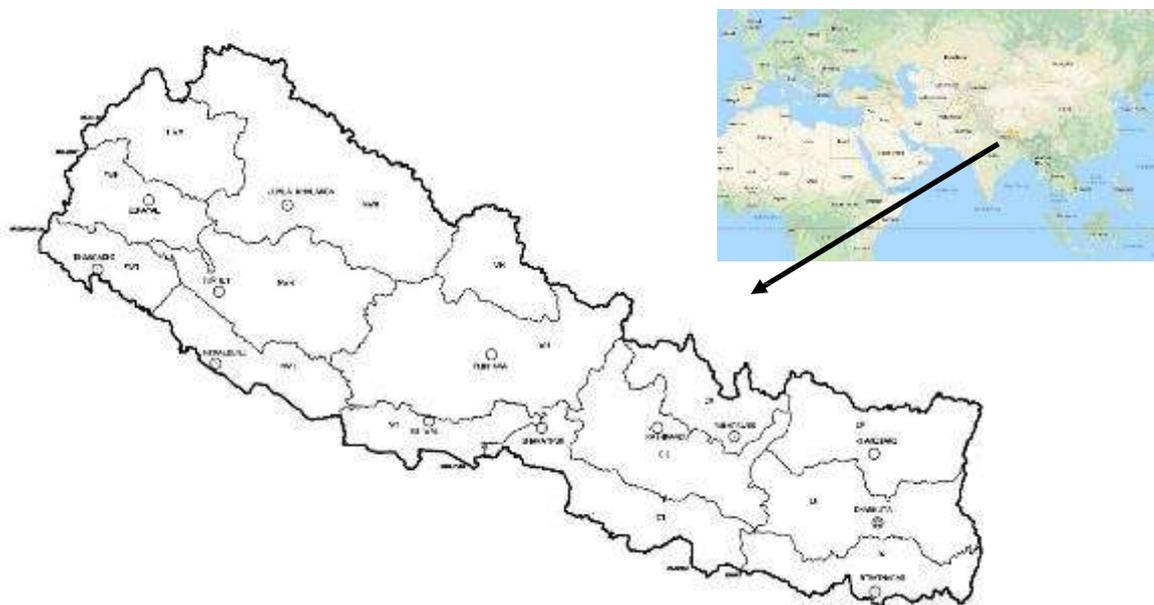


Figure 2: Nepal: Regional Division

The average travel time of road section is estimated based on design speed, sample survey and expert interviews. The average speed of roads is estimated as 50% of design speed for paved roads, 25% of design speed for gravelled roads and 15% for the earthen roads. Due to the availability of regional economic indicator (GDP per capita) of three years 1985, 2001 and 2011, comparative analysis of regional economy is limited to those years.

4.2 The Results

4.2.1 Hubness and Accessibility

We have selected 25 cities that had a population greater than 50,000 in 2015 and at least one city of each region even if they do not meet the population criteria. Hypotheses 1 and 2 are tested by computing the Hubness and Accessibility indexes of each city. Figures 3, 4 and 5 show the road development pattern, emergence of cities and their population, accessibility and Hubness indices.

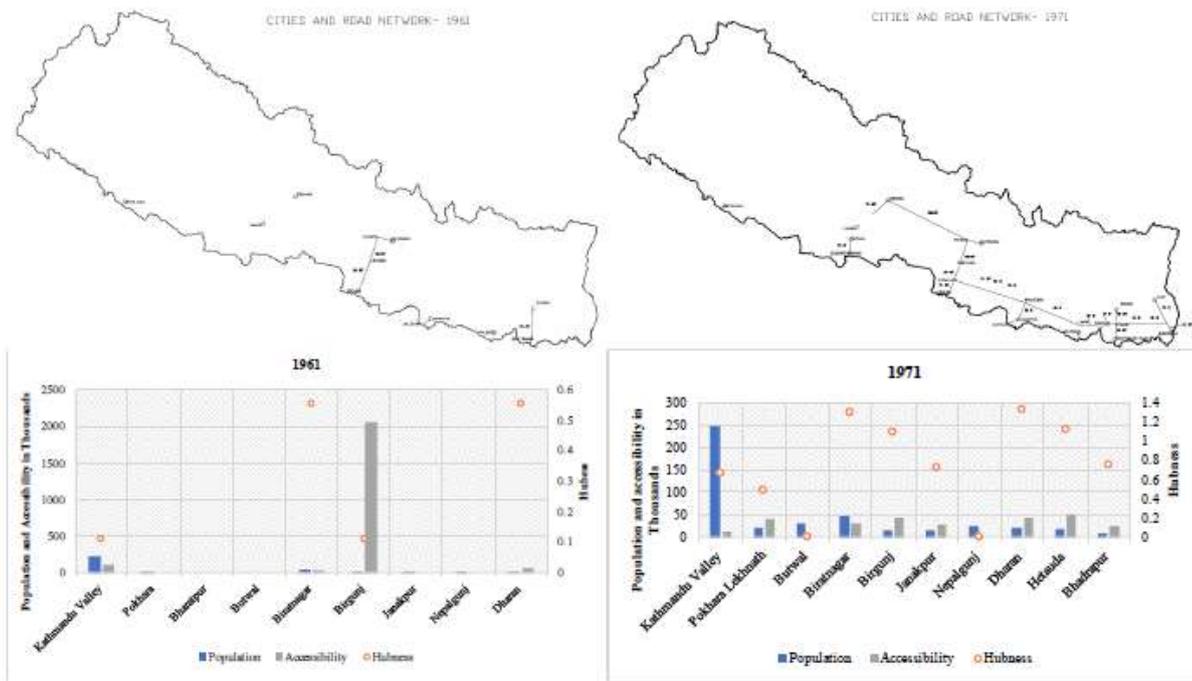


Figure 3: Transport connectivity and population, Hubness and accessibility of cities in 1961 and 1971

In 1961, the capital city, Kathmandu was connected to the border city Birgunj and another border city Biratnagar in the east is connected to inland Terai city Dharan. The Hubness and accessibility of those 4-cities do not show much significant meaning. More roads appeared in 1971 particularly connecting the South-East plains to the capital city. In spite of a higher population growth in the Kathmandu Valley, many cities appeared in the southern plains along the highway corridor. Significant Hubness and accessibility were achieved by the southern cities despite the population growth being modest. Asimilar pattern can be clearly seen in the following figure 4 and 5, that is Hubness do not affect the growth of cities.

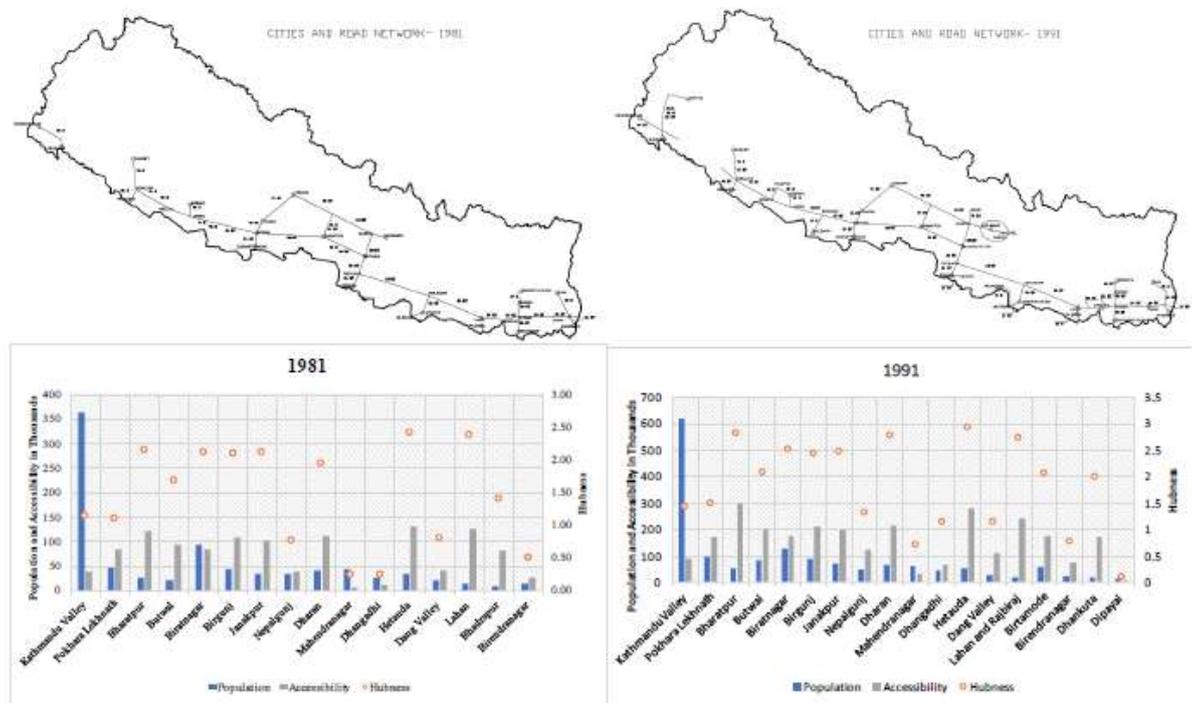


Figure 4: Transport connectivity, population, Hubness and accessibility of cities in 1981 and 1991

Transport connectivity significantly improved in the following years, but the Hubness does not influence the city growth and bigger cities do not necessarily have higher Hubness.

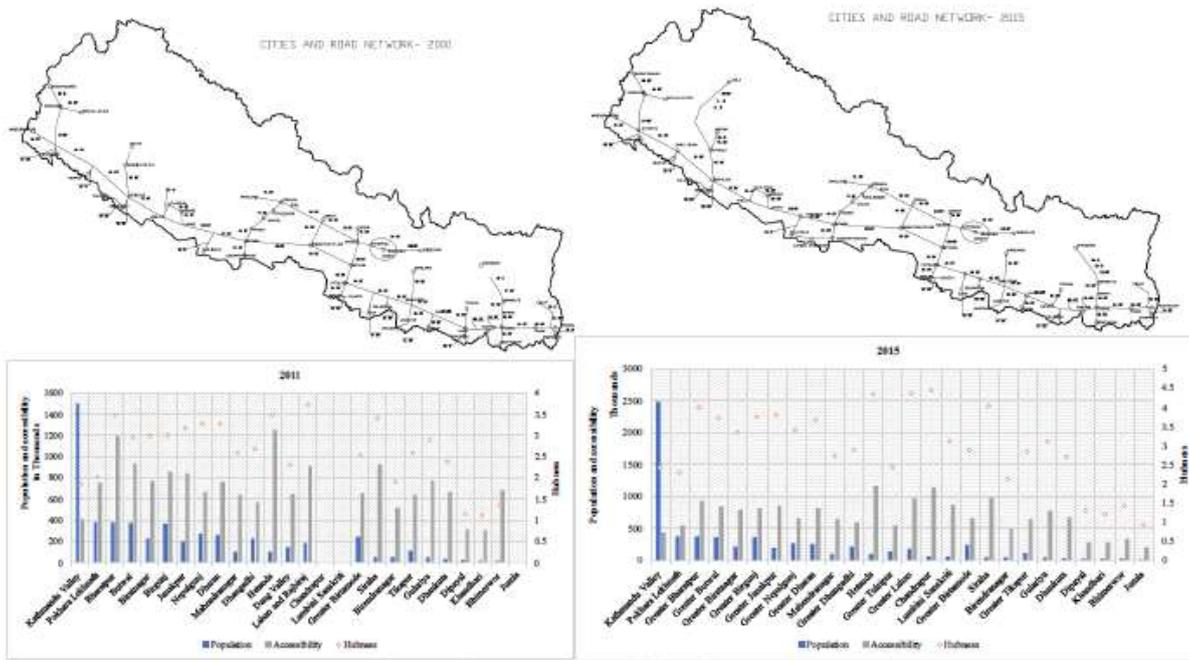


Figure 5: Transport connectivity, population, Hubness and accessibility of cities in 2000 and 2015

Table 1 below shows the ranking of cities based on population, Hubness and accessibility. What is interesting in these figures and table is the growth of cities is not determined by Hubness and accessibility. For example, the city, Hetauda was established in 1971 and already connected to the capital city before 1961 always scored high in accessibility and within the third position in the Hubness over the time but the size (population) has not increased significantly as compared to other cities. Similarly, Kathmandu, the primate city of Nepal is top-ranked in terms of population but far below in terms of Hubness and accessibility.

Table 1: Position of Cities Based on Population, Hubness and Accessibility

S No	Year	1961			1971			1981			1990			2000			2010			2015		
		P	H	A	P	H	A	P	H	A	P	H	A	P	H	A	P	H	A	P	H	A
1	Kathmandu Valley	1	3	2	1	7	8	1	10	12	1	12	14	1	18	18	1	20	20	1	19	22
2	Pokhara	7	5	5	5	8	4	3	11	9	3	11	11	2	19	19	2	18	11	2	21	19
3	Bharatpur	8	5	5	11	9	9	10	3	3	10	2	1	7	3	3	3	2	3	5	5	5
4	Butwal	8	5	5	3	9	9	12	8	7	5	8	6	6	10	9	4	10	3	4	8	8
5	Biratnagar	2	1	4	2	2	5	2	5	8	2	5	8	3	9	7	10	9	9	10	11	11
6	Birgunj	5	3	1	9	4	3	5	6	5	4	7	5	4	8	8	5	8	6	5	7	10
7	Janakpur	6	5	5	8	6	6	7	4	6	6	6	7	11	7	6	11	7	7	11	6	7
8	Nepalgunj	3	5	5	4	9	9	9	13	13	12	13	12	15	5	12	6	5	12	6	10	15
9	Dharan	4	1	3	6	1	2	6	7	4	7	3	4	5	6	5	7	6	10	7	9	9
10	Mahendranagar	8	5	5	11	9	9	4	15	16	8	17	17	9	14	17	15	14	17	15	17	16
11	Dhangadhi	8	5	5	11	9	9	11	15	15	13	15	16	13	12	15	9	12	18	9	15	18
12	Hetauda	8	5	5	7	3	1	8	1	1	11	1	2	12	2	1	16	2	1	16	3	1
13	Dang Valley	8	5	5	11	9	9	13	12	11	14	14	13	10	17	16	13	17	15	13	20	20
14	Lahan	8	5	5	11	9	9	16	2	2	16	4	3	14	1	2	12	1	5	12	2	4
15	Chandrapur	8	5	5	11	9	9	19	17	17	19	19	19	22	22	22	22	22	22	17	1	2
16	Lumbini Sanskriti	8	5	5	11	9	9	19	17	17	19	19	19	22	22	22	22	22	22	18	12	6
17	Bhadrapur	8	5	5	10	5	7	18	9	10	9	9	9	8	15	11	8	15	14	8	14	14
18	Siraha	8	5	5	11	9	9	19	17	17	19	19	19	19	4	4	17	4	4	19	4	3
19	Birendranagar	8	5	5	11	9	9	14	14	14	15	16	15	18	20	20	18	19	19	20	22	21
20	Tikapur	8	5	5	11	9	9	19	17	17	19	19	19	17	13	14	14	13	16	14	16	17
21	Gulariya	8	5	5	11	9	9	19	17	17	19	19	19	16	11	13	19	11	8	21	13	12
22	Dhankuta	8	5	5	11	9	9	15	17	17	17	10	10	21	16	10	20	16	13	22	18	13
23	Dipayal	8	5	5	11	9	9	17	17	17	18	18	18	20	21	21	21	21	21	23	24	24
24	Khandbari	8	5	5	11	9	9	19	17	17	19	19	19	22	22	22	22	22	22	25	25	25
25	Jumla	8	5	5	11	9	9	19	17	17	19	19	19	22	22	22	22	22	22	24	23	23

P=Population Rank, H=Hubness Rank, A=Accessibility Rank

The chart below shows the relationship between the Hubness and the population of cities in 2015. What can be clearly seen in this chart is the growth of cities and Hubness do not have any correlation.

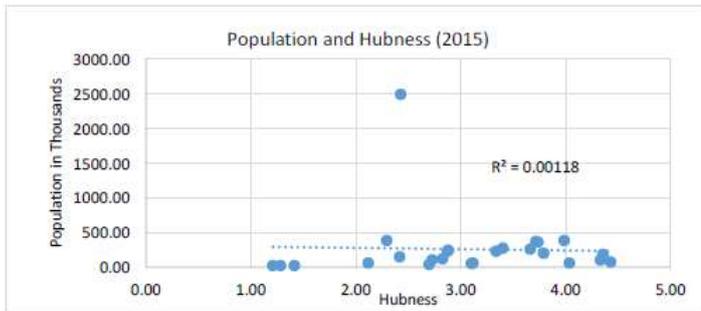


Figure 6: Correlation between Hubness and Population

From above time series analysis of Hubness, accessibility and population growth of cities, the hypotheses 1 and 2 that are drawn from the NEG are not significant in the case of Nepal.

4.2.2 Regional Inequality

For the regional analysis, the entire country is divided into 15 regions based on 3 ecological regions (Mountains, Hills and Plains) and five development regions (Eastern, Central, Western, Mid-Western and Far-Western). Figure 7 shows the comparative chart of regions between urban population, Hubness and accessibility and Regional GDP per capita.

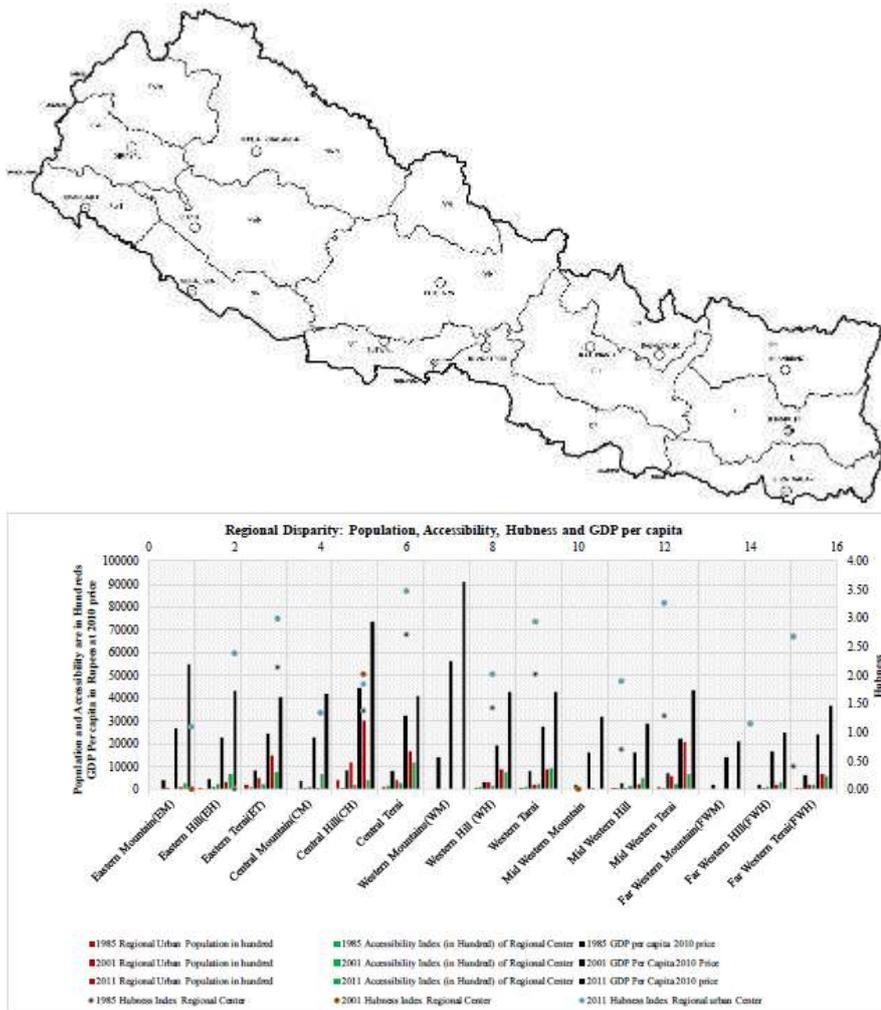


Figure 7: Regional Comparison of Urban Population, Hubness and Accessibility from 1985 to 2011

GDP Data source: Gurung (2005) for 1985 and 2001; UNDP, 2014, for population CBS

It is found that the central hill has the highest share of urban population and scored the second position in terms of Regional GDP per capita. The western mountains which do not contain any city yet secured highest regional GDP per capita since 1985. It seems that the region which has a higher share of urban population can have a higher regional GDP but it is not an essential condition.

Figure 8 below shows that the regional income inequality as measured by GINI coefficient. It can be seen that the regional income inequality has been declining smoothly over time, however, the level of inequality is severe.

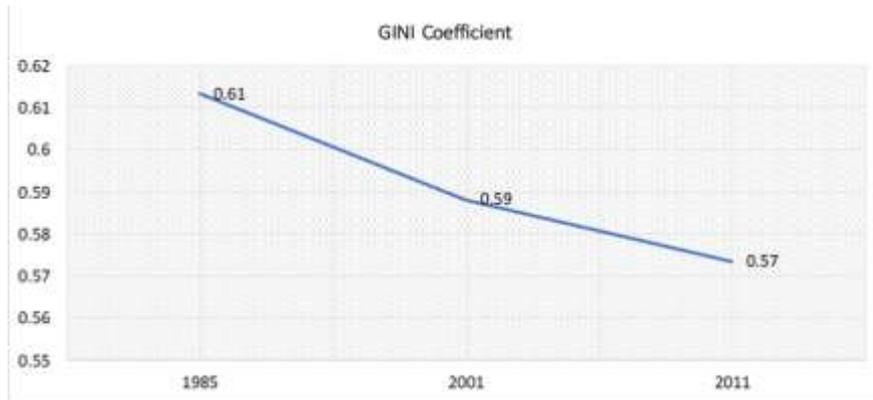


Figure 8: Regional Inequality

From above discussion, our third hypothesis is also falsified as a region that contains a bigger city might have a higher regional income per capita whereas other regions can have higher regional GDP without having a single big city. Transport investment might have a positive impact, since inequality has been declining over time. A possible explanation for the declining inequality might be transport connectivity in the later years in the lower income western regions. However, a more complex mechanism might be associated.

5 CONCLUSION AND DISCUSSION

This paper has conducted an empirical study on the impact of transport investment in urbanization and regional economy. We contest the three hypotheses that are formulated based on the New Economic Geography (NEG) in the context of a developing country, Nepal, where transport is in developing stage. The first hypothesis is 'the size of the cities is determined by their Hubness'. The Hubness of a city is calculated based on the intercity travel time. The primary hub is the city which has the highest Hubness index that is total travel time to reach the other city is lowest. We find that the cities which scored higher Hubness index are not always bigger cities. However, transport connectivity facilitates the formation of cities. The capital city Kathmandu and other bigger cities do not score higher hubness. The second hypothesis is 'a city in a developing country, which is most accessible (superior access), emerges as a big city'. We computed the accessibility index of each city for the comparison. We have found that the most accessible city is not the biggest city. The size of the most accessible city, Hetauda, does not lie even in the top-5 rank in terms of population. Therefore, this hypothesis is also invalid in the case of developing country Nepal. The third hypothesis is 'regional inequality exists because the region that contains bigger city has a higher GDP per capita. We find that this hypothesis is partially true for the case of Nepal. The highest income region does not have any city yet. But the other region that contains larger urban population has higher GDP per capita. Therefore, it can be concluded that the region that contains large urban population can have higher regional GDP per capita but it is not necessary to have a big city in the region to have higher regional GDP per capita. In addition, we found that GINI coefficient shows a smooth declination of inequality, however, the level of inequality is severe in developing countries. It is also found that the earlier connected eastern regions have higher GDP per capita as compared later connected western regions.

The falsification of the formulated hypothesis in the context of a developing country does not mean a complete rejection of the NEG theory. The NEG gives several important concepts, ideas and methods such as an introduction of transportation cost for the regional analysis. The possible explanations for the Nepal study findings might be associated with complex mechanism-for instances, the availability of natural resources which is an immobile factor, the timing gap between transport connectivity and city formation etc. Another possible direction for the improvement might be the introduction of an evolutionary concept into the NEG which is already started by Fujita and Mori (1996). There would, therefore, seem to be a definite need for further research and development of the NEG theory that can explain the phenomenon of developing countries.

REFERENCE

- Alder, Simon. 2014. "Chinese Roads in India: The Effect of Transport Infrastructure on Economic Development." *Work. Pap., Univ. North Carolina, Chapel Hill*. <https://pdfs.semanticscholar.org/343c/5b06911b40a59a33bac4a757866b2692b5b9.pdf>.
- Banister, David, and Joseph Berechman. 2000. *Transport Investment and Economic Development*. London: UCL Press.
- Bhattacharyay, Biswa Nath. 2010. "Estimating Demand for Infrastructure in Energy, Transport, Telecommunications, Water and Sanitation in Asia and the Pacific: 2010-2020." ADBI working paper series. <http://www.econstor.eu/handle/10419/53584>.
- Boschma, Ron A., and Jan G. Lambooy. 1999. "Evolutionary Economics and Economic Geography." *Journal of Evolutionary Economics* 9 (4): 411-429.
- Boschma, Ron A, and Ron Martin. 2007. "Editorial: Constructing an Evolutionary Economic Geography." *Journal of Economic Geography* 7 (5): 537-48. <https://doi.org/10.1093/jeg/lbm021>.
- Bruinsma, Frank R., Piet Rietveld, and others. 1997. "The Impact of Accessibility on the Valuation of Cities as Location for Firms." <http://dare.ubvu.vu.nl/bitstream/handle/1871/52247/19970006.pdf?sequence=1>.
- Bruinsma, Frank, and Piet Rietveld. 1993. "Urban Agglomerations in European Infrastructure Networks." *Urban Studies* 30 (6): 919-934.
- Bruinsma, Frank, and Pieter Rietveld. 1998. "The Accessibility of European Cities: Theoretical Framework and Comparison of Approaches." *Environment and Planning A* 30 (3): 499-521.
- Cervero, Robert. 2001. "Efficient Urbanisation: Economic Performance and the Shape of the Metropolis." *Urban Studies* 38 (10): 1651-

1671.

- Dash, Ranjan Ku, and Pravakar Sahoo. 2010. "Economic Growth in India: The Role of Physical and Social Infrastructure." *Journal of Economic Policy Reform* 13 (4): 373–85. <https://doi.org/10.1080/17487870.2010.523980>.
- Fujita, Masahisa, and Tomoya Mori. 1996. "The Role of Ports in the Making of Major Cities: Self- Agglomeration and Hub-Effect." *Increasing Returns, Monopolistic Competition and Economic Development* 49 (1): 93–120. [https://doi.org/10.1016/0304-3878\(95\)00054-2](https://doi.org/10.1016/0304-3878(95)00054-2).
- Ghani, Ejaz, Arti Grover Goswami, and William R. Kerr. 2012. "Highway to Success: The Impact of the Golden Quadrilateral Project for the Location and Performance of Indian Manufacturing." National Bureau of Economic Research. <http://www.nber.org/papers/w18524>.
- Gurung, Harka. 2005. "Nepal Regional Strategy for Development." *Asian Development Bank*. <https://think-asia.org/handle/11540/5071>.
- Gutiérrez, Javier. 2001. "Location, Economic Potential and Daily Accessibility: An Analysis of the Accessibility Impact of the High-Speed Line Madrid–Barcelona–French Border." *Journal of Transport Geography* 9 (4): 229–242.
- Hansen, Walter G. 1959. "How Accessibility Shapes Land Use." *Journal of the American Institute of Planners* 25 (2): 73–76. <https://doi.org/10.1080/01944365908978307>.
- Hou, Quan, and Si-Ming Li. 2011. "Transport Infrastructure Development and Changing Spatial Accessibility in the Greater Pearl River Delta, China, 1990–2020." *Journal of Transport Geography* 19 (6): 1350–60. <https://doi.org/10.1016/j.jtrangeo.2011.07.003>.
- Jin, Fengjun, Fahui Wang, and Yu Liu. 2004. "Geographic Patterns of Air Passenger Transport in China 1980–1998: Imprints of Economic Growth, Regional Inequality, and Network Development." *The Professional Geographer* 56 (4): 471–487.
- Kasraian, Dena, Kees Maat, Dominic Stead, and Bert van Wee. 2016. "Long-Term Impacts of Transport Infrastructure Networks on Land-Use Change: An International Review of Empirical Studies." *Transport Reviews* 36 (6): 772–92. <https://doi.org/10.1080/01441647.2016.1168887>.
- Kasraian, Dena, Kees Maat, and Bert Van Wee. 2015. "Development of Rail Infrastructure and Its Impact on Urbanization in the Randstad, the Netherlands." *Journal of Transport and Land Use*, September. <https://doi.org/10.5198/jtlu.2015.665>.
- Kim, Hyun-Woo, Du-Heon Lee, and Hee-Sung Park. 2013. "The Impact of Gyeongbu High Speed Rail Construction on Regional Economic Growth." *KSCE Journal of Civil Engineering* 17 (6): 1206–12. <https://doi.org/10.1007/s12205-013-0199-y>.
- Krugman, Paul. 1991a. "Increasing Returns and Economic Geography." *Journal of Political Economy* 99 (3): 483–499.
- . 1991b. "Increasing Returns and Economic Geography." *Journal of Political Economy* 99 (3): 483–499.
- . 1993. "The Hub Effect, or Threeness in Interregional Trade." *Theory, Policy and Dynamics in International Trade*, 29–37.
- . 1996. "Urban Concentration: The Role of Increasing Returns and Transport Costs." *International Regional Science Review* 19 (1–2): 5–30.
- . 1998. "What's New about the New Economic Geography?" *Oxford Review of Economic Policy* 14 (2): 7–17. <https://doi.org/10.1093/oxrep/14.2.7>.
- Lakshmanan, T.R. 2011. "The Broader Economic Consequences of Transport Infrastructure Investments." *Journal of Transport Geography* 19 (1): 1–12. <https://doi.org/10.1016/j.jtrangeo.2010.01.001>.
- Limao, Nuno, and Anthony J. Venables. 2001. "Infrastructure, Geographical Disadvantage, Transport Costs, and Trade." *The World Bank Economic Review* 15 (3): 451–479.
- Lin, George CS. 1999. "Transportation and Metropolitan Development in China's Pearl River Delta: The Experience of Panyu." *Habitat International* 23 (2): 249–270.
- Linneker, Brian J., and Nigel A. Spence. 1992. "Accessibility Measures Compared in an Analysis of the Impact of the M25 London Orbital Motorway on Britain." *Environment and Planning A* 24 (8): 1137–1154.
- Martin, R. 1999. "Critical Survey. The New 'geographical Turn' in Economics: Some Critical Reflections." *Cambridge Journal of Economics* 23 (1): 65–91. <https://doi.org/10.1093/cje/23.1.65>.
- Martin, Ron, and Peter Sunley. 1996. "Paul Krugman's Geographical Economics and Its Implications for Regional Development Theory: A Critical Assessment." *Economic Geography* 72 (3): 259. <https://doi.org/10.2307/144401>.
- Motamed, Mesbah J., Raymond J. G. M. Florax, and William A. Masters. 2014. "Agriculture, Transportation and the Timing of Urbanization: Global Analysis at the Grid Cell Level." *Journal of Economic Growth* 19 (3): 339–68. <https://doi.org/10.1007/s10887-014-9104-x>.
- Ndulu, B. J. 2006. "Infrastructure, Regional Integration and Growth in Sub-Saharan Africa: Dealing with the Disadvantages of Geography and Sovereign Fragmentation." *Journal of African Economies* 15 (Supplement 2): 212–44. <https://doi.org/10.1093/jae/ejl033>.
- Nedozi, Fidelis O., Jude O. Obasanmi, and J. A. Ighata. 2014. "Infrastructural Development and Economic Growth in Nigeria: Using Simultaneous Equation." *Journal of Economics* 5 (3): 325–332.
- NFSMS. 2016. "Nepal Food Security Bulletin." Nepal Food Security Monitoring System. <http://neksap.org.np/>.
- OECD, ed. 2009. *How Regions Grow: Trends and Analysis*. Paris: The Organisation for Economic Co-operation and Development.
- Ortega, Emilio, Elena López, and Andrés Monzón. 2011. "Territorial Cohesion Impacts of High-Speed Rail at Different Planning Levels." *Journal of Transport Geography*, no. 0. <http://www.sciencedirect.com/science/article/pii/S0966692311001591>.
- Rietveld, P., F. R. Bruinsma, H. T. van Delft, and B. Ubbels. 2001. "Economic Impacts of High Speed Trains." *Research Memorandum* 2001: 20.
- Rietveld, Piet, and Frank Bruinsma. 1998. *Is Transport Infrastructure Effective?: Transport Infrastructure and Accessibility: Impacts on the Space Economy*. Springer-Verlag, Berlin Heidelberg.
- Roberts, Mark, Uwe Deichmann, Bernard Fingleton, and Tuo Shi. 2010. "On the Road to Prosperity? The Economic Geography of China's National Expressway Network." https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1709851.
- Rodrigue, Jean-Paul. 2017. *The Geography of Transportation System*. Fourth Edition. Routledge, New York. <https://people.hofstra.edu/geotrans/eng/ch7en/conc7en/ch7c3en.html>.
- Sahoo, Pravakar, and Ranjan Kumar Dash. 2012. "Economic Growth in South Asia: Role of Infrastructure." *The Journal of International Trade & Economic Development* 21 (2): 217–52. <https://doi.org/10.1080/09638191003596994>.
- Sharma, A.K., and Ekta Vohra. 2009. "Critical Evaluation of Road Infrastructure in India: A Cross-country View." *Engineering, Construction and Architectural Management* 16 (1): 73–91. <https://doi.org/10.1108/09699980910927903>.
- Spiekermann, Klaus, and Jörg Neubauer. 2002. *European Accessibility and Peripherality: Concepts, Models and Indicators*. Nordregio.
- Spiekermann, Klaus, and Michael Wegener. 2006. "Accessibility and Spatial Development in Europe." *Scienze Regionali* 5 (2): 15–46.
- Vandenbulcke, Grégory, Thérèse Steenberghen, and Isabelle Thomas. 2009. "Mapping Accessibility in Belgium: A Tool for Land-Use

and Transport Planning?" *Journal of Transport Geography* 17 (1): 39–53. <https://doi.org/10.1016/j.jtrangeo.2008.04.008>.

Vickerman, Roger. 1997. "High-Speed Rail in Europe: Experience and Issues for Future Development." *The Annals of Regional Science* 31 (1): 21–38.

World Bank. 1994. *World Development Report 1994: Infrastructure for Development*. World Bank.

———. 2009. "World Development Report 2009: Reshaping Economic Geography." Washington DC: World Bank.

Yin, Ming, Luca Bertolini, and Jin Duan. 2015. "The Effects of the High-Speed Railway on Urban Development: International Experience and Potential Implications for China." *Progress in Planning* 98 (May): 1–52. <https://doi.org/10.1016/j.progress.2013.11.001>.

1399 IMPACT OF VEHICLE PARKING ON THE ROAD NETWORK SYSTEM OF AGARTALA CITY, TRIPURA

ABSTRACT

Diversified traffic flow and continuous demand for choosing particular vehicle in Agartala City has been increased due to the economic growth of the citizen. Vehicles require street space to move as well as the occupants require space to park. But at present, spaces are a big problem in the city. With the increasing number of motor vehicles, the problem of parking has been introduced as a serious issue in the road network system of Agartala City. Presently, out of the total road network of Agartala City 88 per cent are minor and only 12 per cent are the major roads. The present paper attempts to identify the nature of parking as well as highlight the effect of parking in the road network system in Agartala City. For the Foundation of the research work ground level survey like measuring of roads, collecting different features associated to parking through structured questionnaires, transport survey etc. were carried out at different locations of the city. Moreover, different instruments like GPS, SL4010 has also been used to locate and measure the effect of parking in the urban environment of Agartala City. From the field survey the collected data were analysed with the help of geometry of parking, measuring of Peak Hour Factor (PHF) value, Time Series Analyses of vehicle movement, statistical tools such as mean, deviation and covariance level using SPSS Software and interpretation wherever necessary with logical elucidation of the present research work. The result shows that the space required for parking are very few in Agartala City. Most of the roads are narrow in width and are incapable to facilitate the on street-parking of vehicles. This had resulted hindrances to smooth mobility in the roads causing congestion and unprecedented noisy environment. Relevant preventive measures have been suggested for reducing the problem of parking in Agartala City. Key Words: City, GIS, Parking, Traffic Flow

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1645 ROLE OF PMGSY TO CONNECT RURAL BHARAT TO URBAN INDIA: AN EVALUATIVE STUDY OF MURSHIDABAD DISTRICT

ABSTRACT

Pradhan Mantri Gram Sadak Yojana (PMGSY) is a dream project of Govt of India. Among many other objectives, developing connectivity of unconnected habitations to propel social transformation through improvement of transportation was one of the prime one. With initiation of the project in the Murshidabad in the year 2000, the connectivity with the unconnected habitations numbering 828 PMGSY schemes have been established in phases. Out of 331 PMGSY roads constructed so far in the district, presently connect as many as 5 Census Towns (CT) as terminal nodes, 3 CTs along the road and 1 statutory town as terminal end point. All together 10 roads (those constructed at least 5 years back) and adjoining areas are surveyed to assess the role of PMGASY roads in establishing connectivity of Rural Bharat to Urban India. Two roads are selected randomly from each sub-division (total sub-division in the district is 5) making a total of 10 roads. Both geographical and potential accessibilities are calculated to assess the role of PMGSY. Similarly, the change of dependency on service centres for fulfilling different needs such as health, education, marketing of agricultural produces and purchasing of agricultural inputs etc. is evaluated to see the PMGSY induced transformation of habitations. The study shows that though the schemes have been running for quite a few years, it has not been able to bring the desired change in terms of social transformation to a satisfactory level. Though the connectivity and also accessibility have improved noticeably yet the prime goal of connecting Rural Bharat to Urban India has not happened to a desired level. The present study makes an effort to assess the role of PMGSY to bring desired change of bringing visible social transformation along with bringing Rural Bharat and Urban India more close through enhanced connectivity.

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RS04.2. Infrastructure, Transportation and Accessibility

1037 UNIVERSAL ACCESS ASSESSMENT AT RELIGIOUS TOURIST SPOTS OF INDIA USING GEOSPATIAL TECHNIQUE**Kakoli Saha¹, N.R. Mandal², Rachna Khare³**^{1,2}. Department of Planning,³Department of Architecture, School of Planning and Architecture, Bhopal-462030, India.Email: kakolisaha@spabhopal.ac.in.**ABSTRACT**

Religious tourism to sacred places has a long history in India. 'Tirthayatra', or pilgrimage, has been an important practice in Hinduism since ancient times. All the other old religions which have roots in India, such as Buddhism, Jainism and later, Sikhism also have practices of pilgrimage making it an important element of social life in the country. While differently abled and aged are a significant part of the pilgrims, most of the sacred sites in India lack facilities required for universal access. To address this and related other issues, lately, there has been an initiative by Government of India: 'Accessible India Campaign' (launched in December 2015) in consonance with the Article 9 of UN Convention on the Rights of Persons with Disabilities. This paper discusses the possibilities offered by geospatial technologies with the aim of assessing universal accessibility at religious tourist spots. Ujjain City of Madhya Pradesh, India has been selected as a case study. With more than 5000 years old history, Ujjain is one of the renowned Hindu places of pilgrimage in India. The sacred sites of Ujjain City include temple complexes, ancient monuments, lakes, bathing steps (*ghats*) along the river Kshipra, pilgrim routes, historic urban squares and townscapes. Major road stretches at some of these pilgrimage sites, locations of disembarking from inter-city vehicular /railway travel and pilgrim routes within Ujjain city were selected and mapped in GIS platform. An accessibility audit was performed along the selected road stretches/locations using a purpose made checklist suitable in the Indian context and the same has been spatially represented. Further, a hierarchy of accessibility issues has been developed to identify dominating factors and prioritize actions. The proposed method would help the local authority to plan for making Ujjain City more accessible for differently abled and aged visitors and help in increasing its revenue from tourism. The proposed method may be adopted by other such cities endowed with religious destinations.

Key words: universal accessibility, religious tourism, GIS**1. INTRODUCTION**

An architect and disability advocate Ron Mace, first gave the term universal design and defined it as "The design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design" (Mace and Lusher, 1989). The concept has been re-thought and re-defined by diverse writers around the world. Today, it is recognized that the goal of universal design must go beyond usability to address promotion of health and wellness and also promotion of social participation for all citizens.

Unlike western countries where the concepts of accessibility and universal design originated, Indian disability is ingrained in poverty, rural life and social difference (Mullick, 2011). Today, in India, majority of elderly, people with disabilities and children live in a physical environment which is either unplanned or underdeveloped. Every person develops his concept of 'self' by the interaction with his environment and get educated, encourage and inspired by the series of experiences he has with his surroundings. If his/her access to environment is limited, his self image is negatively impacted. Religion being reflection of our history, culture and identity, it is important to make religious buildings and sites accessible for all members of the society including person with disabilities.

In Indian community, traditions are deeply rooted despite modern lifestyle. One such traditional practice is pilgrimage that almost all religions follow, in one form or the other. The ancient city of central India, Ujjain is situated in the Malwa region of Madhya Pradesh, on the eastern bank of river Kshipra. The religious importance of the town has made it one of the most prominent pilgrimage sites for Hindus with the divine presence of Mahakaleshwara Jyotirlinga and auspicious Mahakumbha mela that is held after every twelve year. With an annual pilgrimage volume of 75 million there is utmost need to make Ujjain accessible to everyone including people with functional limitations. Greater accessibility will benefit everyone and contribute also to the quality of life of its residents, and residents with disabilities in particular.

This paper discusses the tools, planning and implementation processes of accessibility assessment in the unique and complicated nature of the old city of Ujjain, a model for other historic pilgrimage cities of India.

2. BACKGROUND STUDY

The concept and framework of accessible tourism is a neglected area both in the academics and industry in India. As a result, very little information and knowledge is available in this context. At the government level also, hardly any credible documentations are available to provide clear understanding of the subject (Problems and Prospects Of Accessible Tourism In India, 2010).

A study by National Council of Applied Economic Research (NCAER) was indeed revealing of the socio-economic and touring behaviour of Indian households but it was short of specific information on persons with reduced mobility and the disadvantaged groups. Indian Institute of Tourism and Travel Management has recently (October, 2010) published a report on problems and prospects of accessible tourism in India (Problems and Prospects of Accessible Tourism in India, 2010). Main objectives of the study were set to examine various socio-economic and travel-related attributes of the tourists with reduced mobility, their major issues and constraints during different stages of travel and the potential of

developing inclusive tourism market as special-interest visitor segment. Six attractions, essentially historico-cultural in nature, such as Taj Mahal (Agra), Amber Fort (Jaipur), Qutab Minar (Delhi), Sun Temple (Konark), Mamallapuram (T.N) and Old Goa churches were selected for this study. A total of 1205 tourists with reduced mobility were surveyed as part of the study. To finalise the sample size at each location, quantum of visits in a year at each one was considered.

The study found that disabled tourists have to face many barriers at booking stage itself. The major ones are poor understanding of their specific problems and requirements by the booking staff and the inhospitable attitude; a pattern commonly reported by both domestic & foreign tourist. During journey in general, intra-destination travel is most difficult part indicating the lack of accessible taxis & local transport infrastructure and facilities, followed by other constraints like lack of proper information and inadequate signages at necessary points and intersections. There are other noticeable constraints as well such as non-availability of personal aids and equipments at the stations and in the vehicles, locating affordable and accessible accommodation and lack of knowledge about their specific problems among ground staff. However, till date, universal accessibility assessment has not been performed for any pilgrimage city in India (Problems and Prospects Of Accessible Tourism In India, 2010).

The problems encountered at places of stay equally also merit serious attention. Major ones falling in the group are lack of necessary facilities in the rooms meant for tourists with disabilities/reduced mobility, lack of understanding about their special needs and inappropriate location of such rooms. Absence of lift and inaccessible lobby also call for major interventions. At tourist attractions also, there are many barriers such as absence of accessible toilets or its unhygienic condition, non-availability of public utilities and the like. Their easy movement inside the site is also hampered due to the constraints attributable to scarcity of ramps, lifts, signage and slippery/coarse tracks (Problems and Prospects Of Accessible Tourism In India, 2010).

The above mentioned findings helped to select parameters to be included in Universal Accessibility Assessment of Ujjain City. The detailed methodology is explained in section 4.

3. STUDY AREA AND DATA USED

Ujjain city of Madhya Pradesh is selected as case study area because with more than 5000 years old history, Ujjain is one of the renowned Hindu places of pilgrimage in India (fig1A).

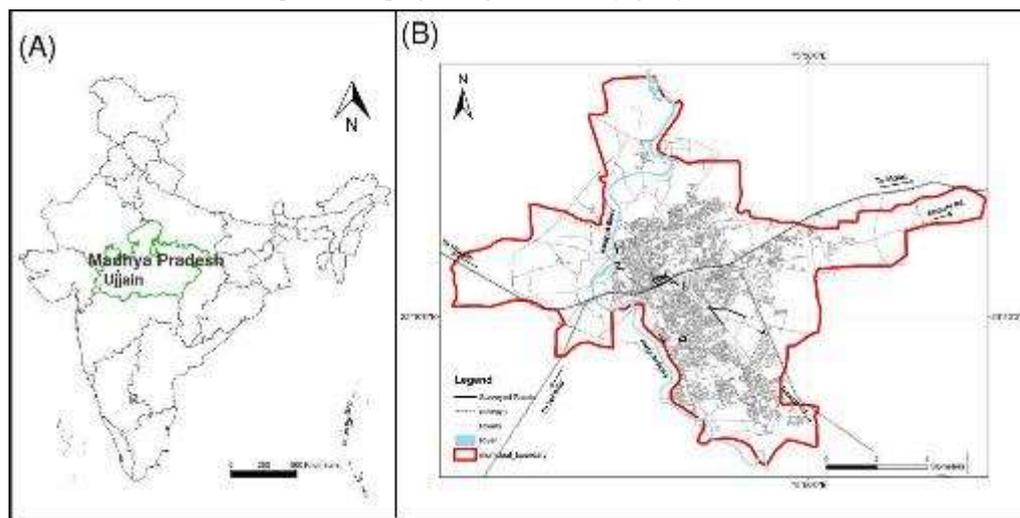


Figure 1: A. location of Ujjain city in India, B. Ujjain Municipal Boundary representing Ujjain city

Since the study was aimed to assess accessibility of religious tourists, the accessibility audit has been performed along the roads within the road network of the city. Since all roads of Ujjain City can not be covered, 17 road stretches was selected to perform the accessibility audit survey (fig1B).

For this study, data is collected through both primary and secondary sources. The road network of Ujjain City is digitized in the GIS platform. To assess the universal accessibility of identified road stretches an accessibility audit checklist was prepared from secondary sources (refer section4.2.1).

4. METHODOLOGY

The methodology for Universal Access Assessment of road stretches within Ujjain city is comprised of two steps -1) Selection of Road Stretches 2) Preparation of Audit Checklist and Performing the Universal Accessibility Survey using the checklist.

4.1. Selection of Road Stretches

The study was aimed to assess accessibility and to make the city accessible, roads play a very important role. Since all roads of Ujjain city could not be covered due to resource constrain, the roads stretches were divided into three categories such as, 1. Road stretches along city entry points, 2. Road stretches along city entry points to accommodation points, 3. Road stretches along heritage sites.

Six road stretches were selected for the first category, eight were selected for second category and three were selected for third category. The selection was done on the basis of footfall of religious tourists. To map the selected road stretches, a road network map of Ujjain City was prepared in GIS platform and then the identified road stretches were marked (fig.1B).

4.2.1. Preparation of an Audit Checklist for Universal Accessibility Assessment of Ujjain City

Two types of checklists were prepared to assess universal accessibility of selected road stretches such as one for City Entry Points including railway station and bus stand and another is for Public Realms including road stretches along arrival points in the city to accommodation points and along accommodation points to heritage sites. The checklists were prepared referring relevant guidelines and checklists such as, Access-improving the accessibility of historic buildings and places (2011), Code of Practice-on Accessibility of Public Services and Information provided by Public Bodies – National Disability Authority, Dublin, Ireland, Improving Access to Heritage Buildings (1999), Accessible Route in Historical Cities (2013), Harmonised Guidelines (2016). Main parameters of the checklists are mentioned in the table 1.

Table 1 Showing Parameters for Access Audit at City Entry Points

At city entry points (railway station, bus stands)	Standard
<p>1. Reservation and information counters</p> <p>1.1. Should have clear floor space in front of the counters of at least.</p> <p>1.2 There should be at least one low counter at a height of from the floor with clear knee space.</p> <p>1.3. The counters should have pictographic maps indicating all the services offered.</p> <p>1.4. On entry and exit should have a minimum width and is level or ramped.</p> <p>1.5. Approach walkway should have tactile pavements for persons with visual impairments.</p>	<p>900 x 1200 m 750 to 800 mm</p>
<p>2. Toilet Facility</p> <p>2.1. Are the toilets accessible to all user groups?</p> <p>2.2. Are the toilets easily identifiable?</p> <p>2.3. Can the grab bars withstand the user load ?</p> <p>2.4. Can doors be locked from inside and releasable from outside under emergency situations?</p> <p>2.5. Is there a unisex accessible toilet ?</p> <p>2.6. Is there colour contrast between the floor, wall and sanitary fittings?</p> <p>2.7. Are there proper signages installed defining the toilet location?</p> <p>2.8. Are signages provided in braille and tactile format?</p> <p>2.9. Are these switches installed at operable height?</p> <p>2.10. Is it a firm, levelled, slip-resistance, free from trip hazards ?</p> <p>2.11. Is it provided with tactile paving/tiles or not for visually impaired persons?</p>	
<p>3. platforms (train)</p> <p>3.1. Should have a row of tactile warning blocks installed before the track edge.</p> <p>3.2. Should have non-slip and level flooring.</p> <p>3.3. Should have seating areas for people with ambulatory disabilities (paralysis)</p> <p>3.4. Should Be well illuminated.</p> <p>3.5. There should be no gap or difference in level between the train entry door and the platform.</p>	<p>400mm-600mm</p>
<p>4. Signages</p> <p>a Does the signages inform the user a route, a hazard, or a facility.</p> <p>b. Are the signs clear, concise, and consistent?</p> <p>d. Information may take the form of visual information (e.g. signs, notice boards)</p> <p>4.1. Signages provision</p> <p>4.1.1. Information and direction signs should be provided at junctions of circulation routes and key destinations.</p> <p>4.1.2. Directional signs should readily identify and provide a logical sequence from a starting point to a point of destination.</p> <p>4.1.3. A clear indication of named exits.</p> <p>4.1.4. A clear indication of the existence of steps or ramps on a route should be provided at both ends of the route.</p> <p>4.1.5. Signs to facilities for Persons with Disabilities should incorporate the International Symbol for Accessibility</p> <p>4.1.6. Colour to be Navy Blue with White lettering.</p> <p>4.1.7. Signs should be provided to inform persons with hearing impairment (eg. hearing enhancement systems).</p> <p>4.1.8. A wall mounted or ceiling hung information board should be provided at lift landings, floor level landings of staircases, junctions/intersections and in main circulation routes.</p> <p>4.2. Directional Signage</p> <p>Signages include directional arrows to direct users to specific areas or elements within an area</p> <p>4.3. Information</p> <p>Information signs include directions, maps, building identification signs, notices and interpretative signs.</p> <p>4.4. Identification</p> <p>Should identify entrances, street addresses, buildings, rooms, facilities, places and spaces.</p> <p>4.5. Location</p> <p>4.5.1. Signs should be provided at all sites, campus, developments and buildings.</p> <p>4.5.2. Signage including approach to building / facility / service, entrance / exit, main lobby or reception, public facilities.</p> <p>4.6. Universal Signage</p>	

<p>4.6.1.Colour Contrast Signs 4.6.1.1. The commonly employed colours are white for the figure and blue for the background. 4.6.1.2. Safety signs use primarily red, yellow and green as information colours.</p> <p>4.6.2. Basic principles 4.6.2.1. Should be Tactile embossed with Braille. 4.6.2.1. Minimal use of bold letters.</p> <p>4.6.3. Pictograms 6.6.3.1. Signage should incorporate a combination of lettering and symbols. 6.6.3.2.Signs should be located where they are clearly visible. 6.6.3.3.Wall-mounted signs that contain timetables,maps or diagrams, should be centered from the ground around. 6.6.3.5.Are ceiling suspended signs above head height at from floor level?</p> <p>6.6.3. Pictograms 6.6.3. 1.Signage should incorporate a combination of lettering and symbols. 6.6.3. 2.Signs should be located where they are clearly visible. 6.6.3. 3.Wall-mounted signs that contain timetables,maps or diagrams, should be centered from the ground around. 6.6.3.4.Are ceiling suspended signs above head height at from floor level?</p>	
<p>5. Seating Area 5.1.Persons in wheelchairs should have a clear and level floor space. 5.2.Clear knee space of at least,wherever a forward approach is used.</p>	
<p>6. Kerb ramps 6.1.Should provided where the vertical rise is less than 150 6.2. Should have a slip-resistant surface; 6.3. Should be designed not to allow water accumulating on the walking surface; 6.4. Should not project into the road surface; 6.5.Should be located or protected to prevent obstruction by parked vehicles 6.6. Should be free from any obstruction such as signposts, traffic lights, etc.</p>	>150m
<p>7. Ramps 7.1. General 7.1.1. Should provide accessibility by both steps and ramps. 7.2.Gradient 7.2.1. It should be noted that the gradient should be constant between landings. 7.3.Width 7.3.1. The minimum clear width of a ramp should not be less than 1800mm 7.4.Surface 7.4.1.Ramps and landing surfaces should be slip resistant 7.4.2. Ramps surface should be designed to prevent water from accumulating on the walking surfaces. 7.5. Landings 7.5.1.Ramps should have a level landing at the top and bottom of each run. 7.5.2.Landings should be at regular intervals 7.6. Handrails 7.6.1. A ramp should have handrails which run with a vertical rise. 7.6.2. Handrails should be provided with Braille/ tactile markings 7.6. 3. Should be slip-resistant with round ends. 7.6.4. should have a circular section in diameter of 7.6.5. Should have a minimum clear space from the walls of</p>	1800mm 900mm from ground
<p>8. Walks and paths 8. 1.Walks should be smooth, hard and have levelled surface suitable for walking and wheeling. 8. 2.Minimum walk way width for two way traffic should be more than 1500mm 8. 3.Pathways should have rest areas at equal intervals 8. 4.Seat height should be between seats should have a backrest and hand rests at height. 8. 5.Texture change should be provided for persons with vision impairment. 8. 6.Gratings and manholes in walks should not be provided. 8.7.Is the route clearly defined and visible? 8.8.Are these accessible by different user groups? 8.9.Is the width of pathway sufficient for all users? 8.10.Is the width sufficient for single wheel chair user? 8.11.Is the width sufficient for single wheel chair user with one person? 8.12. Is the route clearly defined and visible? 8.13. Are these accessible by different user groups? 8.14. Is the width of pathway sufficient for all users? 8.15. Is the width sufficient for single wheel chair user? 8.16. Is the width sufficient for single wheel chair user with one person? 8.17. Do they have proper gradient ? 8.18. Is it a firm, levelled, slip-resistance,free from trip hazards ? 8.19. Is it provided with tactile paving/tiles or not for visually impaired persons? 8.20. Are accessible spaces identified by the signages? 8.21. Are signs clear,simple,and easy to read? 8.22. Are the signages in contrasting colours?</p>	1800mm 450-500mm 900MM 900MM 1200MM

8.23. Are these signs placed at sufficient height? 8.24. Do the signages comply with the standard size? 8.25. Are the signs supplemented by braille formats? 8.26. Is the tactile layout plan available with audio system? 8.27. Are all the signs properly illuminated?	
9. Stairs 9.1. Treads should be deep not less than 250mm 9.2. Risers not higher than 150mm 9.3. The stairs landing should be not less than 1000mm 9.4. Steps should be of a consistent height and depth throughout the staircase. 9.6. There should be colour contrast between landings, and the steps.	
10. Lifts 10.1. Lifts should be marked with the symbol of accessibility and directional signs. 10.2. The sign should incorporate a representation of the International Symbol for Access.	
11. Tactile Guiding & warning blocks 11.1. Single row of tactile warning blocks should be placed at beginning and end of each ramp. 11.2. Warning blocks should be installed in the beginning and end before end of each flight of step. 11.3. Approach walkway should have tactile pavements for persons with visual impairments. 11. 4. Is toilet provided with tactile paving/tiles or not for visually impaired persons? 11.5. 4. Braille and tactile signage should be placed at a height above the finished floor level between 11. 6. tactile information (e.g. signs with embossed lettering or Braille). 11.7. Is Visual and tactile information is reinforced by audible information? 11.8. There are no obstacles, such as trees, poles or uneven surfaces, along guidance blocks.	

Same checklist has been made for road stretches at public realm. While parameters like Signages, Kerb Ramps, Tactile Guiding & warning blocks remain constant other parameters like Traffic signals, Parking Space, Approach to Building, Planned Pedestrian routes, Subways and Foot Over Bridges are added. Details of added parameters are shown in table 2.

Table 2. Parameters for road stretches in Public Realm

At road stretches	Standard
1. Subways and Foot Over Bridges 1.1. Should have provision of signage at strategic location. 1.2. Should have provision of slope ramps or lifts at both the ends to enable wheelchair accessibility. 1.3. Is the width of the walkways at least? 1.4. Should have provision of tactile guiding and warning blocks along the length of the walkway. 1.5. Providing for seats for people with ambulatory disabilities at regular intervals along the walkway and at landings.	
2. Traffic signals 2.1. Pedestrian traffic lights should be provided with clearly audible signals. 2.2. Acoustic devices should be installed on a pole at the point of origin of crossing. 2.3. The time interval allowed for crossing should be programmed according to the slowest crossing persons.	
3. Kerb Ramps (Already mentioned in table 1)	
4. Tactile Guiding & warning blocks (Already mentioned in table 1)	
5. Barriers and hazards 5.1. Obstacles such as lighting columns, bollards, signposts, seats and trees, should be located at or beyond the boundaries of walkways. 5.2. Protruding objects in the access route should contrast visually with the background environment. 5.3. Free-standing columns should not be positioned within the width of an access route. 5.4. Bollards should be avoided but where necessary be at least at the height of 5.5. Provide a wheelchair passage width of at least. 5.6. Hazard protection should be provided. 5.7. finished walk surface should not protrude more than.	1000mm 900 mm 100 mm
6. Parking Space 6.1. Are they located nearest to the entrance? 6.2. Are there signages installed? 6.2. Is the parking area provided with shelter? 6.3. Is the parking area levelled? 6.4. Is the parking area non-slippery? 6.5. Is there a tactile floor guidance in the parking area available for independent mobility for persons with blindness and low vision? 6.6. Is there a tactile floor guidance from the emergency exit to the parking area? 6.7. Gradient along the pathway not less than 1:12? 6.8. Is there a parking lot available for visitors and staff? 6.9. Are there bays reserved for person with disabilities? 6.10. illumination level minimum 40 lux 6.11. lighting is available with 4 mtr radius? 6.12. Any Public telephone available 6.13. Alternative mode of transport to entrance from long way parking 6.14. Is there any other mode of transport if parking on site is not present? 6.15. If it's outside the site, then at what distance? 6.16. Are there signages installed?	

6.17. Is there a tactile floor guidance in the parking area available for independent mobility for 6.18. persons with blindness and low vision? 6.19. Is there a tactile floor guidance from the emergency exit to the parking area? 6.20. Gradient along the pathway not less than 1:12? 6.21. Is there kerb ramp provided in case of level change?	
7. Approach to building 7.1. Should not project into the road surface; 7.2. Should be located or protected to prevent obstruction by parked vehicles; and 7.3. Should be free from any obstruction such as signposts, traffic lights, etc. 7.4. Minimum width of the walkway should be. 7.5. Walkway should be constructed with a non-slip material. 7.6. The walkway should be cross vehicular traffic. 7.7. Warning blocks at before and after finishing of the walkway should be provided. 7.8. Should be provided at the level of approach for Persons with Disabilities to alight from and board a vehicle. 7.9. Difference in level between the driveway and footpath level surface should be avoided. 7.10. The driveway and the pavement or footpath surfaces should be blended to a common level or ramped. 7.11. Passenger alighting and drop off points 7.12. Should provide an access aisle of adjacent and parallel to the vehicle pull-up space at least width and height of. 7.13. The accessible aisle must be at the same level as the vehicle. 7.14. There should be kerb ramps provided. 7.15. Should have identification signage. 7.16. Wherever possible, it should be sheltered. 7.17. Tactile floor guidance be provided from the building drop off area leading up to entry.	1800mm 300mm
8. Planned Pedestrian routes 8.1. Is there any arrival plan or route described? 8.2. Do these points are provided with sittings or not? 8.3. If yes, are these covered? 8.4. Do they have provision for people like pregnant woman, elderly, etc. ? 8.5. Is there any assistance provided by the staff?	
9. Signages (Already mentioned in table 1)	
10. Sidewalks and footpaths 10.1. Is it non-slip floor surface? 10.2. Is it along the entire length of the road? 10.3. Should be not more than height of 10.4. Should be at least width. 10.5. Is it tactile guiding blocks for persons with visual impairments provided? 10.6. Is it have well defined edges of paths and routes by use of different colours and textures? 10.7. Do the footpaths have a clear headroom of at least height from the floor level. 10.8. Should have tactile warning blocks installed next to all entry and exit points from the pathway.	120mm 1800mm 2000mm

4.2.2. Performing Universal Accessibility Survey

Using the checklist mentioned above, surveys to assess universal accessibility was performed. The distance of road stretches were within 1 km. Students were sent to each stretch with appropriate audit checklists mentioned above. At city Entry points, students record information against each sub-parameter in the check list (Table 1) in the form of “Yes” and “No.” Each “Yes” is counted as one and the ones are added up to give total score for that parameter. After giving scores to individual parameter, total accessibility score was calculated in percentage for each stretch and then a comparison was performed within stretches.

Each stretch belong to Public Realm stretch was divided into six points and six students record information against each sub-parameter in the check list (table 2) in the form of “Yes” and “No.” Each “Yes” is counted as one and the ones are added up to give total score for that parameter. After giving scores to individual parameter, total accessibility score was calculated in percentage for each stretch and then a comparison was performed between stretches.

5. ANALYSIS AND DISCUSSION

Since the road stretches were divided into three categories the analysis of was also performed in three steps.

5.1. Analysis of survey at road stretches along City Entry Points

Since rail and road are the two prime modes of transportation at Ujjain city, railway stations and bus stands were considered as city entry points. 6 stretches were selected within Ujjain Railway Station, Vikram Nagar Railway Station, Nanakhera Bus Stand, and Raja Bhau Bus Terminal (fig.2).



Figure 2. A. Map showing platform no. 1, 2, 3, 5 of Ujjain Railway station and Vikram Nagar station. B. Platform Number 1, C. Platform number 2, 3, D. Platform number 5, E. Vikram Nagar station, B1 and B2 is Nana Khera Bus Terminal, C1 & C2. Raja Bhau Bus Terminal.

After performing accessibility audit and total accessibility score in percentage was calculated for each stretch (Table 3).

Table 3. Comparison of accessibility score between City Entry Points Stretches

		Ujjain Railway Station PF-1	Ujjain Railway Station-PF2,3	Ujjain Railway Station-PF-5	Vikram Nagar Station	Nankhera bus terminal	Raja Bhau Bus Terminal
	Maximum score	Accessibility score	Accessibility score	Accessibility score	Accessibility score	Accessibility score	Accessibility score
Reservation and Information Counters	5	2	0	1	1	2	2
Toilet facility	11	2	2	2	0	0	2
Lifts	2	2	1	1	0	0	2
Seating Area	2	2	1	2	1	2	2
Ramps	13	3	7	9	9	4	0
Tactile Guiding & warning blocks	8	3	0	3	3	0	0
Stairs	6	4	3	4	1	3	3
Kerb ramps	6	4	0	1	5	1	4
Signages	27	11	16	6	8	6	6
Walks and paths	27	11	3	13	16	15	7
Platforms	5	0	4	5	4	2	0
Total Audit Score	112	56 (50%)	59 (53%)	47(48%)	35 (32%)	35 (31%)	28 (25%)

According to the table 3 platform (PF) no. 2 and 3 of Ujjain Railway Station has scored highest with 53% of total accessibility score and Raja Bhau Bus Terminal scored lowest with 25% of total accessibility score. High score in signages contributed to the highest score of PF no.2 and 3. On the other hand, nil to low score in every parameter has contributed to the lowest score for Raja Bhau Bus Terminal. Detail investigation of accessibility status of stretches in individual parameters reveal that though PF no. 2 and 3 scored highest among other stretches, it scored nil in some of the individual

parameters like Reservation and Information Counters, Tactile Guiding & warning blocks, and Kerb ramps. Both of the bus stands scored zero in the parameter Tactile Guiding & Warning Blocks. To investigate the matter more closely total accessibility score in percentage was calculated for each parameter (fig.3).

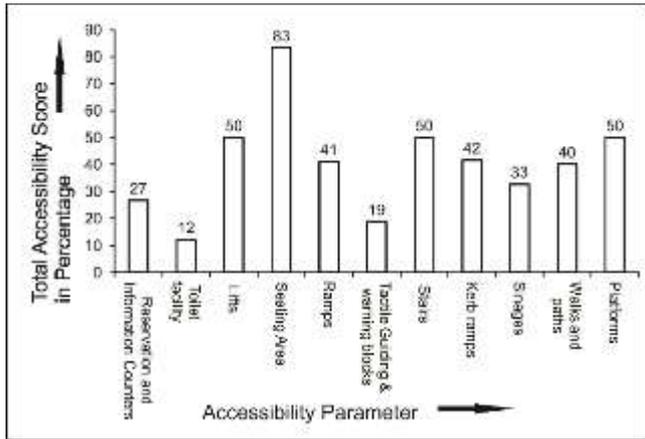


Figure 3: Parameter wise total accessible score in percentage for major City Entry Points

According to fig.3, Toilet Facility and Tactile Guiding & Warning Blocks have lowest accessibility scores (12% and 19% respectively). Since railway stations and bus stands are the transit places, tourists spend quality time in these locations. Considering this fact, toilet is a must have facility for these locations.

As Hindus belief in rebirth, there is a deep rooted belief that disability is the god’s way of punish people for their previous life’s sin and by performing pilgrimage is the way of get rid of the curse. As a result, Ujjain City is visited by a huge number of religious tourists with disability. In this context, improvement in Tactile Guiding & Warning Blocks is necessary for this area.

5.2. Analysis of survey at road stretches along city entry points to accommodation points

Eight such stretches were selected throughout the city where majority of accommodation centres including hotels and lodges are located (fig.4).

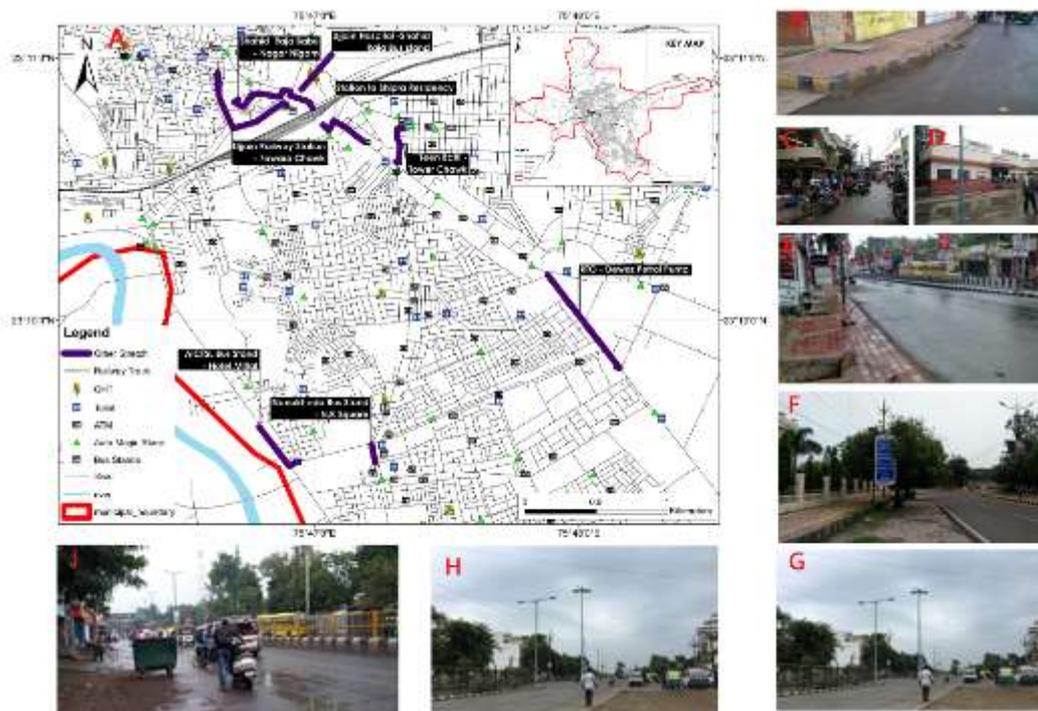


Figure 4. A. Map showing eight stretches including arrival points to accommodation points. B. Ujjain Hospital to Shahid Raja Babu Bus Stand, C. Shahid Raja Babu Bus Stand to Nagar Nigam (Municipality), D. Ujjain Railway Station to Shipra Residency (hotel), E. Teen Batti to Tower chawk (stretch along most of the accommodation points are located), F. RTO to Dewas Petrol Pump, G & H Nankhera Bus stand to N.K. Square, I, Ujjain Railway Station to Fawara Chowk.

The survey was conducted and total accessibility score in percentage is calculated for each stretch (table4).

Table 4. Comparison of accessibility score between different stretches along city entry points to accommodation points

Stretch	Ujjain rly station to	RTO to Dewas	Ujjain hospital-Shahid	Shahid Raja bhau bus	teen batti to tower chalk	Nana khera bus stand to	Ujjain Raily station to	AICTSL bus stand

		shipra residency	Petrol Pump	Raja bus stand	stand to Nagar Nigam		nanakhera bus stand square	Fawara chalk	to hotel Mittal
	Maximum score	Accessibility score	Accessibility score	Accessibility score	Accessibility score	Accessibility score	Accessibility score	Accessibility score	Accessibility score
Subways and Foot Over Bridges	30	0	0	0	0	0	0	0	0
Traffic signals	18	0	0	0	0	0	0	0	5
Kerb ramps	36	0	5	0	0	0	0	0	24
Tactile Guiding & warning blocks	36	0	0	0	0	0	0	0	0
Barriers and hazards	42	0	20	0	0	0	2	0	8
Parking Space	126	3	24	8	2	7	6	1	37
Approach to building	102	4	34	3	0	0	6	0	54
Planned Pedestrian routes	30	0	6	0	5	0	0	0	9
Signages	186	8	54	6	29	6	20	0	40
Sidewalks / Footpaths	48	8	35	10	16	10	0	0	21
Total Audit Score	654	23 (4%)	178 (27%)	27 (4%)	52 (8%)	23 (3.5%)	44 (6.7%)	1 (0.15%)	198(30%)

According to table 4, the stretch from AICTSL bus stand to hotel Mittal score highest with 30% of accessibility score and Ujjain Railway Station to Fawara Chowk (fig.4) scored lowest with 0.15% of accessibility score. High accessibility score in the parameters like Parking Space, Approach to Building, Sidewalks/Footpaths contributed to the high accessibility score. On the other hand, zero score in every parameter other than Parking contributed to the lowest score for road stretch along Ujjain Railway Station to Fawara Chowk. All seven stretches scored zero in three important parameters like Subways and Foot Over Briges, Traffic Signals, Tactile Guiding & Warning Blocks. To investigate the matter more closely, total accessibility score in percentage was calculated for each parameter (fig 6).

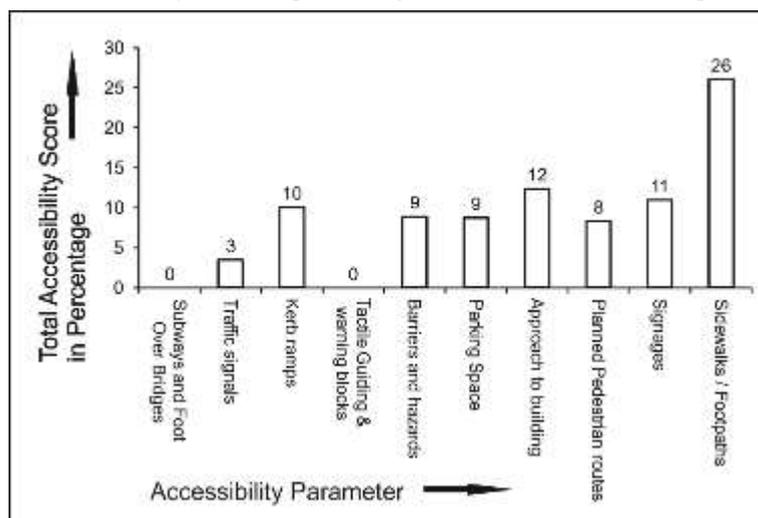


Figure 5. Parameter wise total accessible score in percentage for road stretches along City Entry Points to Accommodation Points

According to fig 5, parameters like Subways & Foot Over Bridges and Tactile Guiding & Warning Blocks scored nil as none of the road stretch has it. It implies the fact that the city lacks those accessibility infrastructure where high investment is required.

5.3. Analysis of survey at road stretches along Heritage Sites

Out of 17, 3 stretches were selected at heritage sites which include temples, bathing ghats along river Kshipra, and palace of the old ruler of Ujjain (fig.6).

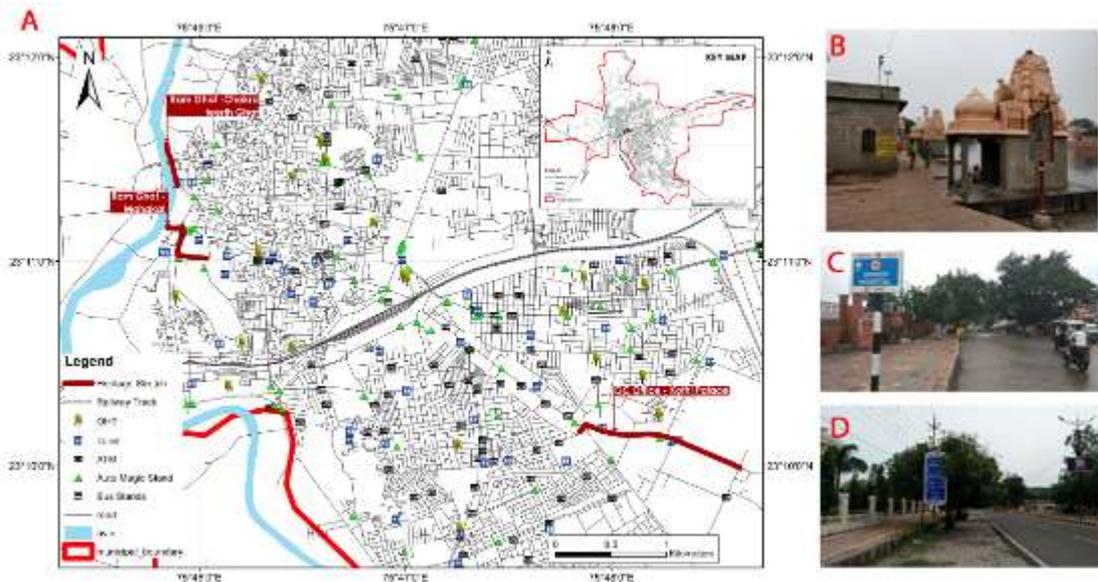


Figure 6. A. Map showing heritage stretches, B. Ram Ghat to Chakra Teerth Ghat (heritage bathing places), C. Ram Ghat to Mahakal temple, D. DC office to Kothi Palace.

After performing the accessibility survey and total accessibility score in percentage was calculated for each stretch and comparison was done (table5).

Table5. Comparison of accessibility score between heritage stretches

		Ramghat to Mahakal	Ramghat to Chakrateerth Ghat	DC Office to Kothi palace
	Maximum score	Accessibility score	Accessibility score	Accessibility score
Subways and Foot Over Bridges	30	0	10	0
Traffic signals	18	0	0	0
Kerb ramps	36	0	0	0
Tactile Guiding & warning blocks	36	0	5	0
Barriers and hazards	42	2	16	0
Parking Space	126	3	26	15
Approach to building	102	4	25	15
Planned Pedestrian routes	30	6	5	3
Signages	186	15	32	34
Sidewalks / Footpaths	48	93	22	16
Total Audit Score	654	128 (19%)	141(21%)	83(12%)

According to table5, Ramghat to Chakrateerth Ghat scored highest (21%) among three stretches. Highest score in multiple parameters such as Subways and Foot Over Bridges, Tactile Guiding & Warning Blocks, Barriers and Hazards, Parking Space and Approach to Building has contributed to the high score. On the other hand, the stretch representing DC Office to Kothi palace scored lowest (12%) because the stretch scored nil in parameters like Subways and Foot Over Bridges, Traffic signals, Kerb ramps,. To investigate the matter more closely, total accessibility score in percentage was calculated for each parameter (fig.7).

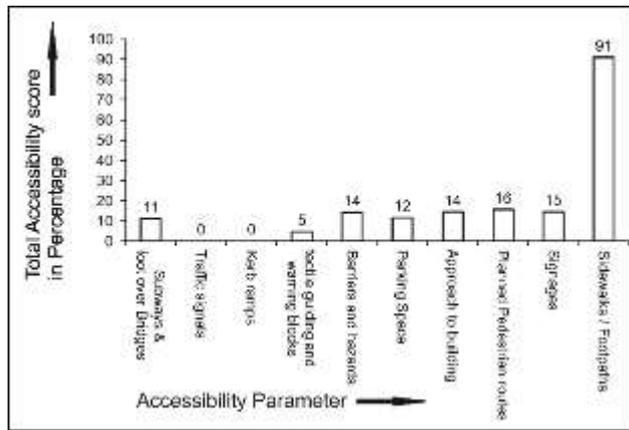


Figure7. Parameter wise total accessible score in percentage for road stretches along Heritage Sites

According to figure7, parameters like Traffic Signal, Kerb Ramp and Tactile Guiding & Warning Blocks needs attention as these parameters scored nil to lowest (5%). Ramghat is a bathing area along Kshipra River, where Hindu pilgrims takes holy dip. Due to this reason, the road stretch along the Ramghat experience huge crowd during every religious occasion.

While undertaking actions for improving accessibility, city authorities would find a multitude of issues to be addressed. However, since fund has to be allocated to bring improvements, these issues can be prioritised according to the monetary allocations so city authorities can improve these issues according to priority list. For that purpose, a hierarchy of accessibility issues has been developed from above analysis to identify dominating factors and prioritise actions. Table 6 summarises the issues for each stretch type.

Table 6. Accessibility issues in each stretch which needs to be addressed on priority basis

Stretch type	Issues needs to be addressed priority basis
1. Road stretches along city entry points	Toilet Facility and Tactile Guiding & Warning Blocks
2. Road stretches along city entry points to accommodation points	Subways & Foot Over Bridges and Tactile Guiding & Warning Blocks
3. Road stretches along heritage sites	Traffic Signal, Kerb Ramp and Tactile Guiding & Warning Blocks

6. CONCLUSION

According to Census India- 2001 figures, the size of the accessible market i.e. disabled persons, their family members/ dependents and other potential people with reduced mobility like those above 60 years works out to be 18.11% of India's population (Problems and Prospects Of Accessible Tourism In India, 2010). It is further estimated that 46.58 million Indian people with reduced mobility is economically significant from tourism angle. It means, promotion of accessible tourism in India can contribute significantly in revenue generated by tourism.

This paper aims to assess universal accessibility at religious tourist spots of India. Ujjain City of Madhya Pradesh, India was chosen as a case study since Ujjain is one of the renowned Hindu places of pilgrimage in India. Accessibility assessment of Ujjain was performed along the road stretches, as roads play an important role to improve the accessibility of a city. For that purpose, entire road network of Ujjain city was mapped in GIS platform. Further, road stretches were categorized into three types such as 1. Road stretches along city entry points including railway stations and bus stand, 2. Road stretches along city entry points to accommodation points, 3. Road stretches along heritage sites including temples and bathing *ghats*. From these three types of road stretches, six, eight and three road stretches were selected respectively on the basis of footfall of religious tourists. To assess the Universal Accessibility of these road stretches, two access audit checklists were prepared from secondary sources. The checklist for assessing accessibility of road stretches along City Entry Points include parameters which are relevant to its location such as Reservation and Information Counters, Platforms etc. On the other hand, the checklist prepared to take care of other two type of stretches has relevant parameters like Traffic signals, Parking Space, Approach to Building, Planned Pedestrian Routes, Subways and Foot Over Bridges etc. Each parameter has five to thirty sub-parameters on the basis of which road stretches were given scores. Road stretches having most of the parameters exist on ground got maximum score. In this way, PF No. 2 and 3 of Ujjain Railway Station were found most accessible within city entry points category. The stretch from AICTSL bus stand to hotel Mittal scored highest in terms of accessibility within the category of Road stretches along City Entry Points to Accommodation Points and road stretch along Ramghat to Chakrateerth *Ghat* scored highest among Heritage Stretches.

A hierarchy of accessibility issues has also been prepared by calculating parameter-wise total accessibility score for each category and dominating factors were identified for prioritizing actions. Among those dominating factors, Tactile Guiding & Warning Blocks is the common for all three kind of stretches. It seems authorities need to emphasize on this factor along with Toilet Facility, Traffic Signal, Kerb Ramp etc to make Ujjain Universally Accessible. If Ujjain City becomes more accessible for differently abled and aged visitors, it will get more revenue from religious tourism. Greater accessibility will also improve the quality of life of the residents of the city.

Though the research has focused on selected road stretches of Ujjain, further development can be done in two ways. Firstly, the access audit can be performed in more robust way, i.e. including more road stretches in each category. Secondly, the proposed method may be applied to other such cities to verify flexibility of the method.

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REFERENCE

- Access-improving the accessibility of historic buildings and places, 2011. National Disability Authority, Dublin, Ireland.
- Accessible Route in Historical Cities, 2013, authors: Ambrose, Ivor, Balmas, Silvia, Barragán Iturriaga, Alicia, Medina Higuera, María, Orejas, Publisher: Maria European Foundation Centre, Brussels, Belgium, pp 1-40.
- Code of Practice-on Accessibility of Public Services and Information, 2006, Public Bodies – National Disability Authority, Dublin, Ireland.
- Creating Tourism Opportunities for Handicapped People in the Nineties, 1991. World Tourism Organization, UNWTO, Madrid.
- Eric J. Martin, 1999. Improving Access to Heritage Buildings- a practical guide to meeting the needs of people with disabilities, Australian Council of National Trusts, Canberra, Australia. pp1-69.
- Harmonised Guidelines and Space Standards for Barrier Free Built Environment for Person with Disability and Elderly Person. February, 2016 – Government of India, Ministry of Urban Development.
- Lusher, R. H., & Mace, R. I., 1989. Design for physical and mental disabilities. Encyclopedia of architecture, 3, 748-763.
- Manual on Accessible Tourism for All – Public-Private Partnerships and Good Practices, 2015. World Tourism Organization and Fundación ACS, , UNWTO, Madrid.
- Mullick, A., 2011. Uniting Differences- Universal Design for Exploring the World Heritage Sites in India, Ed. Rachna Khare, Ajay Khare, SPA Press, Bhopal, India.
- Problems And Prospects Of Accessible Tourism In India, 2010. Commissioned by: Ministry of Tourism (Govt. of India), Indian Institute of Tourism and Travel Management (An Organisation of Ministry of Tourism, Govt. of India).

1071 WHO DISPLACED? HOW IMPLEMENTED THE RESETTLEMENT

ABSTRACT

Jamuna bridge project plays an important role in socio-economic and cultural development of the country, at the same time it causes widespread traumatic psychological and socio-cultural consequences. A huge number of development activities have been undertaken during the development programme of the Jamuna Bridge construction. Displacement, resettlement and rehabilitation programme are the major software issues that addressed the responsibilities of the Jamuna Bridge Authority to the affected people with proper compensation in cash or in kind. In the reality, there are so many suffering both socio-economic and psychological issues involved in the process of resettlement and rehabilitation programme. This paper tries to review the policy of the Bangladesh Government towards the resettlement and rehabilitation programme undertaken for the affected people by the construction of Jamuna Bridge. It is found that the resettlement and rehabilitation programme is different from traditional one and has been introduced for the first time in Bangladesh. In this programme priority has been given to social and economic rehabilitation. As a new type of activity the programme could not be able to avoid different type of problems like providing lower compensation rate for the land than its actual value, construction of temporary houses or cultivating vegetables and crops in fallow land during the period of land acquisition. Deprivation of actual land owners right on the basis of false land records also displayed in the study. In spite of such problems, the importance of the resettlement and rehabilitation programme is placed within its exceptional viewpoint and newness. Key Word: Displacement, resettlement, rehabilitation and Jamuna Bridge

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1161 INTERNATIONAL TRADE AND CAPITAL ACCUMULATION IN AN OVERLAPPING GENERATIONS MODEL WITH A PUBLIC INTERMEDIATE GOOD

ABSTRACT

We investigate the effects of a public intermediate good on trade patterns, capital accumulation and the gains from trade in a two-country, three-sector overlapping generations model. Because a public intermediate good affects not only the productivity of the private production but capital accumulation, the results are opposed to those obtained by previous researches: First, opening to trade may accelerate capital accumulation in the higher-savings country. Second, it is possible that a country with more public intermediate goods supposed to be labor-intensive imports an investment good supposed to be capital-intensive. Third, the lower-savings country may lose from trade.

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RS04.3. Infrastructure, Transportation and Accessibility

1163 URBAN CONGESTION AND HOUSEHOLDS' VULNERABILITY WITHIN THE BORDEAUX METROPOLITAN AREA

ABSTRACT

This paper is part of a research project supported by three local authorities in France (Région, Département and Metropolitan area). The research project focus on interactions between land use and transport in the Bordeaux metropolitan area with a particular attention paid to the social and economic aspects of sustainable mobility in suburban areas. The interaction of mobility constraints with location choices and access to housing is essential to understand contemporaneous patterns of spatial inequalities. The growth in house prices in French urban areas during the last decade (an increase of about 100% between 1998 and 2008) has considerably impacted housing accessibility for a large spectrum of households. Consequently, a growing part of medium and low income families have been led to move away from city centers to find a place to live and particularly to achieve ownership in suburban or exurban areas, thus reinforcing the connexion between owner-occupied housing tenure and car-based suburbanization. This phenomenon of urban relegation has important negative effects on the mobility of these households: lengthening of travel times and distances and consequently increasing travel costs combined with growing automobile dependency (Dupuy, 2011). Therefore, suburban congestion may have a disproportionate impact on medium and low income households located in exurban areas. The combination of exurban relocation of low income households with increased suburban congestion and oil vulnerability creates a risk of increased vulnerability of exurban low income households, defined as the combined increased of social isolation and poverty due to housing and transport increasing costs and irreversibility of location and mobility choices. This research aims to contribute to a better understanding of the combined impact of increasing land and house prices and suburban congestion on the vulnerability of exurban households within the metropolitan area of Bordeaux. It seems thus essential to develop a spatial approach of the impact of urban congestion on households' mobility and location choices. For that, our approach consists of the following three main steps. In the first part of the paper, we will develop a set of spatial indicators of urban congestion based on GPS data Tom Tom in 2009 and 2013 provided by the local authority Bordeaux Metropole. Then, these spatialized indicators of congestion are "territorialized" ie computed for each territory according to the specific profiles of residential areas and the characteristics of local households. Combining information about travel flows from each zone and data about the level of congestion of each road section of the transportation network allows to quantify the impact of congestion on different income groups and territories. An indicator of vulnerability to congestion is thus computed to identify the more impacted populations and areas. In the last part of the paper we propose an evaluation of the consequences of congestion on household's behavior. Can households vulnerable to increased congestion modify their mobility/housing choices in order to adapt, and if they do how do they adapt? We expect to find possible local effects of congestion in three domains: mobility patterns, location choices and housing demand

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1206 FREIGHT RATES UP AND DOWN THE URBAN HIERARCHY. THE CASE OF JAPAN

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ABSTRACT

This paper provides an analysis of the regional freight market structure with regard to the urban hierarchy. Urban hierarchy, which we define by the combination of the size in population and economic activities, impacts freight volumes and freight rates. Using a survey on freight flows between 45 Japanese regions, from 1990 to 2010, we find evidence of economies of scale in truck transportation. The findings show inter-urban freight rates to be negatively related to population size of the Urban Areas (UAs) of origin and destination. Thus, shipping cargo from large to small UA is significantly more costly than in the reverse direction. A regression model is used to explain these differences, controlling for variations on time and cargo types. Part of the explanation appears to be related to economies of scale, agglomeration and distance in freight transportation, which seem to be common to many countries and urban systems. Regional-specific factors, such the incoterms most commonly chosen by Japanese firms, seem to play non-negligible roles as well.

Keywords: Urban hierarchy – freight flows –freight rates - Japan

1. INTRODUCTION

Freight transport plays an essential role in the development and competitiveness of cities and urban systems. It is vital for urban firms, enabling their material connections with markets and suppliers. While some of these relationships take place within the same city, many others do not. Indeed, for urban firms efficient connections with firms from other cities are indispensable for growing beyond their local markets and moving up the value chain.

Given its importance and geographical scope, the implementation of logistics policies requires integrated planning implying not only local but also national authorities. However, the bulk of research works on urban freight is focused on intra-urban flows, giving limited attention to inter-urban exchanges and to the roles cities are currently playing as transit centers between cities.

The purpose of this paper is to help to fill this void by analyzing the structure of interurban freight flows and rates. It measures in which extent they are determined by the positions of urban areas within the urban systems. The results of this work could be helpful for countries considering to support the development of logistics activities for promoting regional development.

Freight volumes and rates are analyzed within the different levels of the urban hierarchy. The aim is to identify the regularities observed within a freight system and which can eventually be later compared to those observed within other countries. By providing insight on the spatial patterns of inter-urban freight, this paper also aims to contribute with empirical evidence on one of the less observed dimensions of urban systems, which has been overlooked by the literature.

The paper is structured as follows. The next section reviews the relevant contributions in the literature. The third section develops the theoretical framework. The data and geographical context are described in section four. Section five presents the results of a regression analysis. The sixth section concludes by highlighting the main implications of this paper.

2. LITERATURE REVIEW: URBAN HIERARCHY AND FREIGHT

The urban hierarchy has been empirically analyzed by Zipf (1940), who observed that the distribution of urban agglomerations in India, Germany and other countries including United States followed a simple rule. The population size of a city is proportional to its rank within a country urban hierarchy. In other words, the size of the largest urban area is twice the size of second largest one, three times the third and so on. This regularity in the urban hierarchy is considered to be the result of a common effort of distance minimization both within industrial linkages and to markets. In one of its works, Zipf (1949) showed regularities on the spatial organization of rail cargo flows between US cities. The tonnage of flows was found to be proportional to the population of the cities of origin (P1) and destination (P2) and inversely proportional to the distance between both (D) ($P1 \cdot P2 / D$ p. 393).

More recently, an analysis of interurban freight movements has been carried out in France (Guerrero and Proulhac, 2014). In France, as a result of different periods of industrial expansion in the 19th and 20th centuries, manufacturing activities are mostly located in small and medium-sized urban areas. These generate a large share of the freight movements to other manufacturing firms and markets in Paris and large urban areas. The prominence of upward freight movements within the urban hierarchy seems to be common to many countries and urban systems. But, when considering activities others than manufacturing, such distribution, the hierarchical pattern is a strongly contrasting one. Many of the major freight movements in the distribution system are flows down the urban hierarchy, although highly differentiated patterns are noted depending on the types of distribution activities involved. While some of them serve their markets from a small number of places, usually within the largest urban areas, others are more ubiquitous. Therefore, the movements of cargo in the distribution system are represented as a waterstream falling step by step from the top to the bottom of the urban hierarchy. This hierarchical pattern is strongly suggestive of the concept of *step*

migration introduced by Ravenstein in the 19th century to explain migration patterns in Great Britain, from rural areas to towns, and then to large cities (1885, cited by Plane et al, 2005).

Without making specific reference to urban hierarchy, Tanaka and Tsubota (2017) showed that in Japan freight rate imbalances largely resulted from the differences of population size of the urban areas of origin and destination. This paper aims to expand the former works by taking in account different levels of urban hierarchy in the organization of freight flows and rates.

3. THEORETICAL FRAMEWORK

To analyze the hierarchical structure of freight flows and rates between cities, the following hypotheses are tested:

3.1. Distance and inter-urban freight rates

Road transport cost consists of several components. Some of them vary with distance and others not. Among the former we find the driver's salary, fuel, maintenance and use costs, or the tolls paid for using motorways vary with distance. Distant-invariant components are, for example, loading and unloading operations, the movement of the truck from the parking to the pick-up point in shippers' establishment, complying with administrative formalities, and so on. Given the above, the following hypothesis is expected to hold:

- *Hypothesis 1: The longer the distance of the freight movement, the lower are the freight rates (by ton km).*

The relationship between distance and freight rates has already been verified within other regional contexts. In France, using a survey with 53 000 truck movements, Jeger and Thomas, (1999) (cited by Reme-Harnay, 2012) underlined that distant trips were comparatively much cheaper than short distance ones, particularly for small loads. Indeed, the impact of distance on freight rates was found to be higher for heavy shipments than for light ones.

3.2. City size and intra-urban freight rates

The trucks performing the collection and distribution of load units usually move in the densely urbanised and/or industrialised zones. They may experience congestion and the consequent private delays and may also impose delays on other vehicles whose costs are counted as an externality (Janic, 2007).

- *Hypothesis 2: The larger the UA, the higher the intra-urban freight rate*

This results from the price index (including, in particular, labor and land costs) which is higher in larger urban areas.

3.3. City size and inter-urban freight rates

- *Hypothesis 3: Shipping downwards is more expensive than upwards.*

This results from the difficulty for truck companies to find back-haul cargo when going to less populated areas, where the local demand for truck transportation is lower (Tanaka and Tsubota, 2017). Since the probability of finding backhaul cargo locally is lower, the front haul freight rate will be higher. Conversely, the opportunities for back haul cargo in large urban areas are higher, because of a higher local demand, which will contribute to lower the front haul freight rates.

- *Hypothesis 4: The wider the population gap between origin and destination by UA, the wider the gap between front haul and back haul rates.*

When the population sizes of the UA of origin and destination are very different, the front and backhaul freight rates tend to be very different as well. The freight rate gap between L+3 and L-3 will be higher than between L-1 and L+1. The explanation is the same that for Hypothesis 3.

3.4. City size, volume, and inter-urban freight rates

- *Hypothesis 5: The larger is the volume between an od pair the lower are the freight rates.*

This is related to scale economies in truck transportation, namely the opportunities to optimize the capacity of trucks. Moreover, since the market is larger there is also more room for competition between truck companies.

- *Hypothesis 6: The characteristics of the origin UA have a stronger impact on freight rates than the characteristics of destination UA.*

The most common incoterm in Japan is CIF, meaning that the transport to the destination is usually included in the price of the good. Therefore, the characteristics of the shippers' UA would determine more the freight rates than the characteristics of consignees' UA.

4. DATA AND GEOGRAPHIC CONTEXT

Japan provides an interesting area for studying the patterns of inter-urban freight rates for several reasons. First its insular context and the extensive use of road transport implies few interference of transit flows and other modes. Second, the monopolar structure of Japan, should help to see the regularities in the relationships between cities along the urban hierarchy (Mori et al., 2008). Third, the large size of the top 3 metropolitan areas, covering each of them several prefectures, allows the analysis of freight flow movements at intra-metropolitan level. Last, but not least, this work has been made possible by the availability of two reliable data sources providing detailed information on the movements of cargo between regions.

4.1. Data: RCMS and CFS surveys

To measure the intensity of freight flows between the different levels of urban hierarchy we use two different data sources. First, we have tested the Regional Cargo Movement Survey (RCMS), carried out annually by the Japanese Ministry of Transport. The flows, in tons, have been converted to tonnes-kilometers (tk). The latter unit allows to put the focus on inter-urban flows, reducing the noise generated by intra-urban flows which represent most of flows in tons. The distance as the crow flies has been calculated between each pair of prefectures, using the location of prefecture office as reference. Intra-prefecture distances have been estimated on the basis of their surfaces.

It is essential to clearly understand the limits of RCMS data prior to analyzing inter-urban freight flows. The first restriction is on the scope of the survey, which is transport supply (transport leg) instead of transport demand (shipment from shipper to consignee). This implies that a large part of inter-urban flows, especially by road, would eventually be counted as many shorter distance flows. The use of tk instead of tonnes allows to mitigate somewhat this problem. The second restriction, partly derived from the first, is the lack of information about the activities generating freight flows. This is particularly problematic when studying the urban hierarchy, since one of the main assumptions of central place theory is that the services located at the top of urban hierarchy tend to serve larger areas than those located at the bottom. The segmentation of flows by type of cargo provides only a partial solution to the lack of information of the activities of shippers and consignees.

4.2. Data: Identification of freight areas and definition of the hierarchical levels

Figure 1 shows a map representing the largest freight flows between prefectures. It highlights largest cities and the relationships over short distances, mainly along the Fukuoka-Tokyo manufacturing belt. It confirms the metropolitan structures also revealed by commuting, migrations, or firms' headquarters (Fujita and Tabuchi, 1997). Many of the freight flows involve the prefectures around Tokyo area, which seem to constitute an urban system in itself. Suburban prefectures are strongly interconnected not just with the capital but also between them. Other specificity of Tokyo is the direction of flows: inbound movements are larger than outbound ones.

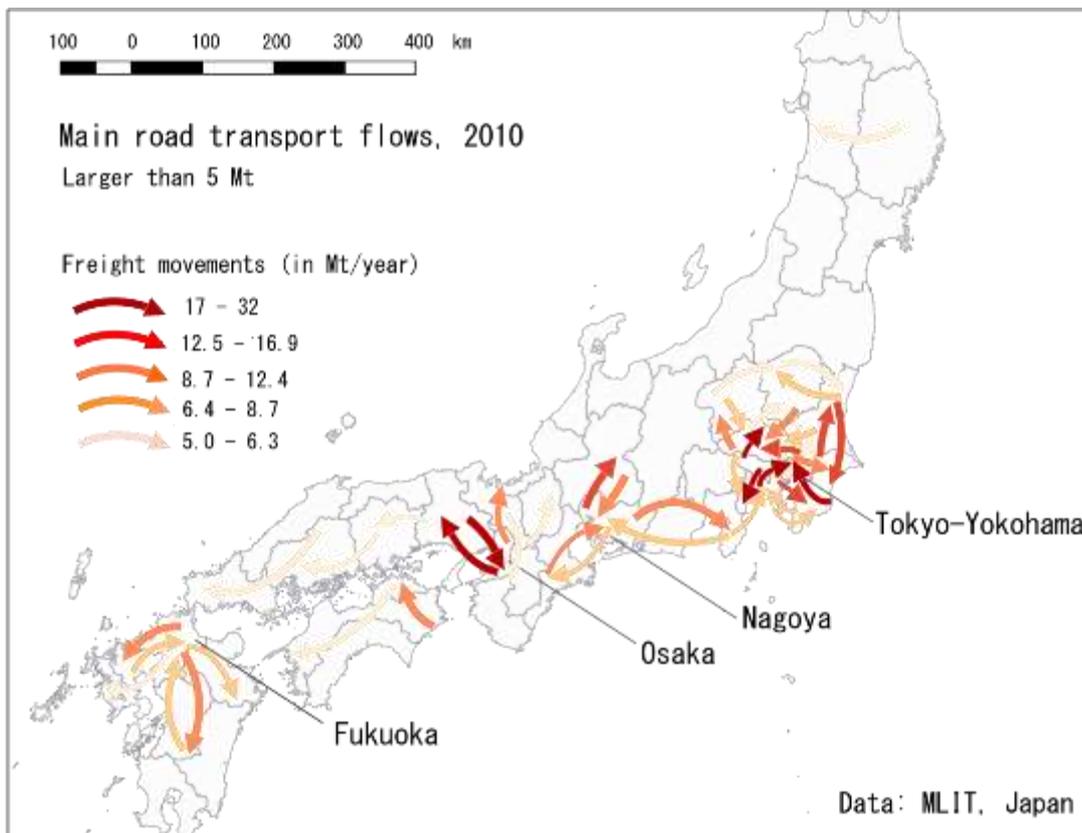


Figure 1. Main road transport flows. Source: Authors

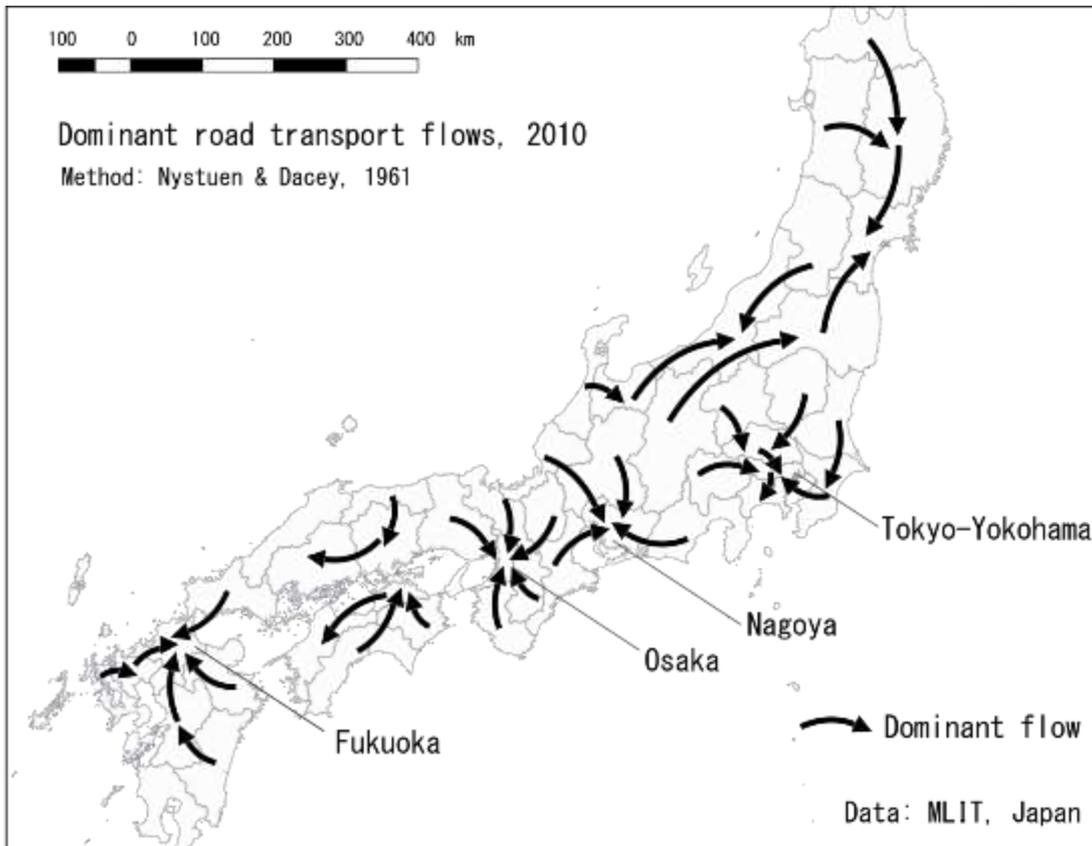


Figure 2. Dominant road transport flows. Source: Authors

The map of the figure 2 represents the dominant freight flows. It provides an alternative view to the main flows by highlighting the hierarchy between prefectures, even outside the top cities. According to this method (Nystuen and Dacey, 1961), a prefecture *i* is dominated by a prefecture *j* (a) if the most important flow from *i* is emitted towards *j*, and; (b) if the sum of the flows received by *j* is greater than the sum of the flows received by *i*. It shows that while on the East Coast freight movements are generally organized around large cities, on the West Coast the freight flows are less polarized. Again, the prefectures around Tokyo exhibit a complex hierarchical pattern with several levels, converging to the core. Paradoxically, the core of the Tokyo freight system is not dominated by Tokyo prefecture but by Yokohama (Kanagawa prefecture). This result, which may seem counterintuitive, is related to a relative specialization of prefectures within Tokyo MA in freight flows of different scope. While Tokyo prefecture polarizes most of the - short-distance - flows of the neighboring areas, Yokohama acts as a gateway to the whole Tokyo MA for many distant prefectures.

Based on the former maps and on the definition of the *Major Metropolitan Areas* of the Statistics Bureau of Japan, data on freight movements has been aggregated in five hierarchical levels. The first two levels (1 and 2) contain the three Major Metropolitan Areas of Tokyo, Osaka and Nagoya. Suburban prefectures have been included when most of their municipalities belonged to one of the three Major Metropolitan Areas, whose definition rely on commuting patterns. A third level (3) has been defined with the other prefectures containing MAs of more than 2 million people: Fukuoka, Hiroshima, Shizuoka and Sendai. Additionally, all other prefectures have been assumed to constitute another two groups (4 and 5) corresponding to least intensively urbanized levels of the hierarchy. Hokkaido and Okinawa, which are islands in the far North and South of the country, have very specific freight patterns resulting from their size and peripherality. Both have been excluded from the analysis. The population of the prefectures in the five hierarchical levels is shown in figure 3. The map in figure 4 indicates their location.

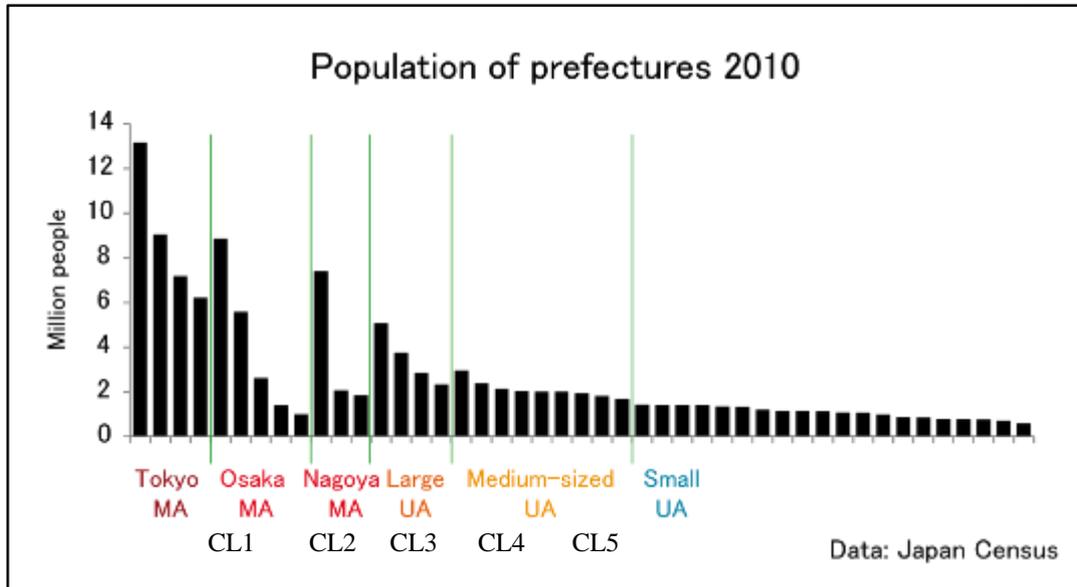


Figure 3. Population of prefectures of the five-level hierarchy. Source: Authors

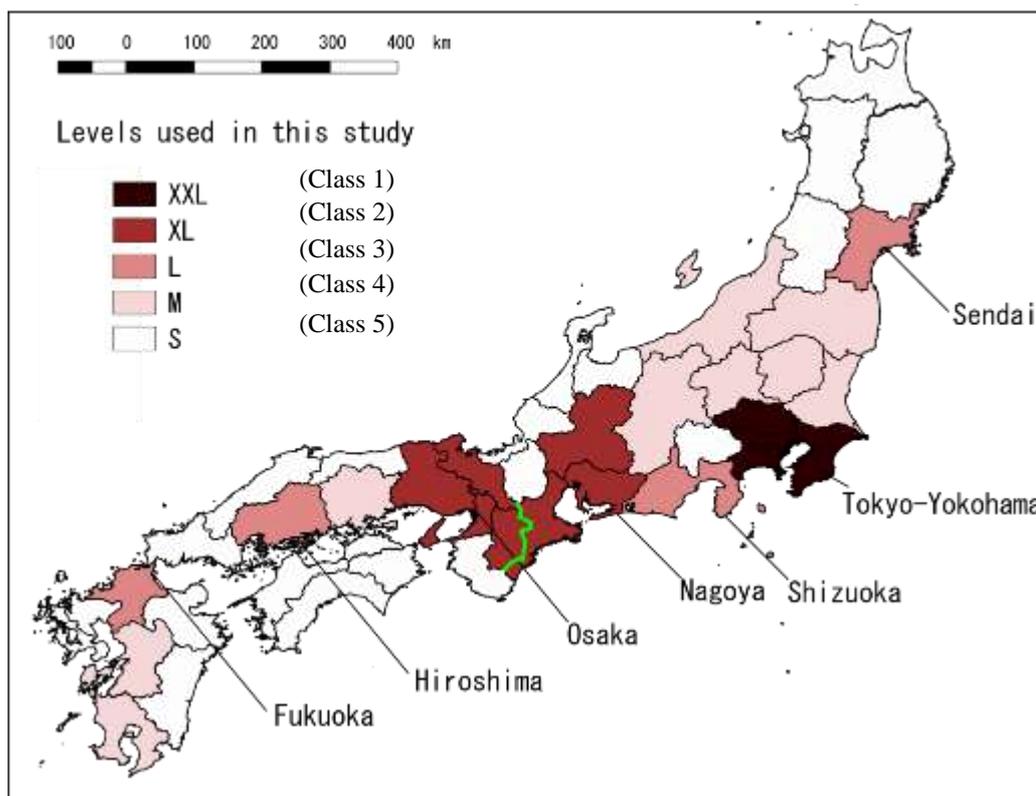


Figure 4. Location of the prefectures in the five-level hierarchy. Source: Authors

Within this five-level, size-based hierarchy, there are 25 possible directions for cargo movements to take place between any pair of levels. For ease of interpretation, these directions have been aggregated in six categories, as shown in the legend of the figure 5, following a method previously used by Guerrero et al., (2014). Thus, it is possible to distinguish the scope of movements (intraurban or interurban), their direction within the urban hierarchy (horizontal, upward, downward) and the number of hierarchical steps over which cargo is carried (neighboring levels or not).

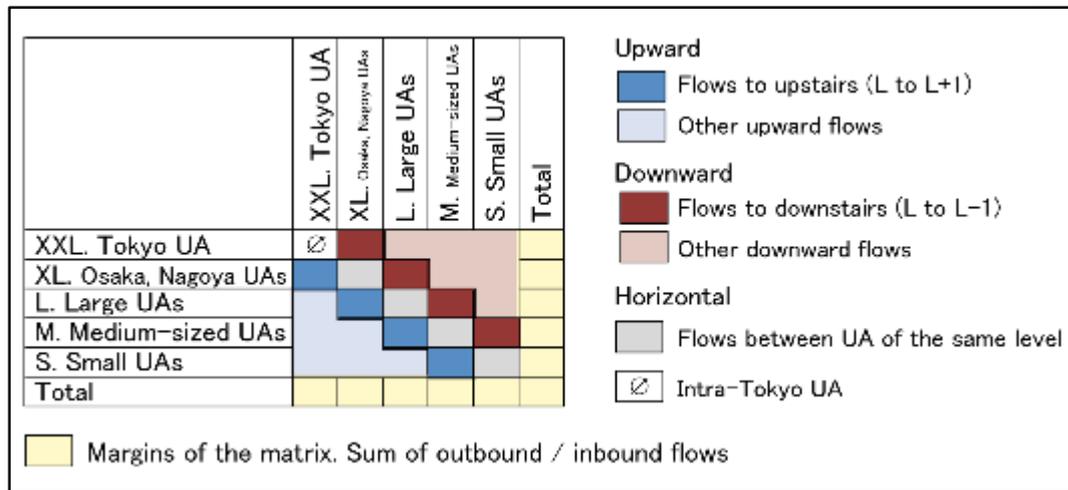


Figure 5. O/D Matrix of freight flows between hierarchical levels. Source: Authors

Table 1 contains average freight rates and distances for the flows between the different levels on 2010. It provides a first overview supporting the hypotheses of this work. For a more rigorous verification, a regression analysis is carried out on the following section, controlling, among other things, for time and commodity-type effects.

Table 1. Variations in freight rates depending on the levels of origin and destination. Source: Authors

		Direction	Avgdist	Avgrate	
Inter-prefecture	Horizontal	Extra-Large	1_Hor-XL	125	52
		Large	1_Hor-L	370	31
		Medium	1_Hor-M	138	53
		Small	1_Hor-S	129	60
	Intra-metropolitan	Tokyo	7_Intra-TOK	33	166
		Nagoya	8_Intra-NAG	46	87
		Osaka	8_Intra-OSA	36	103
	Upward	+1	L+1	253	40
		+2	L+2	233	37
		+3	L+3	167	46
		+4	L+4	405	36
	Downward	-1	L-1	240	40
-2		L-2	201	46	
-3		L-3	150	57	
-4		L-4	367	48	
Intra-prefecture	Intra-prefecture	Large	X_In-pr-L	24	121
		Medium	X_In-pr-M	27	109
		Small	X_In-pr-S	22	114
	Intra-prefecture Metropolitan	Nagoya	X_In-pr-NAG	22	156
		Osaka	X_In-pr-OSA	18	159
		Tokyo	X_In-pr-TOK	16	205

5. REGRESSION ANALYSIS

5.1. Specifications

In this section the hypotheses are tested through regression analysis. Freight market can be captured from two aspects; freight volume and freight rates. Both variables are critical in the determination of structure of regional and national freight transport markets. It is obvious, however, that freight volumes and freight rates are simultaneously determined. One starting point is the structure of the trade flows among regional markets. As the distributions of manufacturing activities and population are typically stable across time, the demand for freight market may be well shaped in advance, suggesting that, given a certain structure of trade flows, freight rates may be determined. As is discussed in the section 3, six hypotheses are to be examined where freight rates are the main concern. It is, however, important to understand the trends of freight volumes. Thus, freight volumes are estimated before freight rates. From the preliminary analysis, it become clear that there are distinct differences between inter-regional and intra-regional freight. Thus, two samples for each of them.

On the inter-regional freight, the following equation is estimated,

$$\ln Q_{rsct} = \alpha + \sum_{u=N} \beta_r \text{Class}_u + \gamma X_{rt} + \theta_t + \delta_c + \epsilon.$$

Q_{rsct} is the freight volume from region r to s of commodity c at year t , Class is a categorical dummy variable of urban hierarchy discussed in section 4 where total number of categories is N and X_{rt} is a vector of regional variables capturing the regional characteristics. Fixed effects in time, θ_t , and commodity, δ_c are also included.

On the determinants of freight rates, the equation to be estimated is written as follows;

$$\ln P_{rsct} = \alpha + \sum_{u=N} \beta_r \text{Class}_u + \sigma \ln Q_{rsct} + \gamma X_{rt} + \theta_t + \delta_c + \epsilon,$$

where P_{rsct} is the freight rates from region r to s of commodity c at year t .

It should be noted that the total number of categories of urban hierarchy is 20 for inter-regional freight and 5 for intra-regional freight. Table 2 summarizes the statistics on freight volumes and freight rates.

Table 2. Summary statistics of freight volume and rates by direction between UA

Movements of freight	log of freight volume			log of freight rates		
	Mean	Std. Dev.	Freq.	Mean	Std. Dev.	Freq.
From 1 to 2	5.34	2.16	2,099	3.74	0.85	2,099
From 1 to 3	5.68	1.99	1,284	3.72	0.87	1,284
From 1 to 4	5.84	2.29	2,738	4.05	0.91	2,738
From 1 to 5	3.87	2.06	4,842	3.95	0.94	4,842
From 2 to 1	5.82	1.99	2,099	3.65	0.76	2,099
From 2 to 3	5.46	2.09	2,043	3.65	0.78	2,043
From 2 to 4	4.70	2.09	3,980	3.76	0.79	3,980
From 2 to 5	4.12	2.22	8,049	4.14	0.92	8,049
From 3 to 1	5.68	2.06	1,284	3.61	0.95	1,284
From 3 to 2	4.99	2.30	2,043	3.73	0.91	2,043
From 3 to 4	4.75	2.24	2,362	3.74	0.85	2,362
From 3 to 5	4.05	2.52	4,652	3.98	0.94	4,652
From 4 to 1	5.89	2.45	2,738	3.93	0.91	2,738
From 4 to 2	4.67	2.28	3,980	3.65	0.88	3,980
From 4 to 3	4.83	2.23	2,362	3.66	0.93	2,362
From 4 to 5	3.21	2.43	8,475	3.94	0.97	8,475
From 5 to 1	4.16	2.27	4,842	3.67	0.97	4,842
From 5 to 2	3.96	2.58	8,049	3.99	1.00	8,049
From 5 to 3	4.04	2.48	4,652	3.88	0.99	4,652
From 5 to 4	3.00	2.50	8,475	3.96	1.01	8,475
Total	4.26	2.48	81,048	3.88	0.95	81,048
Within 1	9.07	2.48	528	5.41	1.25	528
Within 2	8.60	2.55	881	5.17	1.24	881
Within 3	9.15	2.12	526	4.82	1.11	526
Within 4	8.24	2.46	1,114	4.95	1.21	1,114
Within 5	7.43	2.56	2,310	5.24	1.31	2,310
Total	8.12	2.58	5,359	5.14	1.27	5,359

5.2. Regression results

Table 3 summarizes results on inter-urban volumes and freight rates. Results are shown to make it easier to compare the estimates for upward and downward flows and rates. Entire estimation results are shown in the appendix 1. To control regional characteristics, distance, log of population, log of per capita income for both of origin and destination have been included.

Table 3. Inter-freight market: freight volumes and freight rates

Dependent variable	Class	Class	Downward		Upward		Difference	
Freight volumes	1	2	-1.271	***	-0.645	***	-0.626	*
	1	3	0		0.086		-0.086	
	1	4	0.205		0.445	**	-0.240	
	1	5	-0.168		0.306		-0.474	***
	2	3	0.552	***	0.012		0.540	***
	2	4	0.504	***	0.503	**	0.001	
	2	5	0.485	**	0.399		0.086	
	3	4	1.053	***	1.181	***	-0.128	
	3	5	1.063	***	1.141	***	-0.078	
	4	5	1.097	***	0.849	***	0.248	***
Freight rates	1	2	-0.004		-0.148	*	0.144	**
	1	3	0		-0.145		0.145	
	1	4	0.127		-0.079		0.206	***
	1	5	0.033		-0.36	***	0.393	***
	2	3	-0.299	***	-0.17	**	-0.129	**
	2	4	-0.266	***	-0.42	***	0.154	***

2	5	-0.064		-0.321	***	0.257	***
3	4	-0.27	***	-0.393	***	0.123	*
3	5	-0.192	**	-0.36	***	0.168	**
4	5	-0.353	***	-0.355	***	0.002	

Notes: Robust standard errors are clustered at pairs of origin-destination prefecture. Detailed results are shown in the Appendix. The number of stars indicate the statistical significance at *** p<0.01, ** p<0.05, * and p<0.1.

The population sizes of origin and destination UAs largely determine the freight volumes. Log of per capita GDP of origin is positive and statistically significant while the one of destination is negative and statistically significant. These are the most important variables to explain the variations of freight volumes.

After controlling these factors, there are some other time-invariant factors which can capture the regional differences. By employing our urban class categories, the results of these dummies are shown in table 3. All of these coefficients are the difference from the benchmark which is the freight shipped from class 1 to class 3. One of the observed trends is that higher classes have smaller coefficients and lower classes have larger coefficients. These trends are mostly found in the shipments among class 3, 4, and 5. The differences between upward and downward are found statistically significant for the shipments between class 1-5, 2-3, and 4-5.

Freight rates are negatively correlated with freight volumes, meaning that 10% increase in freight volume is associated with 2.1% decrease in freight rates. This demonstrates that there are economies of scale in truck transportation. Given the large variations in freight volumes among regions, this negative relation is substantial.

A further look at the results on the class dummies, shows, in most cases, a smaller size for coefficients of upward flows. This means that after controlling for the population size, size of economies and freight volumes, freight rates remain cheaper for the upward shipments. The differences between upward and downward are found only for shipments between 1-4, 1-5, 2-4, 2-5, and 3-5.

Further analysis of inter-urban freight results is shown in Appendix 2 where the interaction of class dummy with freight volume has been introduced. By comparing the coefficients, differences in economies of scale can be found, showing the extent of price reduction by increase in volume. The cases of downward 1-2, and upward 3-2, 3-5, 4-2, 5-1, 5-3, 5-4 deserve to be highlighted.

Table 4 presents the results for intra-regional freight markets. From column (1), freight volume is positively correlated with population size. Namely, 1% increase in population is associated with 1.35% of freight volume. Column (2) shows negative relations between freight rates and volume. Instead of all in one specification, an interaction term of urban level with freight volume has been introduced. This result suggests that the extent of economies of scale is largest in the class 1 and secondarily in class 2.

Table 4. Intra-regional freight market: freight volume and freight rates

	(1) freight volumes	(2) freight rates	(3) freight rates
freight volume		-0.257*** (0.039)	
freight volume x class1			-0.337*** (0.073)
freight volume x class2			-0.265*** (0.055)
freight volume x class3			-0.253*** (0.059)
freight volume x class4			-0.200*** (0.052)
freight volume x class5			-0.262*** (0.046)
Class dummy: 2	0.643*** (0.226)	-0.097 (0.185)	-0.845 (0.902)
Class dummy: 3	1.192*** (0.208)	-0.327* (0.168)	-1.200 (0.833)
Class dummy: 4	1.123*** (0.260)	-0.296 (0.221)	-1.674** (0.787)
Class dummy: 5	1.048*** (0.352)	-0.125 (0.267)	-0.896 (0.744)
Log of population	1.352*** (0.171)	0.125 (0.141)	0.134 (0.139)
Log of per capita GDP	0.297 (0.450)	1.315*** (0.351)	1.316*** (0.355)
Constant	-14.181*** (4.093)	-4.399 (2.859)	-3.708 (3.102)
Year fixed effects	Yes	Yes	Yes
Commodity fixed effects	Yes	Yes	Yes
Observations	1,003	1,003	1,003
R-squared	0.708	0.494	0.496

Notes: Robust standard errors clustered by each prefecture are shown in parentheses. The number of stars indicate the statistical significance at *** p<0.01, ** p<0.05, * and p<0.1.

So far, the determinants of freight rates have been explored and found that freight volumes explain the bulk of freight rate variations. To check the robustness these arguments, an additional specification is explored. To analyze the gaps in freight rates between back and front haul, all variables have been converted to ratio. The results are provided in Table 5. They confirm again the economies of density from the negative sign in the coefficient of ratio of log of freight volume. This means that if the gap in freight volumes is larger, the freight volume at the numerator is larger than the one at the denominator and the freight rates for the numerator are much lower. Such tendency may be widened if the per capita GDP of the origin (of numerator) is comparatively larger. Interestingly, road distance is not statistically significant, suggesting that the degree of distance economy may be symmetric for a pair of UA.

Table 5. Inter-freight market: freight volumes and freight rates (ratio)

	(1) Ratio of freight rates	(2) Ratio of freight rates
Ratio of log of freight volume	-0.229*** (0.005)	-0.229*** (0.005)
Class dummy: 2	0.141 (0.151)	0.094 (0.162)
Class dummy: 3	-0.169 (0.134)	-0.261 (0.193)
Class dummy: 4	-0.774* (0.429)	-0.835* (0.438)
Class dummy: 5	-1.113** (0.556)	-1.066* (0.558)
Road distance		-0.009 (0.012)
Ratio of log of population	-0.439 (0.369)	-0.440 (0.369)
Ratio of log of per capita GDP	-0.438* (0.241)	-0.437* (0.241)
Constant	1.098* (0.567)	1.068* (0.568)
Origin fixed effects	Yes	Yes
Destination fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Commodity fixed effects	Yes	Yes
Observations	11,379	11,379
R-squared	0.269	0.269

Notes: Robust standard errors are clustered at pairs of origin-destination prefecture. Detailed results are shown in the Appendix. The number of stars indicate the statistical significance at *** p<0.01, ** p<0.05, * and p<0.1.

6. RESULTS AND DISCUSSION

H1: The longer the distance, the lower the freight rates

This relationship is statistically significant. It is explained by the fixed/variable cost composition of road transport. The share of fixed cost per tk is lower for flows conveyed over longer distances. Road distance is negatively correlated with freight rates, as shown in Appendix 1 and 2.

H2: The larger the UA, the higher the intra-urban freight rate

This is explained by the nature of cargo and its value, which is different depending on the size of the city. Road congestion, which is highly dependent on the size and the population density of the urban area, is usually higher in large urban areas. Last but not least, labor costs and price index are also higher in large urban areas, which means that road transport companies should support higher costs, which are at least partly reflected in freight rates.

This relationship has not been verified through the regression analysis. At the highest level of urban hierarchy, intra-urban freight rates are surprisingly cheaper when controlling for population and GDP per capita effects. This is because at such places, there is higher demand for freight volumes. Top levels of UA have larger population and higher per capita GDP. As there are positive correlations of freight volumes with population size and per capita GDP and there is a presence of economies of scale, resulted freight rates are not necessarily lower in small UA.

H3: Shipping downwards is more expensive than upwards

This relationship is not statistically significant. This is explained by the easiness for road transport companies to find backhaul cargo at large urban areas as compared to small ones. Appendix 3 shows that the downward character of flows is not statistically significant after controlling freight volume and regional characteristics. The difference in freight rates results from freight volumes and not from the downward or upward direction of flows.

H4: The wider the size gap between origin and destination UA, the wider the freight rate gap

This relationship is statistically significant. This is explained by the easiness for road transport companies to find backhaul cargo at large urban areas as compared to small ones. The wider the size gap in population, the wider the gap in freight volumes. Consequently, the freight rate gap can be larger.

H5: The larger is the volume, the lower are the freight rates

This relationship is statistically significant. This can be explained by economies of scale in transportation and by a higher level of competition between truck companies as well. It has been verified in all of the analysis.

H6: The characteristics of the origin UA have a stronger impact on freight rates than the characteristics of destination UA

This relationship is statistically significant. This is maybe related to the business characteristics in Japan, a country in which shippers usually assume the transport costs until the establishment of the consignee (Cost, Insurance, Freight). These variables are critical in determination of the freight rates.

7. CONCLUSION

This paper has explored the relationship between freight flows and rates and the position of urban areas within the Japanese urban hierarchy. The joint consideration of the size of the urban area and of patterns of upward and downwards flows provided a very useful framework for understanding inter-urban freight rates in Japan. It has focused on the reasons which could lead to the differences in freight rates. It showed that freight rates between urban areas are largely determined by freight volumes and distance. Beyond these two large sources of explanation, other factors play non-negligible roles as well. Differences in the size of the urban areas of origin and destination also impacts freight rates. Therefore, shipping cargo from small to large urban areas is cheaper than on the opposite direction. When there is a wide population gap between the urban areas of origin and destination, there is also a wide gap between front haul and back haul freight rates. Finally, other characteristics such the economic performance of urban areas of origin and destination, measured by their GDP per capita, plays a role in the formation of freight rates. The characteristics of the origin UA turned to be more important than those of the destination UA. This could be a regional specificity, since Japanese shippers usually include transport costs in the price of the goods they sell (Cost, Insurance, Freight).

REFERENCES

- Fujita, M., & Tabuchi, T. (1997). Regional growth in postwar Japan. *Regional Science and Urban Economics*, 27(6), 643-670.
- Guerrero, D., & Proulhac, L. (2014). Freight flows and urban hierarchy. *Research in Transportation Business & Management*, 11, 105-115.
- Guerrero, D., Proulhac, L., & Nierat, P. (2014). Supplying Cities from Abroad: The Geography of Inter-Urban Freight Flows. In *Supply Chain Forum: An International Journal*, 15(4), 6-15.
- Jeger, F., & Thomas, J. E. (1999). Les déterminants des prix du transport routier de marchandises. *Notes de synthèse du Service économique et statistique*, (123), 9-14.
- Mori, T., Nishikimi, K., & Smith, T. E. (2008). The number-average size rule: A new empirical relationship between industrial location and city size. *Journal of Regional Science*, 48(1), 165-211.
- Nystuen, J. D., & Dacey, M. F. (1961). A graph theory interpretation of nodal regions. *Papers in Regional Science*, 7(1), 29-42.
- Plane, D. A., Henrie, C. J., & Perry, M. J. (2005). Migration up and down the urban hierarchy and across the life course. *Proceedings of the National Academy of Sciences*, 102(43), 15313-15318.
- Ravenstein, E. G. (1885). The laws of migration. *Journal of the statistical society of London*, 48(2), 167-235.
- Harnay, P. (2012). *La formation des prix dans le transport routier de marchandises. Analyse économétrique et analyse empirique*, Research Report 09/228, Ministry of Transport (France), 36 p.
- Tanaka, K., & Tsubota, K. (2017). Directional imbalance in freight rates: evidence from Japanese inter-prefectural data. *Journal of Economic Geography*, 17(1), 217-232.
- Zipf, G. K. 1949, Human Behavior and the Principle of Least Effort. *Addison-Wesley, Cambodry Mus. Am. Arch. and Ethnol.(Harvard Univ.)*, *Papers*, 19, 1-125.

1279 RAILWAY INFRASTRUCTURE OF NORTH EAST INDIA: PROSPECTS AND POSSIBILITIES

ABSTRACT

Indian Railway (IR) is the fourth largest railways systems in the world after USA, China and Russia. The main motto of the India Railway is the cost effective mode of mass transportation for both freight and passenger. Indian Railway is the life line of the country which covers mostly all states. The Northeast India has unique strategical location, geographical isolation and geo-political value which comprises of the eight sister states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and Sikkim. The total area of the region is about 262192 km² and about 36 per cent International Border to total International Boundary is located here. North Eastern States are sharing the International Border with Bangladesh, Bhutan, China, Tibet and Myanmar. Due to locational isolation alongwith physical, social, economical and political factors like undulating topography, tribal movement, social unrest, central-state relation, political instability, cultural dynamics, land acquisition related issues etc. of North Eastern States make this region lack behind. Transport network was developed by the British ruler for excavating the natural resources of the region because this region was a major source of hydrocarbons, especially natural gas and oil, coal, limestone and bamboo etc. Transport network played an important role not only for India's national security but likewise to the feeling of wholeness in diversity that characterises its power. Railway transportation can transform the partially economic situation of the region. This paper deals with present conditions of railway transport system in North Eastern Region of India and hindrance of railway system within the region and highlight on the future prospect. Secondary data has been collected from office of the Zonal Railway Manager, Malegaon, Guwahati; Personnel Railway Manager, Northeast Frontier Railway, Malegaon, Guwahati; Chief Commercial Inspector, Lumding, Assam. A detailed examination of railway records was carried out to understand the developmental process of railway in this region and helps to recognize the role of Political, Social, Economical and Technological factors in the development railway transportation in North Eastern States. ArcGIS and QGIS have been used for analysed the regional disparity in terms of physiographic and infrastructural features. Some statistical tool has been used for quantify the collected data by applying SPSS. Findings suggest widespread inequality in railway infrastructure and service among the North Eastern States. Railway system of this region going through a challenging phase and railway network having a virtual space integrated regional development.

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1568 SOCIAL AND ECONOMIC INTER-REGIONAL EFFECTS OF HSR SYSTEMS: A REVIEW FOR TURKISH HSR LINES

ABSTRACT

High Speed Railway investment projects require economically significant financial resources and take so much time to build the systems. Moreover, these systems need to be implemented after intensive and fussy social and economic feasibility because of its both regional and inter-regional great impacts and costs. In this study, HSR systems are, which either implemented or constructed and planned, in Turkey, evaluated from the point of passenger and freight transportation, logistic activities and regional developments. Transport data and development indicators analysis in terms of their spatial distribution and synthesis according as their regional and inter-regional relations. GIS program are used to make the analysis and synthesis. As well, other countries which use HSR systems in transportation mode or plan to construct the system, are examined in connection with their relation from Asia to Europa vice versa. According as the study, it is seen that HSR services strengthened the connections between Europe and Asia, especially in terms of time and distance issues. At the same time, while the transportation infrastructure of the region is getting stronger, the international and inter-regional connections of the country are also increasing. Moreover, countries which are located on the HSR lines, benefit positively from the systems, on the other hand, countries that are located outside of the systems, cannot benefit in terms of the economic and social mobility that the system creates. So far, the study shows that HSR lines is going to be one of the key linkage between the countries and regions from the point of transportation modes.

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RS06.1. Location of Economic Activity

1098 AGGLOMERATION AND FIRM WAGE INEQUALITY: EVIDENCE FROM CHINA

ABSTRACT

China is experiencing rapid urbanization with the steady emergence of large cities, leading to policy discussions of the role of large cities in the country’s development. While the consensus is that agglomeration plays an important role in economic development and large cities can act as engines of economic growth, there is relatively little empirical knowledge of the effects of agglomeration on inequality. In this study, we apply panel data from a micro firm-level survey and from city-level data to investigate whether there is causal relationship between agglomeration and establishment wage dispersion in China. Given potential endogeneity of city size, we employ an instrumental variable regression (IV) approach. We find strong evidence that agglomeration has significant effects on wage dispersion in the short run and long run. The link between agglomeration and wage dispersion is heterogeneous across regions. The spatial distinct results appear to be due to differing stages of development. Our results are consistent with the two-sided sorting models in that the most productive and least productive firms are moving from inland cities to the coast. Keywords: agglomeration, wage dispersion, city size, China

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1342 SCOPE OF AIRPORT-ORIENTED DEVELOPMENT (AOD) FOR INDIAN AIRPORTS - A DISTRIBUTION ASSESSMENT USING SPATIAL ECONOMETRICS MODELS

ABSTRACT

Principally, the cities have developed around a central core of transportation and logistics. Starting from seaports to rivers and canals, from railways to roadways, and finally around airways. Today, airport is more than just a hub for human movement. It is a driver of business location, economic growth, and global integration. To position metropolitan regions on a global scale and enhance their ability to compete with other regions, policy-makers undertake major investments in the form of large-scale development projects, and airport-oriented development (AOD) is one of them. AOD can be analysed as “ecosystem of business”, which includes airports, airlines, passengers, governments, local communities, and regional economies. Region’s economic scenario is a key factor for the growth in air service demand and the vice-versa also holds true, as air transportation can be a strategic cause and facilitator of a region’s economic growth. The major catalytic impact caused by airports is generation and enhancement of regional economic competitiveness by promoting export activities, tourism activities, market connectivity, boosting business operations and productivity, and influencing companies’ location and investment decisions. Airports have layers of impacts at spatial, environmental, economic, social, and network level. However, the intricate role of airports in the economy has made the science of impact analysis more complicated as the relationship between regional economic growth and spatial changes is complex and causal. Moreover, less attention is given to the relationship between air transport, spatial effects, and economic development. Numerous studies attempt to evaluate the regional impacts of airports by economic assessment tools. Other researches have generally focused on financial efficiency and productivity, while neglecting the role of space or location and spatial effects in the study of airport activity. Here, spatial econometrics comes into the picture which is a powerful tool for the analysis of spatial relationships. Regional observations are linked to a location and it is commonly observed that data collected for regions in space are not independent, but rather positively spatially dependent, which means that observations from one location tend to exhibit values similar to those from nearby locations. Spatial econometric models allow to account for dependence among these observations. It is important to understand the spatial correlations that may exist on airports as the connectivity of India's airports is majorly complementary than competitive and establishes a balance of competition and cooperation. Also, India's airports have recently undergone several reforms and it is important to analyse the spatial distribution of airports taking into consideration the factors that explain their distribution. Thus, an analysis of the cost of airports with their observed spatial characteristics, is justified, as it may help clarify the role that networks play, and allow for analysis that proposes optimal controls. The paper analyses the cost function of Indian airports using various direct and modified variables and alternative spatial models to review the scope of airport-oriented development (AOD) in Indian setting.

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1393 DISTINGUISHING PRODUCTIVITY DIFFERENCE FROM AGGLOMERATION AND SELECTION EFFECT: EVIDENCE FROM INDONESIAN MANUFACTURING FIRMS

ABSTRACT

This study examines the productivities differences between Indonesian manufacturing firms in small and large cities. While a large of literature studied the agglomeration and selection effects on firms separately, this study tests those two effects simultaneously by using a new quantile approach developed by Combes (2012). By using the data of Indonesian manufacturing firms census from 1990 to 2014 data, we find a strong evidence of agglomeration benefit for firms in the large cities than those are in the small cities. However, we find a stronger selection effect in small cities than the larger cities. The average productivities of firms in the above-median of employment density are 18.2 percent higher than those below median, while the minimum productivities to enter the market are 0.6 percent higher in the below-median cities. The results are robust to different spatial definition of city size and scale. When we breakdown the manufacturing firms into 24 sectors, we find that firms in 19 sectors are better-off from the agglomeration effect, while five sectors suggest non-statistically significant. In contrast, there are 11 sectors that suggest selection effect while the rest are not statistically significant. We conclude that natural resources endowment and the quality of local infrastructure drive our results.

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1415 THE IMPLICATIONS OF INDUSTRIAL ROBOTICS LABOR DEMAND FOR METROPOLITAN ECONOMIES IN THE UNITED STATES

ABSTRACT

Questions about how automation is changing the nature of work and the composition of the workforce are taking on new urgency in the age of robotics and artificial intelligence. However, the question of where these changes will have the greatest impacts is largely un-examined. While effects of technological change have a global reach, some local economies will be more affected by technology-related labor disruptions than others, depending on the particularities of their industry structure, production processes, and supply chains. This research is a component of a larger project funded by the NSF National Robotics Initiative. It focuses on local economies in the U.S., specifically on metropolitan economies and employs actual data about robotics labor demand. This approach stands in contrast to other recent estimates that infer the effects of robot use based on sales data and industry structure (e.g. Acemoglu & Autor, 2011).

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RS06.2. Location of Economic Activity

1291 SIGNIFICANCE OF REGIONAL NETWORKS IN TRADITIONAL CULTURAL INDUSTRIES: CASE OF HANDLOOM INDUSTRY IN VARANASI DISTRICT, INDIA

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ABSTRACT

There has been growing academic interest in understanding how cultural attributes of a region and local production systems are deeply inter-related so as to shape its cultural industries, and thereby, cultural economy of the region. The latter is one of the rapidly growing economies in the world. As neo-classical economic theories of agglomeration and Marshallian industrial district fail to suitably map the dynamics of cultural and creative industries, the concept of cultural economic geography has emerged. In the latter case, cultural factors result into significant sources of regional differentiation and competitive advantage in globalized economies. This has found its application, particularly, in developing countries where traditional cultural industries and their creative resources are largely rooted in regional culture, agrarian societies, and mostly operate from both urban and rural areas where they have existed over generations. To examine this phenomenon in Indian scenario, silk weaving industry of Varanasi District has been selected. Over generations, local weavers have mastered the art of weaving with silk on handlooms producing 'Banarasi' brocades and 'sarees' which have secured geographical indication rights, thus, supporting the link between the product and its place of production which spans Varanasi and five adjoining districts. Though the trade in silk products is centered in Varanasi city, production is spread across the district (1,535 sqkm) with more than 60% of approx. 14,000 handloom weaving households living in tight-knit clusters dotting the rural hinterland. Such a regional scale of operations in this industry, which thrives on traditional artisanal skills and tacit knowledge, is realized by the presence of strong informal networks of dense inter-personal and inter-organizational relations among a variety of actors who are directly or indirectly involved in the industry. Organizational hierarchy among weavers and allied workers and its evolution, factors affecting their location decisions, and specificities of the value-chain have been studied. To map the dynamics of network relations, a questionnaire-based survey has been conducted with a representative sample of handloom weavers from Varanasi District, seeking information on their primary and secondary connections in the industry. Further, Social Network Analysis has been employed to describe various structural aspects of these networks; thus, establishing the significance of such informal networks in operations of the traditional silk weaving industry in the city-region. Thus, this paper re-establishes the significance of studying the region as a unit, wherein economic transactions are not only facilitated by competitive advantage extended by economies of agglomeration, but also by creative advantage accruing from economies of scope in terms of informal exchange of traditional knowledge and cultural diversity across dense networks.

Keywords: cultural economy, cultural industrial cluster, handloom industry, social network analysis

INTRODUCTION

In recent decades culture-led development strategy has found increasing attention of policy makers as well as scholars across the world. Developed countries, like the United Kingdom, Australia, the USA, Hong Kong, have created dedicated governmental infrastructure to bolster the share of 'cultural and/or creative industries' in local economy. This may be explained by the lower share of production of crafts in these countries, as compared to technology-intensive, post-industrial, and service-oriented creative economic activities, like advertising, media, TV, etc. Moreover, a number of contextually developed 'creativity indices' are being used by several governments in the developed world to monitor the growth of these industries, which build a rapidly growing sector. Recently, developing countries are also following suit. However, there lies a difference between them and their counterparts from the developed world, which need be identified and worked on carefully; hence, the need for further research.



Figure 1 Classification of cultural and creative industries (UNESCO, 2013)

Before studying the difference, it is important to introduce the basic terminology. Although wide semantic ambiguity exists in the definitions of 'cultural and creative industries'; broadly speaking, industries with production and consumption processes having a 'symbolic and expressive element at their core' have been classified as cultural

industries (UNESCO, 2013); for instance, arts (performing, visual, and literary) and crafts. Whereas industries ‘requiring creativity, skill and talent, with the potential for wealth, and job creation through exploitation of their intellectual property’ have been identified under the broader set of creative industries (DCMS, 2001); e.g. advertising, film and media, publishing, and even software development.

The difference lies in the observation that cultural industries are deeply rooted in local context, culture, and communities; whereas creative industries are purely looking at activities protected under law related to Intellectual Property Rights (UNCTAD, 2010). Unlike creative industries exploiting individual creativity, traditional cultural industries build upon creativity which is a collective good of artisan communities. As individual creative acts cannot be disentangled from collective values and knowledge (i.e. local traditions), these can’t be protected under the existing legal framework. This is why traditional cultural industries fail to comply with the conceptual definition of creative industries. Hence, it is important to make the distinction between these two industrial sectors, particularly in the context of developing countries, as both require different contexts to grow and their economic contributions are also different.

Additionally, creative industries need entrepreneurial climate (e.g. start-up environs), economic diversification, soft institutional factors (such as tolerance, urban amenities, social diversity), and urbanization economies (enabling information flow and cross-fertilization of ideas) to grow; whereas traditional cultural industries operate largely in rural areas where they have existed over generations with hereditary skill transfer (Fahmi, Koster, & Van Dijk, 2016). Thus, the factors affecting location decision of workers in both creative and traditional cultural industries widely differ.

Hence, there is a need to freshly identify factors affecting location decisions of artisans engaged in traditional cultural industries, particularly in developing country scenarios; which are different from those active in relation to creative industries. This paper tries to address this gap, through a focused discussion on regional networks in case of silk-weaving industry spread across Varanasi district, which is essentially a traditional cultural industry where the skills are passed on over generations.

Before detailing out the empirical case, it might be helpful to discuss factors which help build a conducive environment for cultural industries, in general, to grow and sustain. The next section deliberates upon the same.

PLACE, CULTURE, AND ECONOMY

Unlike in other manufacturing industries, processes of cultural production and consumption are highly rooted to the place where they originate. In fact, local ‘traditions, norms and sensibilities actively shape the structures and strategies of business operations in the cultural economy and the design of final outputs’ (Scott, 2000). ‘The particular traditions, conventions, and skills that exist in any given urban area help to infuse local products with an exclusive aura that can be imitated by firms in other places but never completely reproduced’, notes Scott (2006). Distinctive place-based characteristics of products – be it technology- or crafts-intensive, utilitarian or cultural – increases their chance of continued competitive success, as consumers value them for both qualitative aspects and price-efficiency (Scott, 2006). On one hand, elements of place enter into the design specifications of products; and on the other, changing symbologies of outputs get assimilated into cultural assets of places where they are made. Since cultural economy is a site of dense inter-firm transactions, involving both traded and untraded interdependencies, it demands mutual proximity; thus, bringing in the component of geography in the discourse of cultural economy. The conceptual diagram (fig. 2) by Evans (2004) may be referred in this regard.



Figure 2 Triad of symbiotic relationship between Place, Culture & Economy

This understanding of the recursive relationship between place and cultural production had resulted into increased scholarly attention to identify local factors which help create a conducive environment for cultural industries. This led to development of various conceptual frameworks which take spatiality into account, namely ‘Creative City’ (Landry & Bianchini, 1995), ‘Cultural Economy of Cities and Creative Field’ (Scott, 1997), ‘Creative Milieu’ (Landry, 2000), ‘Creative Atmosphere’ (Lazzeretti, Boix, & Capone, 2009), ‘Creative Economic Geography’ (Flew, 2010).

Besides market forces of production and consumption, a lot of other factors influence the economy of traditional cultural products (such as indigenously developed arts and crafts); for instance, protection and suitable adaptation of traditional artisanal knowledge – which is at the core of cultural production. Instead of in professional training institutions, such

skill-sets are typically passed from one generation to the next in an artisan family. This is why networks disseminating tacit knowledge become significant in the study of cultural industries; hence, are being discussed in the next section.

NETWORKS IN CULTURAL INDUSTRIES

Artisan communities, generally, live in tight geographical clusters for both competitive and creative advantages. Competitive advantages refer to benefits generating out to agglomeration effect, i.e. economies of scale, as is witnessed in Marshallian industrial districts. On the other hand, creative advantages are generated in terms of flow of knowledge through web of informal face-to-face interactions among individual members of the artisan community.

However, scholars have noted that benefits of clustering are not simply generated out of mere co-location of enterprises; rather it need be complemented by development of collaborative networks (Comunian, 2012; van Heur, 2009). This is why, most of the studies on cultural economic geography have identified network of dense inter-firm transactions as one of the key determinants of a conducive environment. This is besides the concentration of skilled labour with local sensibilities, and cultural diversity of local population. The latter parameter might not be relevant for traditional cultural industries, as such artisan communities are largely homogenous in general.

To better explain the significance of inter-firm networks in study of traditional cultural industries, it may be noted that the knowledge involved in artisanal production is highly informal, or tacit, in nature. This is because such knowledge gets disseminated only through informal face-to-face interactions; unlike codified knowledge which can be demonstrated, and transferred geographically (and historically) through various media. Typically, artisanal skills are deeply protected within the artisan community or the family, and are transferred over generations by the virtue of heredity, and not by institution-based learning.

Another aspect of networks in traditional cultural industries is the fact that inter-firm transactions are both traded and untraded in character. Unlike in a typical manufacturing sector, such transactions are highly informal in character with no formal contract being signed, and wherein mutual trust and reciprocity are corner-stones of the practice. In this case, trust can be inter-personal and/ or inter-organizational in nature.

Social Network Analysis (SNA) is one of the number of tools and techniques which have been used to measure the strength of networking involved in cultural industries. In a study by Lee (2015), 'connectivity' and 'quality of information' have been identified as indicators of networks that actively promote knowledge spill-over and learning.

Equipped with this basic understanding of the relevance of studying networks w.r.t. traditional cultural industries, the following sections elaborate on local regional networks which are in action in case of traditional occupation of silk-weaving in Varanasi.

SILK WEAVING – A TRADITIONAL OCCUPATION

Varanasi is a repository of varied locally produced cultural products which have bagged geographical indication tags, such as handwoven silk products, wooden toys and lacquerware, pottery, *zardozi* (i.e. embroidered fabric), and others. These are also sources of livelihood of a sizeable share of its population. Of them, silk-weaving is the largest employer in the city-region, and hence, the focus of this paper.

Over generations, weavers of Varanasi have mastered the art of weaving silk products on handloom; particularly 'saree' (a traditional women's garment) and brocade laced with 'zari' (i.e. fine threads of silver and/or gold). Even the finished product - 'Banarasi Saree' - is named after the region, i.e. Banaras, or Varanasi. Thus, 'Banarasi Saree' is good example of a cultural product wherein the place of production becomes a unique component of the product, and vice versa.

Over centuries, silk-weaving has been a family-owned enterprise held on privately-owned handlooms set at respective houses. Although, typically, an adult male member of the family operates the loom, other members of the household are also engaged in the process; thereby turning it into a household industry. To consider the specificities of this industry, it is rather important to study the weaving process in practice, prevailing organizational hierarchy among weavers. The same has been briefly discussed in following sections.

Weaving process in Varanasi

Following are basic dimensions governing the variety of Banarasi Sarees.

1. Type of yarn (natural, synthetic, and blended)
2. Patterns of weave (based on the various arrangements of warp and weft)
3. Techniques of weaving (hand- or machine-driven)
4. Design motifs (traditional or modern); e.g., *butidar, jangla, jamdani, tanchoi, jamawar, etc.*

Weaving process may be broadly classified into three phases of production, i.e. pre-loom, on-loom, and post-loom operations. Following steps are typically followed for silk weaving in Varanasi (Bajpai, 2015; Textiles Committee & HWA, 2007) (refer fig. 3).

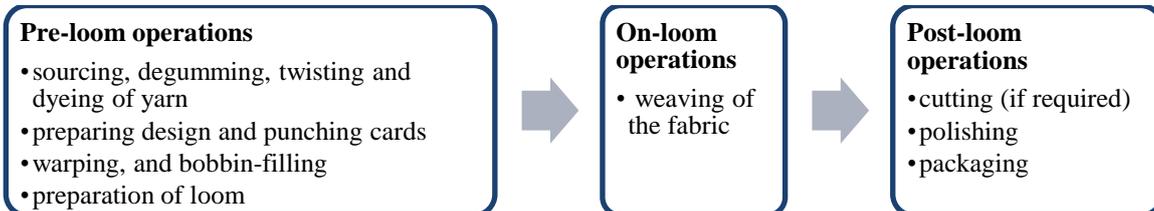


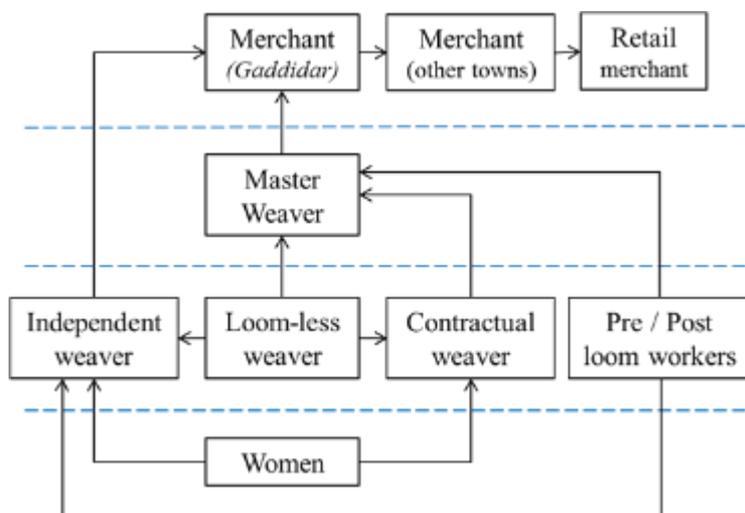
Figure 45 Weaving process in Varanasi - adapted from (Textiles Committee & HWA, 2007) (photos: author)

Thus, silk weaving involves a large array of skilled workers or artisans required at different stages of production; each being completed at different workshops instead of a single large factory.

Organizational hierarchy of weavers in Varanasi

Organisational structure of the weaving community in Varanasi has been explained by Basole (2015) (refer fig. 4). Weavers are broadly classified into following groups.

Independent weaver	: One who independently works on his loom housed at his residence, employs raw materials, and sells finished product in the market.
Contractual weaver	: One whose services are being hired by a master weaver; works on his loom housed at his residence. Master weaver provides for raw materials (yarn and design).
Loom-less weaver	: One who doesn't own any loom, thus, weaves on a loom housed at the employer's residence/workshop; provided with raw materials and work.
Master weaver (<i>girhasta</i> in Hindi)	: One who may or may not weave himself, but employs one or more weavers, either at his residence / workshop, or on contract.



Source: adapted from Basole (2015)

Figure 4 Organization of actors in weaving industry

Presently, about 95% of handloom weavers work as a wage-earner (i.e. loom-less or contractual weaver). Rest of the weavers (i.e. independent weavers) engage in production either in anticipation of demand or against a prior order (Textiles Committee & HWA, 2007). Both independent and contractual weavers employ loom-less weavers as and when required, if they have idle loom capacity and/or require extra labour to meet demand pressures. Womenfolk typically performs allied tasks, such as, winding of yarn (*'naari-baana'*) and cutting in respective households.

Almost all business transactions in this industry are informal in nature. Following transactions are typically held in production process of a Banarasi Saree.

1. Merchant or trader (*gaddidar* in Hindi) places order with a master-weaver (or, *girhasta*). The trader might also pay an advance amount to the master-weaver to buy yarn and other raw-materials, develop design by hiring services of a designer (which may, or may not, be brought to the trader for approval).
2. Once the design is ready, the master weaver places order for graphing and punching cards to be fitted to a jacquard machine.

3. Next, the master-weaver hires an adequate no. of contractual and/or loom-less weavers to enable production. Hired weavers may work on looms set up by the master-weaver at a workshop, or may work on individually owned looms at respective houses.
4. Upon completion, the weaver returns the finished product to the master-weaver, who would further send it to the trader.

A rigid hierarchical differentiation has set in within the weaving community where once independent class of weavers has become highly dependent upon the ones in upper echelons of the community, i.e. master weavers (*girhasta*) and merchants (*gaddidar*). The occupational structure has changed over years with diversification of labour; massive shift from handlooms to power-looms; labour emigration from Varanasi to textile factories beyond the region; and the rise of contractual weavers.

Such changes are altering the social structure of weaving community in Varanasi. Previously, almost everyone in a weaver’s household had been engaged in processes ancillary to weaving. Now, increasingly, pre- and post-loom operations are getting outsourced; thus, changing the familial and social relations.

As noted by Schütte & Kreutzmann (2015), the count of independent weavers is fast declining. Contractual and loom-less weavers are the weakest and most vulnerable among all in the hierarchy; since they neither have any command on the design nor on the pricing of the product they weave. Increasing reliance of weavers on *gaddidar* and/or *girhasta* for supply of raw materials and design (owing to their weak economic situation), drives them into relationship of dependency.

Regional networks in weaving industry

As per the records of the Geographical Indications Registry of Chennai, production of the registered product ‘Banarasi Brocade and Sarees’ is spread across five districts, having the highest share in Varanasi district (refer fig. 5). About 87% of the handloom weaving households and 88% of the handloom weavers in the region are located in Varanasi district, with Varanasi city being the major hub for production and trading.

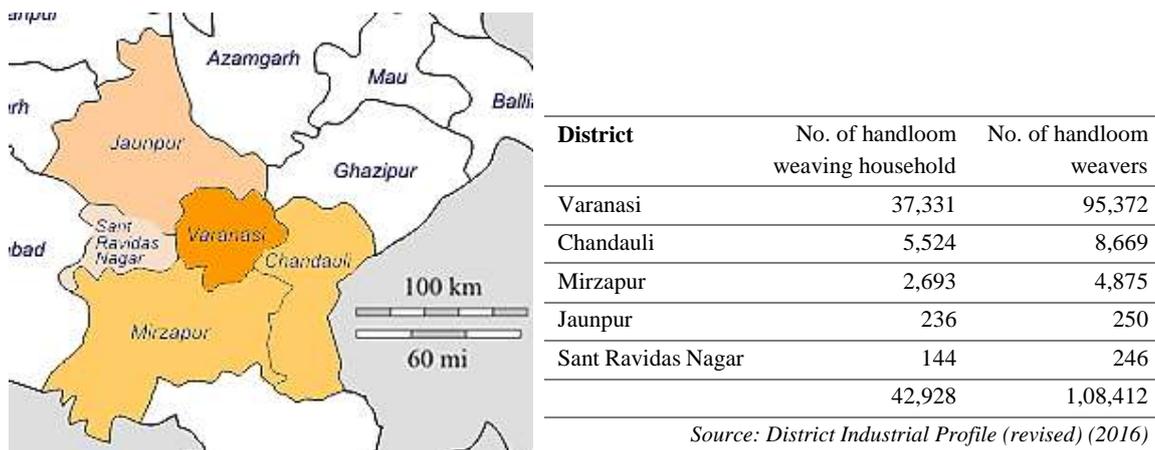


Figure 46 Regional spread of Banarasi brocade and saree industry

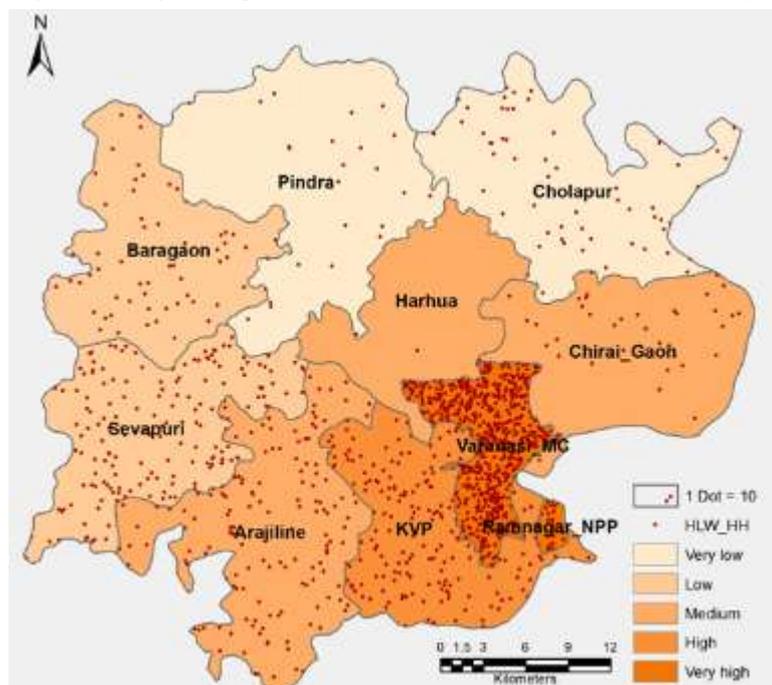


Figure 47 Distribution of handloom weaving households across blocks in Varanasi district (source: author; dot density refers to density distribution of handloom weaving households, and the choropleth map refers to no. of households as per Census of India 2011)

As per a draft report of the baseline survey of Varanasi Handloom Mega Cluster conducted in 2015-16 by the Office of Assistant Commissioner, Handloom and Textile industries of the State Government of Uttar Pradesh, about 42% of the handloom weaving households in the district are located within the municipal limits of Varanasi Municipal Corporation. Rest of the households are spread across the rural hinterland in concentrated pockets, particularly, in southern blocks of the district, namely, Kashi Vidya Peeth (which encapsulates the municipal area from three sides), Sevapuri, Arajiline, and (refer fig. 6).

Though the production is decentralized across the region, trading is highly concentrated in few wholesale markets located at the heart of Varanasi city, namely, at Chowk, Gol Ghar, and Madanpura; and also in Lohta lying just outside the municipal limits towards the west. This may be explained by the hierarchical structure of the weaving community, briefly discussed in a previous section, and structure of spatial networks of business transactions spread over the region.

CONCEPTUAL FRAMEWORK

In order to further explore the network of inter-relationships between weavers and allied workers, a number of pilot surveys and field visits were conducted in selected pockets in Varanasi city and its rural hinterland. Based on the initial observations, a paper-based questionnaire was developed.

The paper-based questionnaire survey was primarily intended at identifying both professional and social networks of weavers, and physically map those connections to identify the spatial dimension. Various types of weavers – those who directly work on the loom – were respondents of the survey, excluding those who are engaged in either pre- or post-loom operations. The questionnaire included following broad sections.

Section	To identify:
Occupational details	Type and quantum of production; type of infrastructure involved (i.e. loom)
Professional network	Professional connections of the weaver; frequency and length (in years); physical distance / proximity and level of trust with each of the connections
Social network	Participation in weaving by family members and relations; source of financial support; sense of belongingness and social participation of the weaver
Governance	Level of governmental intervention
Miscellaneous	Migration pattern (type of job and location); aspirations for the future

Broadly, respondents were asked to identify individuals with whom they interact professionally. Proximity of the individual (km), average frequency of interactions (no. of days per month), and the length of connection (in years) were noted for each tie. Further, this information was fed to a visualization interface (NodeXL) to draw network graph for a sample cluster. The graph was interpreted based on knowledge obtained from both literature and observations from the field.

From a part of the ongoing paper-based questionnaire survey, descriptive results w.r.t. networks are being discussed in following sections of this paper, followed by discussion of a sample cluster of Adampura in Varanasi city.

RESULTS AND DISCUSSION

Informal networks

As mentioned in a previous section, weavers in Varanasi are increasingly getting relegated to the status of contractual labour. In the prevalent system, most of the weavers are provided with requisite raw materials (i.e. yarn and design) by a master weaver or a trader, as per order. They are required to weave and deliver the woven product back against which they get paid as per the contract. Of the small sample set of 32 respondents from Adampura Zone in Varanasi city being interviewed, about 72% of handloom weavers have been contractual, whereas only handful are working independently, i.e. they employ their own labour, capital, and sell the finished product in the market. Rest are master weavers, each contracting work to about three to six weavers, who work either at their respective households, or those who are loom-less and travel to work in a workshop ('*kar-khana*' in Hindi) set up by the employer. There are contractual weavers who have been working on contracts from a single master weaver for the past fifteen years, whereas there are many who keep on switching from one to another every second or third year. Thus, there is neither any formal employment, nor even a formal contract involved in such transactions, which are largely based on mutual trust.

Proximity of connections

Although inter-firm networks are spread across a large city-region, ties between weavers and traders and/or allied workers are typically local, i.e. with high proximity. In other words, weavers and allied individuals often form locally dense non-overlapping cliques connected by few distant actors. Such a network structure may be classified as 'small-worlds' (Giuliani & Pietrobelli, 2011).

Most of the weavers living in dense urban areas of Varanasi have reported that distances covered for different transactions lie within a range of 500 m to 2 km. In rural areas, the range is around 2 to 5 km, with less frequent ties spanning for 10 km or more (e.g. services offered by a trader, or one who punches cards, or a designer). Hence, it is important to assess physical distances, since local ties are supposed to offer creative advantages of clustering (by

promoting frequent informal interactions); whereas distant ties are expected to generate competitive advantages resulting out of specialization.

Frequency of interactions

Besides the physical distance or geographical proximity, it is also important to assess the frequency of interactions while measuring the strength of networking ties. Respondents mostly reported high frequency in meeting their professional aides over both professional and non-professional interactions, given the concentration of weaving households in areas where they mostly live.

Contractual weavers usually meet their respective master weavers / traders over three to four times in a month, as and when they require additional yarn for weft, and also to deliver the finished product. However, the services of a yarn supplier, warper, and dyer are required by an independent weaver only once in one-and-half to two months, as and when the warp is consumed, since four to six sarees may be woven out of a typical roll of warp.

Strength of ties

Strong inter-relationships between weavers may also be explained by the fact that the weaving community in Varanasi is not only an occupational group, but largely a ‘biradari’, i.e. a caste-based community, where 60% to 95% of the weavers belong to Momin Ansari group of Muslim community. (However, it may be noted that weavers mostly refrain from having professional ties with their in-laws.) Thus, a deep cultural sense of belonging adds to inter-personal trust which is crucial for such networks.

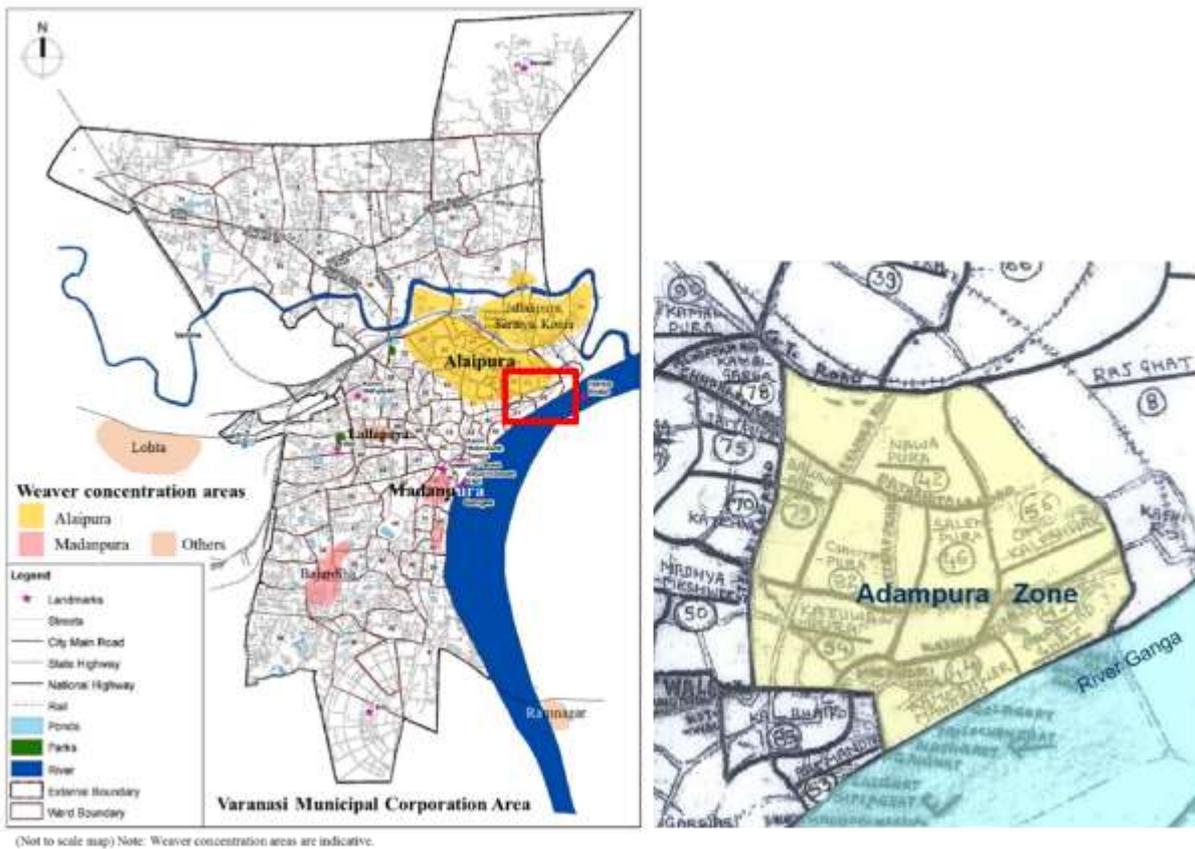


Figure 48 Adampura Zone: (left) Weaver concentration areas in Varanasi municipal area; (right) Adampura Zone identified on municipal ward map (indicative) (adapted by author from various sources and field observations)

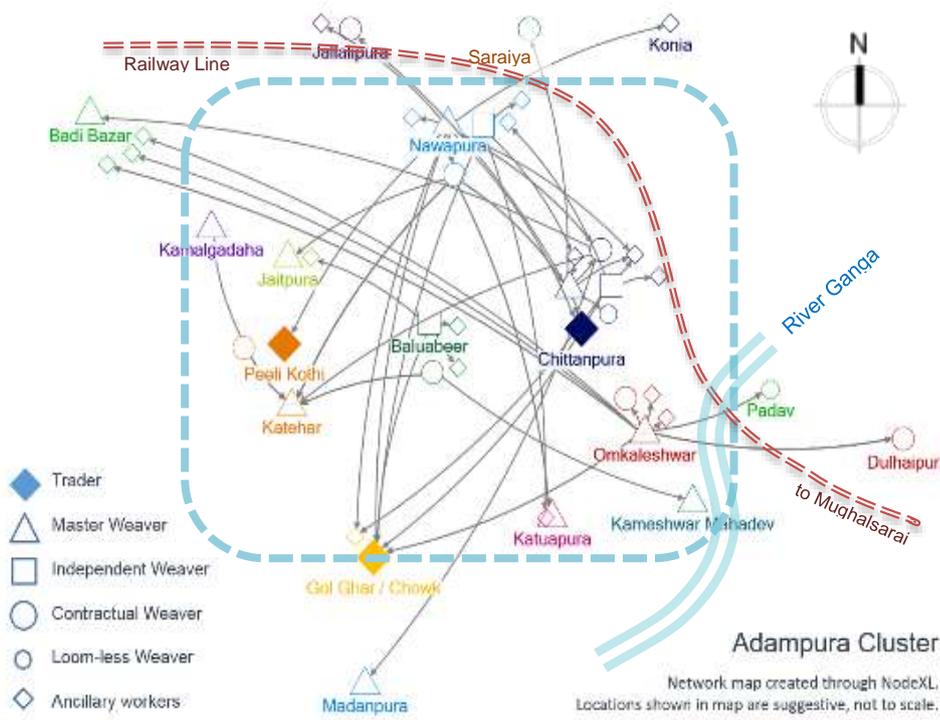


Figure 49 Map of professional network among weavers in Adampura Zone / Cluster (source: author)

Case of Adampura Zone in Varanasi

In order to describe the spatiality of inter-connections in the weaving community of Varanasi, Adampura Zone has been discussed in following paragraphs. Adampura is one of the prime weaving concentration area in the city of Varanasi under the jurisdiction of Adampura Police Station. It includes the following municipal wards with high density of weaving households: Nawapura, Chittanpura, Omkaleshwar, Baluabeer, and Katuapura (refer fig. 7). These wards are majorly comprised of following neighbourhoods, namely Fulwariya, Chittanpura, Pathani Tola, Alampura, Omkaleshwar, Koyla Bazar, and Dulligarhi. These are complemented by adjoining neighbourhoods of Katehar Mohalla and Jaitpura; and the entire belt is collectively known as Peeli Kothi – which is a hub of trading, under the auspices of several elite traders and exporters from the area.

About 32 weavers from Adampura Zone were interviewed. A basic network diagram has been prepared from the connections reported by these respondents (refer fig. 8). Nodes have been grouped as per the type of worker in distinct neighbourhoods. Following aspects may be noted from the map: Gol Ghar / Chowk, Peeli Kothi, and Chittanpura are trading hubs showing high centralities; whereas Nawapura and Chittanpura both are clusters of a range of weavers and allied workers (i.e. warper, dyer, punch card maker, etc.). Omkaleshwar towards the east receives contractual and loom-less weavers from Padav and Dulhaipur which are located across the river. Similarly, areas across the railway line - Jallalipura, Saraiyan, and Konia - are hubs of contractual and loom-less weavers and allied workers. Badi Bazar in the west is a hub of raw materials (i.e. yarn, dye).

Thus, it is evident from the above discussion that spatial information helps to assess various structural properties of a network, namely centralities, proximity, strength of ties, and nature of dependence. Hence, networks of business transactions in traditional cultural industries shall be assessed in relation to physical attributes of various actors and their inter-connections.

CONCLUSION

Traditional cultural industries are largely craft-based and practised by artisan communities. These industries thrive upon skill-sets getting passed on over generations and being protected within the community. Transfer of such tacit knowledge demands a strong network of inter-firm and inter-personal relationships. Since artisans live in tight-knit geographical clusters associated with strong social ties and a strong sense of belonging, spatial dimension of such networks gain significance in assessing the strength of such interconnections.

The case of Varanasi's silk weaving industry is a good example in this regard, highlighting the importance of trusted and reciprocal inter-relationships in sustenance of professional ties. Also, these networks have given shape to a particular organizational hierarchical structure embedded in the weaving community which has a pre-dominant bias on contract-based employment, albeit informal in nature.

The study is being further expanded to individually explore many such 'small-world' networks spread across the city region. This will enable the researcher to assess the network structure at a regional scale and examine the differences between properties of networks in urban and rural pockets. Further examination may be conducted to assess how

various exogenous and/or endogenous factors are affecting these network structures, such as rampant increase in mechanization in weaving industry resulting into faster and larger production; increasing migration of weavers from on-loom to pre- or post-loom operations; and rising emigration of weavers from Varanasi to distant regions.

REFERENCES

- Bajpai, S. (2015). *Brocade and Chowkpurana: Craft and Art of Uttar Pradesh- Prospect for their Sustainability*. Maharaja Sayajirao University of Baroda. Retrieved from [http://shodhganga.inflibnet.ac.in/bitstream/10603/77182/10/10 chapter 2.pdf](http://shodhganga.inflibnet.ac.in/bitstream/10603/77182/10/10%20chapter%202.pdf)
- Basole, A. (2015). Authenticity, Innovation, and the Geographical Indication in an Artisanal Industry: The Case of the Banarasi Sari. *The Journal of World Intellectual Property*, 18(3-4), 127-149. <https://doi.org/10.1111/jwip.12035>
- Comunian, R. (2012). Exploring the Role of Networks in the Creative Economy of North East England: Economic and Cultural Dynamics. In B. Warf (Ed.), *Encounters and engagements between economic and cultural geography* (The GeoJou, Vol. 104, pp. 143-158). Springer. <https://doi.org/10.1007/978-94-007-2975-9>
- DCMS. (2001). Creative Industries Mapping Document. In *Computer* (pp. 3-23).
- Evans, G. (2004). Strategies for Creative Cities. Retrieved from <http://www.ceut.udl.cat/wp-content/uploads/Evans.pdf>
- Fahmi, F. Z., Koster, S., & Van Dijk, J. (2016). The location of creative industries in a developing country: The case of Indonesia. *Cities*, 59, 66-79. <https://doi.org/10.1016/j.cities.2016.06.005>
- Flew, T. (2010). Toward a cultural economic geography of creative industries and urban development: Introduction to the special issue on creative industries and urban development. *The Information Society*, 26(2), 85-91. <https://doi.org/10.1080/01972240903562704>
- Giuliani, E., & Pietrobelli, C. (2011). *Social network analysis methodologies for the evaluation of cluster development programs*. Inter-American Development Bank.
- Landry, C. (2000). *The Creative City: A Toolkit for Urban Innovators*. London: Earthscan.
- Landry, C., & Bianchini, F. (1995). *The Creative City*. London. Retrieved from <http://www.demos.co.uk/files/thecreativecity.pdf>
- Lazzeretti, L., Boix, R., & Capone, F. (2009). Why do creative industries cluster? An analysis of the determinants of clustering of creative industries. In *DRUID Summer Conference* (pp. 1-34). Copenhagen. <https://doi.org/10.4324/9780203112571>
- Lee, M. (2015). Fostering connectivity: a social network analysis of entrepreneurs in creative industries. *International Journal of Cultural Policy*, 21(2), 139-152. <https://doi.org/10.1080/10286632.2014.891021>
- Schütte, S., & Kreutzmann, H. (2015). Making a living in Varanasi: Social place and socio-economic space. *Berlin Geographical Papers*, 44. Retrieved from http://www.diss.fu-berlin.de/docs/servlets/MCRFileNodeServlet/FUDOCs_derivate_000000005765/BGP-44_Making-a-Living-in-Varanasi.pdf
- Scott, A. J. (1997). The cultural economy of cities. *International Journal of Urban and Regional Research*, 21(2), 323-339. <https://doi.org/10.1111/1468-2427.00075>
- Scott, A. J. (2000). *The cultural economy of cities: essays on the geographies of image producing industries*. London: Sage.
- Scott, A. J. (2006). Creative cities: Conceptual issues and policy questions. *Journal of Urban Affairs*, 28(1), 1-17. <https://doi.org/10.1029/E0060i004p00042-05>
- Textiles Committee, & HWA. (2007). *Dream of Weaving : Study & Documentation of Banaras Sarees and Brocades*. Mumbai. Retrieved from <http://textilescommittee.nic.in/writereaddata/files/banaras.pdf>
- UNCTAD. (2010). *Creative economy report 2010*. Geneva and New York. Retrieved from http://unctad.org/en/Docs/ditctab20103_en.pdf
- UNESCO. (2013). *Creative economy report 2013. Special edition*. Paris. Retrieved from <http://www.unesco.org/culture/pdf/creative-economy-report-2013.pdf>
- van Heur, B. (2009). The Clustering of Creative Networks: Between Myth and Reality. *Urban Studies*, 46(April 2008), 1531-1552. <https://doi.org/10.1177/0042098009105503>

1553 SHARED AUTOMATED VEHICLES AND EMPLOYMENT AGGLOMERATION: INTEGRATING URBANSIM WITH AGENT-BASED TRANSPORTATION SIMULATION MODEL

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ABSTRACT

Increasing use of shared automated vehicles (SAVs), a promising future transportation system, will likely change transportation costs and land accessibility, and eventually the spatial distribution of employment. The variations in employment location decisions will, in turn, alter the spatial distribution of opportunities to incubate new businesses and expand existing services, with significant implications for reorienting the economic structure and competitiveness of a region. However, few studies have explored the potential changes in employment location choices in an SAV dominant scenario. This study addresses this gap in the literature by simulating the employment agglomeration patterns with the help of an integrated urban simulation model and an agent-based SAV dynamic ridesharing model. The results show that SAV will accelerate the existing deindustrialization trends by significantly reducing the travel costs and enhancing land accessibility.

Key words: Shared Automated Vehicles, Employment Agglomeration, Commercial and Industrial Land, Agent-based Simulation

INTRODUCTION

Shared Autonomous Vehicles (SAVs), envisioned as a ubiquitous transit system, have generated significant attention and discussion in recent years (Collie, Rose, Choraira, & Wegscheider, 2017). While the technology is still under development and legal issues remain, small-scale SAV projects are already implemented in cities worldwide (NuTonomy, 2016; Siegel, Robert, 2016). A wealth of literature has demonstrated the feasibility (Kornhauser, 2013), affordability (Burns, Jordan, & Scarborough, 2013), and reduced environmental impacts (Fagnant & Kockelman, 2014; Greenblatt & Saxena, 2015) of the system when compared with private vehicle ownership (Zhang, Guhathakurta, & Khalil, 2018) and current ride-sourcing mobility services.

However, the long-term impacts of this promising future travel mode on urban land use have not been adequately researched (Guerra, 2016). Although some SAV studies have explored the influence of the system on urban parking (Zhang & Guhathakurta, 2017; Zhang, Guhathakurta, Fang, & Zhang, 2015) and residential location choices (Zhang, 2017), to authors best knowledge, no study, to date, has explored how SAVs will influence commercial and industrial land uses. Hence, there is a pressing need to extend the current employment/industrial location choice theories by examining how employment agglomeration patterns will change with the proliferation of SAVs. This study integrates employment location and relocation choice models in UrbanSim (Waddell & Ulfarsson, 2003) with an SAV simulation model (Zhang & Guhathakurta, 2017) to explore changes in employment agglomeration patterns in an SAV dominated future. The results enhance our existing understanding of the spatial distribution of employment by industry sectors under an SAV dominated scenario.

The rest of the paper is organized as follows. Section 2 revisits existing employment location choices theories and the literature on the impacts of SAVs. In Section 3, we introduce the integrated model framework, implementation methods, and data sources. Section 4 summarizes model results, which are validated and verified in Section 5. Section 6 concludes by highlighting the main findings and discusses model limitations as well as potential future research endeavors.

PRIOR WORK

There is an extensive literature examining how transportation-related factors influence employment location choice in metropolitan areas. Weber (1929) formulated the theory of industry location, proposing that firms locate in places that minimize the transportation costs of materials and products. The spatial theory of firm location choices was pioneered by Losch's idealized hexagonal markets, which distributed firms according to their demand potential (Losch, 1954) and by Christaller's work on central place and hierarchy of cities (Christaller, 1933). Both Losch and Christaller provided conceptual frameworks explaining the role of accessibility to raw materials and markets in firm location choices.

The co-locating phenomenon of firms, which was not addressed in the initial models, was later explained in the theoretical literature on agglomeration economies. This line of theory suggests that the returns to scale are not constant, but rather increase for firms that cluster with other firms. The extent of scale economies vary by the type of agglomerating firms, particularly with respect to whether they are within the same industry sector, complementary to the sector, or in other sectors (Marshall, 2009). The localization economies are realized when firms in the same industry sector agglomerate, which offers at least three benefits including access to buyer-supplier networks, labor market pooling, and knowledge spillovers (Fujita & Thisse, 2003; Krugman, Cooper, & Srinivasan, 1995). Meanwhile, multiple factors may prevent extremely high density of firms. These factors are associated with adverse externalities caused by agglomeration, such as congestion, pollution, and high rents in the urban centers. Recent empirical models, also include other amenities, such as government policies and local tax as drivers of agglomeration (Waddell & Ulfarsson, 2003).

The existing location theories suggest accessibility to resources and amount of developable land play an essential role in firm location choices. The introduction of SAVs as a new form of urban mobility service will inarguably change firms' accessibility to human capital and markets as well as the availability of land in the region. Therefore, this travel mode would inevitably lead to shifts in employment location choices. First, SAVs will increase firms' accessibility to labor by reducing the transportation costs. Several studies suggest that the mobility service provided by SAV system will be more affordable compared with privately owned vehicles and even some public transit services. The mile based cost for SAV ranges from €13-50/mile according to recent articles and commercial assessment reports (Albright, Bell, Schneider, & Nyce, 2016; Barclays, 2016; Bridges, 2015; Burns et al., 2013). The cost of SAVs varies depending on the assumptions in technology development, future insurance rate, maintenance frequency, vehicle fuel type, as well as the density of travel demand. In the most optimistic estimation, where electric SAV system fulfills the travel demand, the system costs approximately €13/mile and can still anticipate 30% of marginal profits (Bridges, 2015). Although the estimated cost of SAVs varies significantly among studies, even the highest estimated cost of SAV (€50/mile) is well below the current cost for an average sedan, which is estimated at €75/mile (AAA, 2016).

Beyond the mile-based cost reduction, SAVs can further reduce transportation costs by enabling multi-tasking in vehicles. Given that the burden of driving is eliminated in self-driving cars, the in-vehicle travel time (IVTT) may not be a nuisance to drivers, as they can be productive or just relax in cars. Therefore, it is anticipated that the primary travel time costs in the era of SAVs will be the out-of-vehicle travel time (OVTT) costs, i.e., waiting time costs. In other words, the accessibility to destinations or resources is no longer an inversed function of distance, but instead negatively associated OVTT costs and discounted IVTT costs. The average waiting time costs may vary throughout the city, depending on the distribution of available SAVs. Although the SAVs can relocate to balance the distribution of services in the city, the OVTT costs in higher density districts are expected to be lower. This indicates that compactly developed zones may turn out to be more accessible to various markets and resources in the region.

Moreover, SAVs may also change the spatial patterns of developable land by eliminating a significant amount of parking lots in urban areas. Simulation results from both hypothetical and real-world network-based model settings all suggest that over 90% of the parking lots can be eliminated in the SAV scenario (Zhang et al., 2015; International Transport Forum, 2015; Zhang & Guhathakurta, 2017). Additionally, the reduction in parking land is unlikely to be uniformly distributed in the city. More reduction is anticipated in areas with high land values, given SAVs are programmed to park in zones that minimize total parking expenses (Zhang & Guhathakurta, 2017). This suggests that more land may be available for development in areas with comparatively higher land values, such as urban core and commercial sub-centers, where currently a considerable amount of land is zoned as parking spaces to meet the minimum parking requirements.

In sum, prior studies conceptually support our hypothesis that SAVs will fundamentally change the employment location choices by reducing transportation costs and land availability in urban areas. This study seeks to quantify the potential changes in employment distribution patterns in a SAV dominated scenario.

METHODS AND DATA

Model Development

This study uses a three-step model framework, which integrates employment location and relocation choice models in UrbanSim with an agent-based SAV simulation model, to examine changes in employment agglomeration patterns in a SAV dominant scenario. First, the preferences in employment location choice by industry sectors are estimated using Multinomial Logit models (MNL). Second, the explanatory variables in the MNL models, especially the accessibility to human capital and density of available commercial and industrial land, are updated using outputs from the SAV simulation model (i.e., reductions in commute costs and parking spaces). Finally, changes in employment location choices by industry sector are simulated using the employment relocation choice models in UrbanSim. The following sections discusses the steps mentioned.

Step 1: Employment Location Choice Models

The aggregated MNL models, i.e., the Transportation Analysis Zone (TAZ) level models, are applied to reveal preferences for employment location choices. In addition to the selected relocation TAZ, additional nine TAZs with commercial or industrial land are randomly sampled as alternatives for each job in the model. In other words, each relocating job has 10 alternative TAZs to select from. The probability of a job n choosing to locate in TAZ i can be expressed as:

$$P_{ni} = \frac{e^{V_{ni}}}{\sum_{j=1}^{10} e^{V_{nj}}} \tag{1}$$

The utility of job n choosing TAZ i , denoted as V_{ni} , in the above equation can be expressed using a linear combination of independent variables as follow:

$$V_{ni} = \beta_1 HC_{edu,i} + \beta_2 A_i + \beta_3 L_i + \beta_4 X_i + \epsilon_{ni} \tag{2}$$

Where, $HC_{edu,i}$ are vectors measuring TAZ i 's regional accessibility to human capital with education attainment, edu . A_i represents localization and agglomeration features, such as employment counts by sector and firm density, in TAZ i . L_i is the density of available commercial/industrial land in TAZ i . X_i are vectors of transportation infrastructure, built environment, and local policy and economic conditions in TAZ i . $\beta_1, \beta_2, \beta_3$, and β_4 are vectors of estimated coefficients. ϵ_{ni} is the unobserved random utility component for each decision maker n given TAZ i , which is independent and identically Gumbel-distributed.

$HC_{edu,i}$ features are estimated using Equations (3)-(6). $HC_{edu,i}$ are defined as the sum of all available labors with education attainment, edu (i.e., $pop_{edu,j}$) weighted by the generalized transportation cost (i.e., $e^{-TC_{ij}}$) across all TAZs (i.e., J TAZs) in the region. TC_{ij} is the transportation costs between TAZ i and j , including the travel time costs ($time\ cost_{ij}$) and vehicle costs ($vehicle\ cost_{ij}$). The time costs are estimated by multiplying the sum of OVTT costs (incurred at trip origins and destinations [i.e., $OVTT_i$ and $OVTT_j$]) and IVTT costs (incurred between origins and destinations [i.e., $IVTT_{i,j}$]) by average hourly salary. Vehicle costs ($vehicle\ cost_{ij}$) are estimated by multiplying the shortest distance between TAZ i and j (i.e., $dist_{ij}$) with the average vehicle cost per mile, including both vehicle ownership and operational costs. The average vehicle cost is the weighted average of mile-based costs. The weights are estimated based on the composition of regional vehicle inventory.

$$HC_{edu,i} = \sum_{j=1}^J pop_{edu,j} * e^{-TC_{ij}} \tag{3}$$

$$TC_{ij} = time\ cost_{ij} + vehicle\ cost_{ij} \tag{4}$$

$$time\ cost_{ij} = (OVTT_i + OVTT_j + IVTT_{i,j}) * average\ job\ salary \tag{5}$$

$$vehicle\ cost_{ij} = dist_{ij} * cost\ per\ mile \tag{6}$$

Step 2: Labor Accessibility and Land Availability in the Era of SAVs

A discrete-event simulation model is applied to examine possible impacts of SAVs on land accessibility and urban parking. The SAV model simulates a scenario in which urban residents give up private vehicle ownership and rely exclusively on the SAV system to fulfill their daily travel demand. The model generates urban travel demand – trips, using Origin and Destination (OD) pairs obtained from OD matrices derived from local travel demand models. Travel departure times are simulated to follow the distributions obtained from the local travel survey. Upon receiving clients' calls for vehicles, the system assigns the closest available SAV to fulfill the request. Clients will be put on a waiting list if all vehicles are occupied and be prioritized for assignment once an SAV is freed up. After dropping off clients, SAVs will either be assigned to serve waiting clients, cruise to underserved areas, if in a surplus area, or park directly. The first simulation day will be used as a "warm-up" period to determine the required SAV fleet size to serve the study area. Results from the second and subsequent simulation days will be used to analyze average waiting time and system-wide parking demand. See Zhang et al. (2017) for more details regarding the conceptual SAV model and model implementation algorithms.

The SAV simulation model outputs are used to update the values of two sets of independent variables: (1) human capital accessibility variables ($HC_{edu,i}$) and (2) density of available commercial and industrial spaces (L_i). The human capital accessibility will be improved significantly, due to the reduction in commute costs introduced by SAVs. Human capital accessibility will be updated using Equations (7)-(10) in the era of SAVs. The time costs will be a linear function of OVTT costs at both ends of the trip and a discounted (i.e., α) IVTT cost. Given the uncertainty in the perception of reduced IVTT costs, α ranging from 0% to 50% are examined in this study, as existing literature estimated the value of travel time to as approximately 25% to 50% of prevailing salary (Litman, 2008). Furthermore, the average vehicle cost per mile will be replaced by the SAV cost per mile, 30 cents/mile (i.e., the average of existing estimations, ranging from 13-50 cents/mile).

$$HC_{edu,i} = \sum_{j=1}^J pop_{edu,j} * e^{-TC'_{ij}} \tag{7}$$

$$TC'_{ij} = time\ cost'_{ij} + vehicle\ cost'_{ij} \tag{8}$$

$$time\ cost'_{ij} = (OVTT_i + OVTT_j + \alpha * IVTT_{i,j}) * average\ job\ salary \tag{9}$$

$$vehicle\ cost'_{ij} = dist_{ij} * SAV\ cost\ per\ mile \tag{10}$$

Simulation studies suggest that SAV may be able to eliminate over 90% of urban parking spaces (Zhang & Guhathakurta, 2017). The redundant parking spaces hold the potential to be converted into rentable commercial or industrial spaces. The most recent Atlanta parking inventory report indicates the average area of parking space in Atlanta is approximately 300 square feet (CAP, 2014). Therefore, the updated density of available land in TAZ i can be estimated as follow:

$$L'_i = L_i + \delta * Parking_i * 300 / Area_i \tag{11}$$

Where, $Parking_i$ is the unused parking spaces in TAZ i based on the output of SAV simulation model. The parking lots reduction potentials depend heavily on the market penetration of SAVs. The coefficient δ indicates the percentage of parking spaces that will be transformed into rentable spaces, primarily due to the changes in the zoning ordinance, developers' preferences, and the market demand, which are not modeled in this study. Instead, this study conducts sensitivity tests with parking space conversion rates, δ , ranging from 25% to 90%.

Step 3: Simulate Employment Relocation using UrbanSim

The employment relocation choices are simulated iteratively over multiple years. At the beginning of each simulation year, the model first identifies the relocating jobs and then assigns the relocating jobs to TAZs with the highest utility value, calculated based on employment location choice models. The relocation jobs include (1) new employment in the region, which is generated based on the control totals in the region and (2) existing jobs that decide to relocate, which are randomly selected from all jobs in the region according to the average relocation rates by industry sectors. For each new or relocating job, a choice set of ten TAZs are randomly pooled, and utilities for the sampled TAZs are calculated using the coefficients from the employment location choice MNL model and the updated independent variables, as shown in Equations (12)-(13).

$$P_{n,i,k} = \frac{e^{V_{n,i,k}}}{\sum_{j=1}^{10} e^{V_{n,j,k}}} \quad (12)$$

$$V_{n,i,k} = \beta_1 HC_{edu,i} + \beta_2 A_{i,k} + \beta_3 L_{i,k} + \beta_4 X_i + \epsilon_{n,i} \quad (13)$$

Where, $P_{n,i,k}$ is the probability for relocating job n to select alternative i in the simulation year k ; $V_{n,i,k}$ is the utility of alternative i in simulation year k to firm n ; $HC_{edu,i}$ is the accessibility of TAZ i to human capital with education attainment, edu , after the introduction of SAVs; $L_{i,k}$ is the updated density of available commercial and industrial land at the beginning of simulation year k ; $A_{i,k}$ is the updated localization effects at TAZ i , at the beginning of simulation year k .

The final choice is simulated by selecting the TAZ with the highest utility. By the end of simulation year k , the TAZ level agglomeration features, $A_{i,k}$, and available land features, $L_{i,k}$, will be updated to $A_{i,k+1}$ and $L_{i,k+1}$ and will be used to calculate $V_{n,i,k+1}$ and $P_{n,i,k+1}$ in simulation year $k + 1$. This agent-based employment relocation choice model is implemented using UrbanSim (Waddell & Ulfarsson, 2003).

Two scenarios, i.e., Business as Usual (BAU) and SAV scenarios, of employment relocation choice model are developed. The BAU scenario is implemented using the current TAZ level variables. The SAV scenario is implemented with updated access to human capitals and commercial and industrial land density variables. For both scenarios, the relocation of employment is simulated for five years. The results from BAU and SAV models are eventually compared to examine the possible impacts of SAVs on regional employment agglomeration patterns.

Model Simplification and Assumptions

There are several assumptions and simplifications embedded in the developed model, which are summarized as follows:

- 1) No change in the travel patterns, i.e., no induced travel demand and no variations in the travel behaviors (e.g., OD matrices and trip departure time distribution);
- 2) Potential changes in the traffic condition is not modeled in this study. some studies suggest that AVs will induce travel demand (Harper, Hendrickson, Mangones, & Samaras, 2016). However, multiple simulation studies also suggest that AVs may significantly increase road capacity (Shladover, Su, & Lu, 2012; Tientrakool, Ho, & Maxemchuk, 2011). Therefore, it remains unclear whether the existing congestion during peak hours may deteriorate or mitigate in the era of AV;
- 3) It assumes a 100% market penetration rate and the heterogeneity in the preferences for SAVs is not considered. The purpose of this study is not to examine how the employment location choices may change in the transition period, but how the location choices may evolve in an SAV dominated scenario;
- 4) Land use types will remain the same in the SAV scenario, i.e., there will be no conversion between commercial/industrial land and other types of land.
- 5) Changes in potential parking land conversion and IVTT costs are introduced as exogenous variables. We conducted sensitivity tests with different parking land conversion rates (from 25%-90%) and discounted IVTT costs (from 0% to 50%) in the model verification and validation section to determine how these variables may influence model outputs.

Model Implementation and Data

Step 1: Employment Location Choice Model Implementation

2010 and 2015 ESRI business data, with geocoded firm locations, are used to develop employment location choice models by industrial sector. There are 164,494 and 204,906 businesses in 2010 and 2015 dataset respectively. The datasets contain attributes, such as business names, business types, firm locations, and the number of employees. In the 2015 ESRI data, approximately 92,767 firms locate on residential parcels, indicating that these businesses are home-based. These businesses are typically small, with only one or two employees. In this study, home-based businesses (i.e., businesses with less than three employees or located on residential parcels) are filtered out, given that they are most likely to be self-employed businesses and a different set of factors may influence their location choices. Finally, firms that either started after 2010 or relocated between 2010 and 2015 are considered as firms who made location choices and are included in the estimation of MNL models. 70,086 firms or 563,129 jobs are used to estimate the employment location choice model.

The businesses are divided into eight industrial sectors based on Standard Industrial Classification (SIC) code to develop models separately. Different models are estimated for each sector, as most empirical employment location choice models suggest that firms from different sectors inherit significantly different location preferences (Waddell & Ulfarsson, 2003). Table 1 presents the classification of industry sectors based on the SIC code and the employment count.

Table 1: Number of New or Relocated Business by Industry Sector

Industry Sectors	2-Digit SIC Code	Number of Jobs	Count of Firms	Average Size
Construction	15 - 17	13,258	1,224	10.8
Manufacturing	20 - 39	24,551	1,705	14.4
TCU	40 - 49	34,555	3,237	10.7
Wholesale	50 - 51	15,326	2,441	6.3
Retail	52 - 58	209,483	7,085	29.6
FIRE	60 - 67	43,815	3,188	13.7
Services	70 - 89	191,357	17,055	11.2
Public	91 - 99	30,784	2,272	13.5
Total		563,129	70,086	14.7

Table 2 tabulates the descriptive statistics and data sources for all considered independent variables, such as accessibility to human capital, agglomeration economy/diseconomy, land availability, transportation infrastructure access, built environment, local tax policies, and other county-level policy factors, in firm location choice models.

Table 2: Summary of Independent Variables in Employment Location Choice Model

Variable Type	Variables	Min	Max	Average	Std. Dev.	Data Source
Human Capital/ Market Size ($HC_{edu,i}$)	Access to Population with Bachelors	0	44.47	1.96	3.79	Calculated by Authors, using data from Census Bureau
	Access to Population with High School	0	18.08	1.87	2.61	
	Access to Population without High School	0	5.74	0.49	0.79	
	Access to Labor Pool (population above 25)	0	57.80	3.76	6.23	
	Median Income (by TAZ)	6815	147412	66657.36	35481.48	
Agglomeration economy /diseconomy (A_i)	# Jobs in Sector 1 – Manufacture	0	7551	89.78	334.49	Esri 2010
	# Jobs in Sector 2 – Construction	0	4183	67.03	155.19	
	# Jobs in Sector 3 – TCU	0	6447	83.65	338.16	
	# Jobs in Sector 4 – Wholesale	0	3004	68.80	213.47	
	# Jobs in Sector 5 – Retail	0	4969	114.57	311.84	
	# Jobs in Sector 6 – FIRE	0	6116	332.36	538.01	
	# Jobs in Sector 7 – Services	0	23978	591.37	1227.98	
	# Jobs in Sector 8 – Public	0	12500	95.33	516.15	
	Job Density (per Acres)	0	963.12	6.31	35.28	
	Average Employment Size	0	171.35	10.69	12.34	
Land Availability (L_i)	Available Commercial/Industrial Land Density (SQFT per Acres)	2.7	113683.3	2498.8	6791.8	CoStar Group, Inc*
Transportation Infrastructure (X_i)	Distance to Expressway Exit (meters)	203.8	91045.9	13964.6	12730.4	Calculated by Authors, Using road shapefiles from ARC**
	Distance to Highway (meters)	1.0	20980.4	4083.6	3330.5	
	Distance to Airport (miles)	0.43	32.57	12.14	5.21	
Built Environment (X_i)	Rate of Unemployment	0	0.56	0.10	0.06	Census Bureau
	Population Density (2010)	0	60.23	3.67	3.55	
	Walkability (Walkscore)	0	96	18.38	21.66	WalkScore® API***
	Average Land Value (per SQFT)	3.45	127191.52	307.74	3368.42	CoStar Group, Inc*
	Entropy (2010)	0.04	0.96	0.63	0.19	Calculated by Authors, using data road and land use data from ARC
	Percent of Four-way Intersection	0	1.00	0.12	0.13	
	Density of Four-way Intersection (per Km ²)	0	465.50	13.40	29.20	
County Specific (X_i)	Property Tax Rate	0.60	1.40	1.04	0.22	County Websites
	Location Quotient (TAZ level) across all sectors	0	13.96	1.67	3.54	Calculated by Authors
	Dummies for each County	NA	NA	NA	NA	using LEHD data****

* CoStar Group, Inc: A provider of commercial real estate information. **ARC: Atlanta Regional Commission

*** WalkScore® API: Application Programming Interface (API) released by WalkScore® for users to access WalkScore data given latitude and longitude pairs. **** LEHD: Longitudinal Employer-Household Dynamics data provided by Census Bureau.

Businesses need human capital to undertake production and other revenue-generating activities. Thus, the accessibility to skilled labor plays an important role in the choice of firm location (Basile, Castellani, & Zanfei, 2009; Mota & Brandão, 2013). In this study, the accessibilities to the population by different level of education attainment ($HC_{edu,i}$), estimated using Equations (3)-(6), are used to measure TAZ level access to human capital. The time costs are associated with travel time and average hourly salary by industrial sector, obtained from the Bureau of Labor Statistics. The vehicle costs are estimated by multiplying the travel distance by the average vehicle costs per mile. The average mile-based vehicle cost is the weighted average costs. The weights are calculated using regional vehicle composition profile obtained from the Atlanta 2011 travel survey and 2016 AAA's vehicle cost report.

Theories regarding agglomeration and localization economies suggest that firms can realize benefits by co-locating and sharing raw materials, skilled labor pools, markets, and infrastructure (Marshall, 2009). While the theory of scale diseconomy indicates that the negative externalities stemming from the high density may prevent firms from agglomerating. The negative effects include congestion, server competition, and an insufficient amount of critical infrastructure. The agglomeration related variables (A_i) used in this study include TAZ level employment by sectors, job density, and average employment size. Given the theory of agglomeration economy and diseconomy, the correlations

between firm location choice and the agglomeration variables are not linear (Bhat, Paleti, & Singh, 2014). Therefore, squared terms of these variables are also considered to reflect the phenomenon of diseconomy when the density becomes too high. Agglomeration variables are estimated from 2010 Esri business data.

The probability of a firm to locate in a TAZ i is also determined by the availability of rentable commercial/industrial spaces. The land availability variable (Li) for the year 2010 is generated by aggregating CoStar’s building level rentable space data to TAZ level. The data is normalized by the area of TAZs to reflect the intensity of available land in TAZs.

Transportation infrastructure and built environment features also affect firm location choices (Bhat et al., 2014). Adjacency to various types of transportation infrastructures, including states expressways, highways, and airports, are examined in different models. Additionally, built environment features, such as population density, walkability (using WalkScore), percent of four-way, three-way intersections, and cul-de-sacs, are also tested to determine whether TAZs with better infrastructure and more compact and diverse development patterns are more appealing to firms in the study area.

The county-specific variables, such as property tax, Location Quotient (LQ), and county binary dummies, are also examined in the models. County property tax is included because prior empirical studies suggest property tax can influence firm location choice via the supply of rentable spaces (Guimaraes, Figueiredo, & Woodward, 2004; Jofre-Monseny & Solé-Ollé, 2010). LQ index is calculated by County to measure the specialization effects. LQ is defined as the percentage of businesses from a certain industry sector for each county divided by the national percentage of the businesses in the same sector. The index is calculated using the Equation below:

$$LQ_{i,j} = \frac{B_{i,j}/TotB_j}{B_{i,nation}/TotB_{nation}} \tag{14}$$

Where, $LQ_{i,j}$ denotes LQ for industry sector i in County j ; $B_{i,j}$ denotes total number of businesses in industry sector i in County j ; $TotB_j$ denotes total number of businesses in County j ; $B_{i,nation}$ denotes total number of businesses in industry sector i in the nation; $TotB_{nation}$ denotes total number of businesses in the nation.

LQ index specifically captures the effect of localization economy (Gabe & Bell, 2004). A county may have a high localization economy if the proportion of a specific industry sector is significantly higher than the national average. Based on the theory of localization economy, firms from the same sector may decide to collocate to have better access to specialized human capital and market.

Other unobservable county-level variables are included in the location choice model by introducing county specific binary variables. The coefficients of these dummy variables will capture the mean effect of unobserved county factors in firm location choices.

Step 2: SAV Simulation Model Implementation

The SAV simulation model is implemented using OD matrices and transportation network from Atlanta Regional Commissions (ARC)’s travel demand model. There are 1,593 TAZs and 9 million vehicle trips in the 10-county study area. The trip departure time distribution is obtained from the weighted 2011 ARC travel survey. The travel demand peaks between 7-8 AM and 5-6 PM. ARC’s travel demand model also provides the link level travel speed, which varies by time of the day, including morning peak, noon, evening peak and night.

Results from 50 rounds of warm-up running tests suggest approximately 367,160 vehicles will be sufficient to serve the 10-county travel demand, i.e., more than 99% of the clients can be picked up within 15 minutes after calling for services. The average waiting time is 7.13 minutes for the entire region. The average waiting time increases to 10.59 during the evening peak hours. The results also show that each SAV can serve, on average, 24.5 trips on a daily basis. Additionally, increasing the fleet size is not going to improve the system performance significantly. An SAV system with 5% more vehicles (i.e., 18,358 additional SAVs) can only reduce the average waiting time by 0.32 minutes to 6.81 minutes. Therefore, in this study, the total fleet size parameter is fixed at 367,160 vehicles for all simulation runs. The expected waiting time for clients departing from different TAZs is calculated using results from all model runs. The TAZ-level average waiting time is then used to update commute costs in the era of SAVs, based on Equations (7)-(10). The discount for IVTT is first set to 0% in the model. The sensitivity tests show the simulation results with discount factors set as 25% and 50%.

Step 3: Employment Relocation Model Implementation in UrbanSim

This study implements employment relocation model using the employment transition and employment relocation models in UrbanSim. The employment transition model in UrbanSim first generates new firms based on regional employment control totals across industry sectors from ARC. The employment relocation model then selects a random sample of existing firms to relocate in the region, based on the average relocation rates by industry sectors. The relocation rates are calculated using Esri 2011 and 2015 data, as tabulated in Table 3. UrbanSim relocation choice model then allocates both the new and relocating firms into TAZs. The probabilities of selecting TAZs for relocation are computed using the estimated employment location choice models from Step 1. Jobs will be eventually assigned to TAZs with the highest probability scores.

Table 3: Annual Relocation Rate by Industry Sector

Industry Sector	Relocated Jobs (2010-2015)	Total Jobs	Annual Relocation Rate
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Construction	13,258	95,302	2.8%
Manufacture	24,551	137,726	3.6%
TCU	34,555	105,843	6.5%
Wholesale	15,326	105,431	2.9%
Retail	209,483	426,851	9.8%
FIRE	43,815	154,192	5.7%
Services	191,357	825,865	4.6%
Public	30,784	155,144	4.0%
Total	563,129	2,006,354	5.6%

MODEL RESULTS AND ANALYSIS

Existing Firm Location Preferences

The estimated firm location choice models are tabulated in Table 4 by industry sector. The final models only include significant variables. The models exclude alternative specific constants and base alternative. Therefore, the estimated coefficients can be directly interpreted with respect to the direction of change in the utility and can also be compared with other coefficients across models. Unstandardized independent variables are used in the models because despite the absolute values of human capital access and commercial/industrial land density variables vary dramatically between SAVs and BAU scenarios, the difference between standardized variables are quite small, rendering it hard to examine the impact of SAVs. The coefficients for standardized variables (i.e., Betas) are also provided in the table for references.

Table 4: Employment Location Choice Model Results by Industry Sectors

Types	Variables	Manuf. Estimation [Beta] (t-stats)	Constr. Estimation [Beta] (t-stats)	TCU Estimation [Beta] (t-stats)	Wholesale Estimation [Beta] (t-stats)	Retail Estimation [Beta] (t-stats)	FIRE Estimation [Beta] (t-stats)	Services Estimation [Beta] (t-stats)	Public Estimation [Beta] (t-stats)
Human Capital/ Market Size (HC _{edu})	Access to Population with Bachelors	-	-0.0587 [-0.223] (-8.35)	-0.0135 [-0.051] (-3.24)	-	-	0.0662 [0.251] (9.96)	-	-
	Access to Labor Pool	-	-	-	-	-	-	0.0314 [0.397] (11.54)	0.0139 [0.176] (9.87)
	Median Income	-	-0.000027 [-0.958] (-16.94)	-0.000005 [-0.178] (-12.58)	-	-	-	-	-
Agglomeration Economy / Diseconomy (A _i)	Sector specific job #	0.00725 [2.674] (75.25)	0.00313 [0.458] (132.3)	0.00259 [0.876] (118.95)	0.00567 [1.210] (117.17)	0.0024 [0.748] (166.92)	0.00189 [0.589] (75.27)	0.000217 [0.266] (57.21)	0.00112 [0.578] (105.79)
	Sector specific job # (Squared)	-3E-6 [-4.207] (-48.93)	-5E-7 [-0.220] (-102.35)	-3E-7 [-0.470] (-76.77)	-2E-6 [-0.200] (-52.52)	-5E-7 [-1.010] (-110.07)	-3E-7 [-0.300] (-52.59)	-7E-9 [-0.130] (-30.99)	-7E-8 [-0.310] (-70.85)
	# Jobs in Sector 1 – Manufacture	N/A	0.000951 [0.318] (21.72)	0.000139 [0.046] (2.89)	-	-	-	-0.000119 [-0.040] (-5.30)	-0.000488 [-0.163] (-11.23)
	# Jobs in Sector 2 – Construction	-	N/A	0.000164 [0.025] (6.91)	0.000244 [0.038] (20.2)	-0.000163 [-0.025] (-17.24)	-	-0.00007 [-0.011] (-7.69)	-
	# Jobs in Sector 3 – TCU	0.000166 [0.056] (5.61)	0.000313 [0.106] (132.3)	N/A	-	-0.00092 [-0.031] (-12.10)	-0.000154 [-0.052] (-9.09)	-0.000279 [-0.094] (-24.25)	-
	# Jobs in Sector 4 – Wholesale	0.000269 [0.057] (5.29)	0.000168 [0.036] (8.04)	0.000556 [0.119] (16.88)	N/A	-	-0.000434 [-0.093] (-16.33)	-0.000393 [-0.084] (-24.49)	0.000265 [0.057] (6.56)
	# Jobs in Sector 5 – Retail	-	-0.000092 [-0.029] (-5.94)	-	-	N/A	-	-0.000319 [-0.099] (-48.68)	-
	# Jobs in Sector 6 – FIRE	0.000149 [0.032] (5.59)	0.000312 [0.168] (12.55)	-	-0.000085 [-0.046] (-3.14)	0.000047 [0.015] (5.86)	N/A	-	0.00027 [0.084] (13.61)

Types	Variables	Manuf. Estimation [Beta] (t-stats)	Constr. Estimation [Beta] (t-stats)	TCU Estimation [Beta] (t-stats)	Wholesale Estimation [Beta] (t-stats)	Retail Estimation [Beta] (t-stats)	FIRE Estimation [Beta] (t-stats)	Services Estimation [Beta] (t-stats)	Public Estimation [Beta] (t-stats)
	# Jobs in Sector 7 – Services	-	-0.000154 [-0.189] (-18.02)	-	-	-	0.000152 [0.188] (26.84)	N/A	-0.000041 [-0.050] (-6.11)
	# Jobs in Sector 8 – Public	-	-	-	-	-0.000201 [-0.104] (-22.27)	-0.000191 [-0.099] (-12.77)	-0.000136 [-0.070] (-26.68)	-
	Log Job Density (per Acres)	0.0567 [0.049] (6.19)	0.131 [0.114] (12.98)	0.200 [0.173] (17.44)	0.0949 [0.083] (9.16)	0.127 [0.110] (30.12)	0.839 [0.727] (105.95)	0.960 [0.832] (249.57)	0.236 [0.205] (26.64)
Land Avail (L_i)	Ln Commercial/ Industrial Land Density	-0.046 [-0.038] (-1.86)	-0.022 [-0.019] (-3.34)	-0.0555 [-0.047] (-6.96)	-0.0138 [-0.012] (-1.86)	-	0.0636 [0.053] (2.13)	0.0168 [0.014] (3.64)	0.104 [0.087] (16.57)
	Distance to Expressway Exit (meters)	-	-	-	-0.000005 [-0.064] (-3.36)	-0.000006 [-0.077] (-11.33)	-0.000004 [-0.051] (-3.28)	-0.000006 [-0.076] (-12.41)	-
Transp. Infrastructure	Distance to Highway (meters)	-0.00004 [-0.133] (-9.35)	-0.000035 [-0.117] (-9.26)	-0.000026 [-0.087] (-5.28)	-	-0.000021 [-0.070] (-11.45)	-0.000027 [-0.090] (-8.37)	-0.000021 [-0.070] (-12.95)	-0.000078 [-0.260] (-15.68)
	Average Land Value (per SQFT)	-0.000019 [-0.064] (-34.03)	-0.000028 [-0.094] (-82.52)	-0.000031 [-0.104] (-93.26)	-	-	-	-	0.0000337 [0.011] (125.04)
Built Environment	Ln Population Density (2010)	-0.246 [0.105] (-43.35)	-	-	-	0.158 [0.067] (29.56)	-	-	-
	Entropy (2010)	1.37 [0.274] (17.52)	2.62 [0.524] (34.67)	0.705 [0.141] (9.38)	1.63 [0.326] (20.04)	0.360 [0.072] (10.24)	-	0.199 [0.040] (7.040)	-
	Clayton	-	0.469 [0.469] (2.308)	-	-	-	-	-	-
County-Specific	Cobb	0.397 [0.397] (1.941)	0.833 [0.833] (5.243)	0.610 [0.610] (4.55)	0.499 [0.499] (3.344)	0.679 [0.679] (8.52)	0.584 [0.584] (3.591)	0.502 [0.502] (9.089)	0.291 [0.291] (2.054)
	Dekalb	-	0.608 [0.608]	-	0.385 [0.385]	0.371 [0.371]	0.400 [0.400]	0.280 [0.280]	-
	Douglas	-	0.840 [0.840] (4.082)	-	-	-0.270 [-0.270] (-2.074)	0.658 [0.658] (3.120)	-	0.457 [0.457] (2.390)
	Fayette	0.530 [0.530] (1.738)	0.537 [0.537] (2.630)	0.345 [0.345] (1.782)	0.440 [0.440] (1.972)	-	-	0.202 [0.202] (2.539)	-
	Fulton	-	-	-	-	0.455 [0.455] (3.130)	0.308 [0.308] (1.891)	-	0.370 [0.370] (2.509)
	Gwinnett	-	-	-	-	-	-	-0.151 [-0.151] (-2.620)	-0.503 [-0.503] (-3.507)
	Henry	-	0.440 [0.440] (2.136)	-	-	-	-	-	-
	Rockdale	-0.944 [-0.944] (-2.942)	0.913 [0.913] (4.351)	-	-	-0.633 [-0.633] (-4.404)	-	-0.313 [-0.313] (-3.661)	-0.965 [-0.965] (-3.321)
	Log Likelihood	-27798.5	-42933.8	-32528.5	-35088.5	-170008.1	-43591.7	-207553.3	-40273.3
	MacFadden R²	0.319	0.357	0.362	0.344	0.208	0.423	0.484	0.400
	Sample Size	13,258	24,551	34,555	15,326	209,483	43,815	191,357	30,784

The results tabulated in Table 4 are consistent with the existing theories and empirical studies of firm location choices. Human capital or market size variables ($HC_{edu,i}$) are significant in models for several industry sectors. The signs of the estimated coefficients, however, are not consistent. For instance, jobs in FIRE sector prefer to locate in TAZs with higher access to the population with bachelor or above education attainment. For businesses in services and public sectors, TAZs with better access to the overall labor pool (i.e., population above 25) turn out to be more appealing. Meanwhile, construction and TCU sectors tend to locate in TAZs with less access to the population with higher education attainment and lower median income.

Manufacture, retail, and wholesale jobs are not sensitive to access to human capital.

The agglomeration economy or diseconomy related variables (A_i), such as industry- specific employment and squared version of the variables, are significant and with expected signs across all the models. The results show that the utility function is an inverted “U” shape parabolic curve with respect to the industry-specific employment count. This suggests that when the density is low, firms agglomerate in TAZs with comparatively larger sector-specific employment. However,

when the employment density in the TAZ reaches a certain threshold, the TAZ turns out to be less appealing to businesses to avoid fierce competitions. The model also suggests that firms prefer to co-locate in TAZs with larger total employment density, as the signs for the estimated coefficients of job density (log transformed) are positive and the estimations are significant across different sectors.

The results also support the localization economy theory, which suggests that jobs from different sectors agglomerate to achieve mutual benefits. Manufacturing jobs tend to be positively associated with jobs in TCU, wholesale, and FIRE sectors. Construction sector jobs are more likely to coexist with jobs from manufacturing, TCU, wholesale, and FIRE sectors.

TCU employment agglomerates with manufacturing, construction, and wholesale businesses and is not significantly correlated with retail, FIRE, service, nor Public jobs. Jobs in the Wholesale sector prefers to locate in TAZs with more construction employment and less FIRE employment. Jobs in the retail sector are negatively associated with jobs from the construction, TCU, and Public sectors, however, are positively correlated with jobs from the FIRE sector. FIRE jobs coexist with employment in the service sector and are negatively correlated with jobs from the TCU, wholesale, and public sectors. Service jobs are negatively associated with almost all types of jobs, except for FIRE jobs, which turns out to be not significant. Jobs in the public sector are negatively associated with the manufacturing, wholesale, and services jobs when controlling for all the other independent variables. The localization economy, however, is not as dominant as the urbanization economy, as the correlations of jobs across sectors are sometimes non-significant or even negative. The localization economy, to some extent, relies heavily on the design of local zoning ordinance.

Land availability (*Li*) is also a critical factor in firm location decision-making, as it is significant in most models, except for the retail sector. Jobs in the manufacturing, construction, TCU, and wholesale sectors prefer to locate in TAZ with lower commercial/industrial land density. While the estimations for the commercial/industrial density are 0.064, 0.017, and 0.010 for FIRE, services, and public sectors respectively, indicating these jobs prefer to locate in TAZs with more intensive commercial or industrial activities. This may occur because manufacturing, construction, TCU, and wholesale sectors need sufficient spaces for storage and for machines to operate. Additionally, many construction and transportation (e.g., freight) firms tend to locate in suburban and even rural areas, although their services are delivered primarily in urbanized districts.

Transportation infrastructure variables including distance to highway and expressway exit are negatively correlated with TAZ utility, which is also consistent with most location theories. Proximity to expressway exits is critical to location decision for jobs in the wholesale sector. Distance to highway turns out to be important for manufacturing, construction, TCU, and public sectors. For jobs in retail, FIRE, and services sectors, estimations for both distances to expressway exits, and highway are negative and significant, indicating both factors are considered as critical in location decision process.

Built environment characteristics, such as average land value, population density, and entropy index, are significant for the majority of sectors. Manufacturing, construction, and TCU jobs prefer TAZ with lower land value to reduce operating expenses. Public sector prefers TAZs with higher average land value. This is because businesses in the public sector are more likely to obtain Tax exemptions from the government. Jobs in the retail sector tend to follow the distribution of consumers by locating in TAZs with higher population density. Meanwhile, jobs in the manufacturing sector prefer to locate in zones with less population density, because zoning ordinance typically separates residential neighborhoods with manufacturers to prevent nuisances. Finally, most sectors prefer TAZs with more diversified land use profile, as the estimated coefficients for entropy index are positive for most sectors, except for FIRE and public sectors.

Finally, some county-specific dummy variables are significant in different models.

Location quotient and tax rate variables are not significant in the final models. Manufacturing, construction, TCU, and wholesale jobs tend to locate in peripheral counties, such as Clayton, Douglas, Fayette, Henry, and Rockdale. Meanwhile, Retail, FIRE, Services, and public jobs prefer counties such as Cobb, DeKalb, and Fulton. The results also show that Cobb County is more attractive to almost all jobs across sectors, with positive and significant coefficients in all models.

In summary, the results show that: 1) Sectors, such as manufacturing, construction, TCU, and wholesale prefer to locate in TAZs that is further from the downtown area; 2) Sectors, such as FIRE, services, and public sectors choose to locate in inner city and carry out more intensive economic activities; 3) Retail sector relies heavily on the market size at the TAZ level and therefore tend to follow the distribution of population.

Labor accessibility and Land Availability in the era of SAV

In the SAV dominated scenario, the accessibilities to different labor pools are updated using average waiting time outputs from the SAV simulation model, based on Equations (7)- (10). After the introduction of SAV, the accessibilities to the population with bachelor or above degrees, on average, doubled in the region, due to the remarkable reduction in transportation costs. However, the improvement is not evenly distributed, as shown in Figure 1 (left), as the percent of improvement in the peripheral areas is higher than the downtown area. This is because the current accessibility to human capital in the remote areas is quite poor. However, despite the smaller percentage increase in downtown area, the increase in absolute magnitude peaks in compact zones (see Figure 1 right). Such changes in accessibility is consistent with results from a Switzerland Study (Meyer, Becker, Bosch, Axhausen, 2017). Further, the accessibility to bachelors degree holders increases more in the northern TAZs, compared to the southern part of the region, because more people with bachelor or higher education attainment live in the northern part of the region.

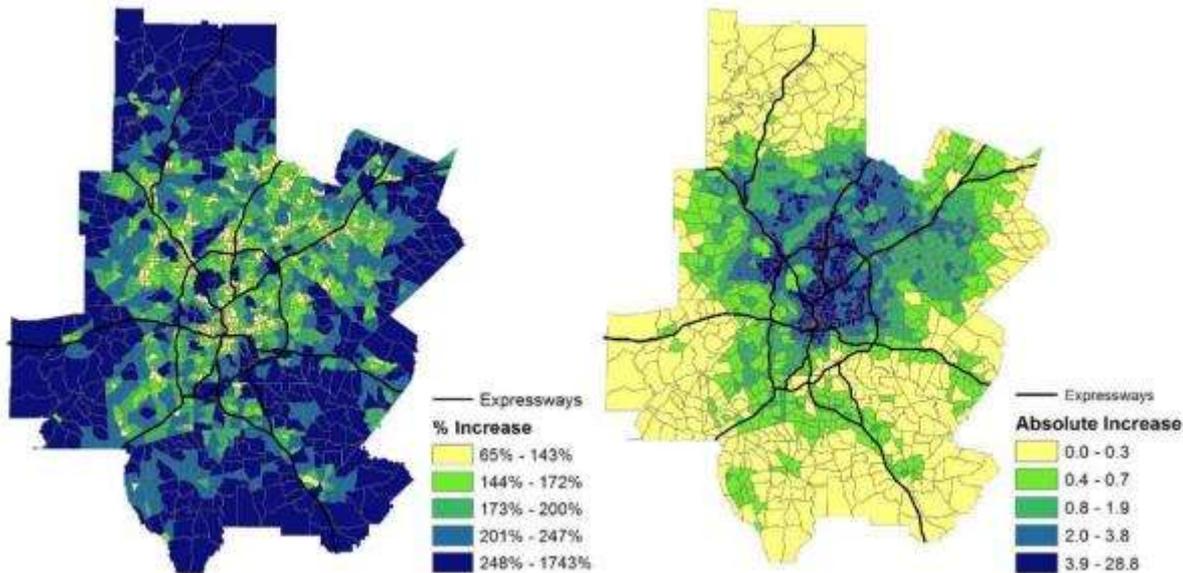


Figure 1: Change in Access to Population with Bachelor or Higher Education under SAV scenario

The number of parking spaces in existing commercial or industrial properties are obtained from the CoStar Group, Inc. Assuming that 90% of the unused parking spaces in the SAV simulation model can be converted to commercial or industrial land use, the corresponding land use density variables are then updated using Equation (11). The updated spatial distribution of commercial and industrial land density is illustrated in Figure 2 (right). On average, the commercial and industrial square feet density increase by 10.7%. The density increases most significantly in the downtown area and TAZs adjacent to highways and expressways, where the existing parking land density is comparatively higher.

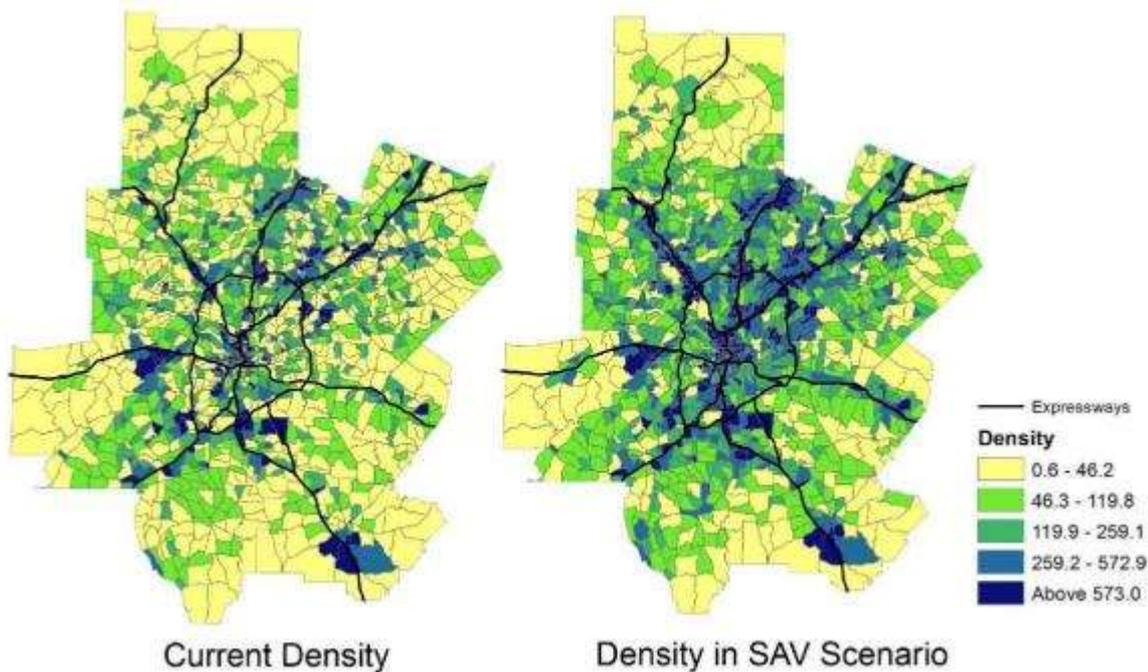


Figure 2: Changes in Available Commercial and Industrial Land Density

New Employment Agglomeration Patterns

The estimated MNL models, baseline independent variables in the BAU scenario, and updated independent variables in the SAV scenarios are input into the UrbanSim model to generate results for BAU and SAV scenarios. The model is set to run from the simulation year 2010 to 2015 to examine possible changes between the two scenarios. The output for 2015 employment in incorporated cities are then aggregated by different existing land use intensities, including downtown, inner city, inner ring suburban and outer ring suburban areas. The classification of incorporated cities in the Atlanta metropolitan region is made based on the built year of structures, density, and dependency of automobiles (Lee, 2005)²³⁰. The classification results are shown in Figure 3.

²³⁰ Lee (2005) classified Atlanta metropolitan area into downtown, inner city, inner ring suburban, and outer ring suburban based on the dominance of built year of structures, density, and dependency of automobiles. For instance, inner ring suburb refers to communities that are low density, single-family areas, which were typically developed between 1950 - 1969. The primary transportation access mode is automobile. More detailed classification methodology can be found in Lee's dissertation Section 3.2.2 (pp. 80-94)

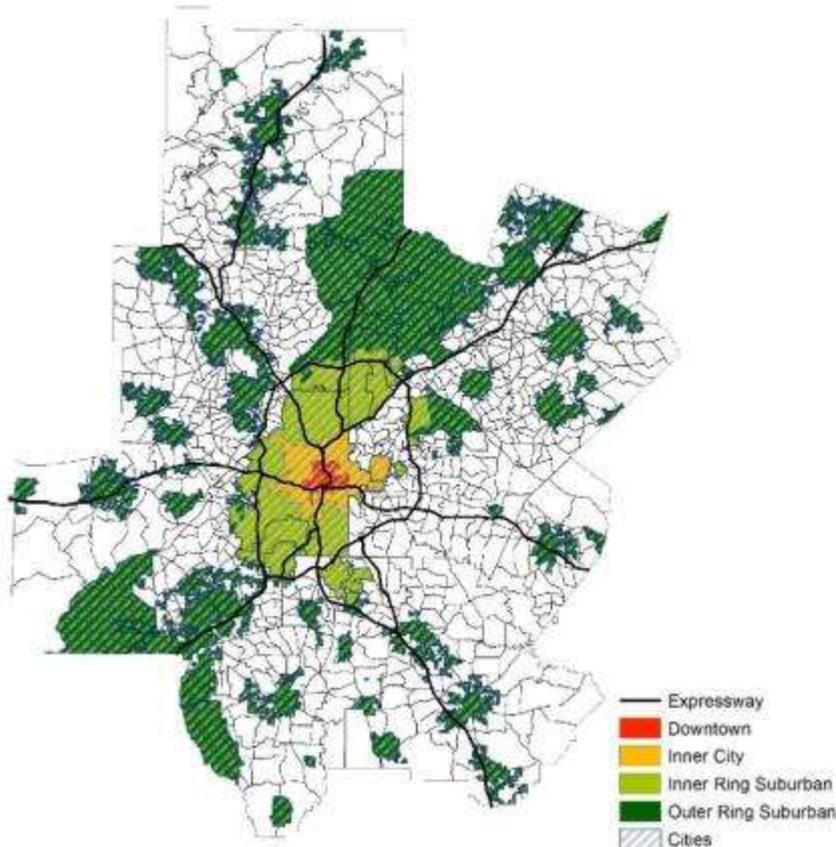


Figure 3: Cities Classification by Land Use Intensity

The simulation results from the BAU and SAV scenarios by industry sectors are tabulated in Table 5. The results suggest that SAVs may exaggerate the current migration trend for commercial and industrial economic activities in the region. In the SAV scenario, sectors, such as construction, manufacturing, TCU, and wholesale, are more likely to relocate to suburban areas, as the job density for these sectors decreases significantly in downtown and inner-city areas, while the job density in the inner ring and outer ring suburban areas increases in the SAV scenario compared to the BAU scenario. Construction jobs are most likely to relocate to inner ring suburban areas. Manufacturing, TCU, and wholesale job densities tend to grow the most in cities located in the outer ring suburban areas.

Employment in FIRE, Service, and public sectors are likely to concentrate more in cities, located in downtown and inner-city areas. The job density in the downtown area increases by 11.8%, 1.4% and 3.1% for FIRE, service, and public sectors respectively in the SAV scenario compared to the BAU scenario. For these sectors, the densities of jobs reduce most significantly in the inner ring suburban areas, ranging from 5.9% to 7.8%.

Retail job density increases in cities across the region, except for the inner ring suburban area. The inner-city area may experience a significant increase in retail density by approximately 4.8%. The retail job density in the downtown area also increases by approximately 0.8%.

Meanwhile, unlike FIRE, service, and public sectors, the job density for retail sector also increases slightly in outer ring suburban areas by 0.6%. This is because retail sectors tend to follow the spatial distribution of the market. The retail employment density in inner ring suburban area seems to level off, as it only increases by 0.02%.

Table 5: Job Density by Industry Sector across Scenarios

Industry Sectors	Scenarios	Downtown	Inner City	Inner Suburban	RingOuter Suburban	Ring
Construction	BAU	0.655	0.214	0.109	0.111	
	SAV	0.576	0.180	0.120	0.115	
	Change	-12.1%	-15.9%	9.8%	3.8%	
Manufacture	BAU	0.597	0.190	0.115	0.103	
	SAV	0.555	0.178	0.115	0.104	
	Change	-6.9%	-6.0%	0.2%	1.0%	
TCU	BAU	1.192	0.602	0.400	0.133	
	SAV	0.983	0.546	0.402	0.139	
	Change	-17.5%	-9.4%	0.5%	4.5%	
Wholesale	BAU	0.490	0.193	0.143	0.110	
	SAV	0.431	0.189	0.153	0.120	
	Change	-12.0%	-1.8%	6.6%	8.3%	
Retail	BAU	1.895	0.737	0.578	0.332	
	SAV	1.910	0.773	0.578	0.334	
	Change	0.8%	4.9%	0.0%	0.6%	

FIRE	BAU	1.858	0.462	0.492	0.200
	SAV	2.077	0.462	0.454	0.195
	Change	11.8%	0.0%	-7.8%	-2.5%
Service	BAU	14.393	2.052	1.398	0.721
	SAV	14.591	2.067	1.316	0.702
	Change	1.4%	0.7%	-5.9%	-2.7%
Public	BAU	7.573	0.444	0.155	0.097
	SAV	7.810	0.445	0.143	0.091
	Change	3.1%	0.3%	-7.4%	-6.9%

The overall employment density in cities with different land use intensity does not change significantly, as the percent changes in total employment density in all areas are less than 0.1%. This indicates that although SAVs are likely to change the spatial distribution of jobs by industry sectors, the firms are not going to sprawl outside of the city, due to the agglomeration effects.

However, it appears that SAV may further segregate different types of jobs in the region. For instance, manufacturing, construction, TCU, and wholesale jobs will migrate to cities in the outer ring. While, sectors such as FIRE, service, and public will become more dominant in the cities in the core of the urban region.

MODEL VALIDATION AND VERIFICATION

We validate the developed models by comparing the results from the 2015 BAU scenario with the 2015 ESRI observed business data. The estimated Spearman correlations by industry sectors, as shown in Figure 4, indicate that BAU simulation results are highly correlated with 2015 observed TAZ level employment counts across industries. The estimated correlations for manufacturing, wholesale, and services sectors are the lowest, at 0.72. The correlation is the strongest for the TCU sector, which is 0.84. The high correlations between the simulated BAU results and the observed 2015 employment distribution, to some extent, validate the model framework and the estimated coefficients from the employment location choice models. The discrepancies between the simulated results and the observed data can be attributed to (1) the changes in location preferences over time and (2) the missing control variables in the employment location choice models.

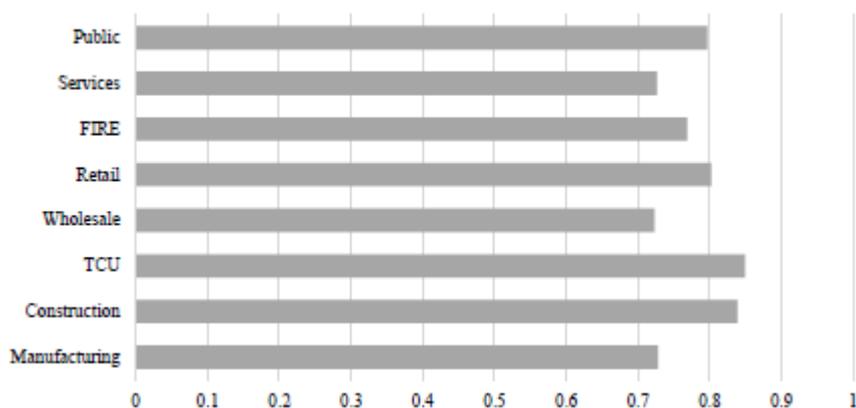


Figure 4: Correlations between BAU results and observed 2015 ESRI business data by sector

We also verify the model by conducting a series of sensitivity tests. First, several parking lots conversion rates, including 25% and 50%, are examined and compared with the 90% conversion scenario. The results, as displayed in Table 6, suggest that different parking conversion rates are not going to change the trends in employment relocation choices across sectors, as the signs of differences between SAV and BAU employment densities are stable across scenarios. Some sectors, such as retail, services, and wholesales are less sensitive to the variations of parking conversion rates, as the estimated coefficients for the commercial and industrial land density variable in these sector-specific location choice models are either not significant or small in magnitude.

For sectors that are sensitive to changes in parking conversion rate, the variations in model outputs are not linear. For instance, the downtown employment density for the construction sector decreases by 11.6% in the scenario where 25% parking are converted into commercial or industrial use. The reduction rate only increases to 14.2% when the parking conversion rate is doubled to 50%. Further, the reduction rate is merely 15.6% when the parking conversion rate rises to 90%. This is because the utilities of location choices are not linearly associated with the commercial and industrial land density variable but the log-transformed variable. As a result, the reduction in construction employment density diminishes when increasing the parking conversion rate from 25% to 90%.

Table 6: Changes in Employment Density (vs. BAU results) by Different Parking Conversion Rates

Industry Sectors	Parking Conversion Rates	Downtown	Inner City	Inner Suburban	RingOuter Suburban	Ring
Construction	25% Conversion	-11.59%	-10.30%	7.16%	3.49%	
	50% Conversion	-14.22%	-13.67%	10.09%	4.32%	
	90% Conversion	-15.60%	-16.70%	10.53%	4.39%	

Manufacture	25% Conversion	-2.92%	-2.29%	0.07%	0.32%
	50% Conversion	-5.28%	-4.84%	0.16%	0.83%
	90% Conversion	-6.90%	-6.00%	0.20%	1.00%
TCU	25% Conversion	-7.60%	-4.53%	0.21%	1.94%
	50% Conversion	-12.36%	-7.42%	0.36%	3.82%
	90% Conversion	-17.50%	-9.40%	0.50%	4.50%
Wholesale	25% Conversion	-10.26%	-1.65%	5.81%	6.96%
	50% Conversion	-11.36%	-1.58%	6.16%	7.97%
	90% Conversion	-12.00%	-1.80%	6.60%	8.30%
Retail	25% Conversion	0.84%	4.53%	0.00%	0.52%
	50% Conversion	0.69%	4.64%	0.00%	0.56%
	90% Conversion	0.80%	4.90%	0.00%	0.60%
FIRE	25% Conversion	4.13%	0.00%	-3.85%	-0.76%
	50% Conversion	9.30%	0.00%	-6.51%	-2.02%
	90% Conversion	11.80%	0.00%	-7.80%	-2.50%
Service	25% Conversion	1.01%	0.52%	-4.19%	-1.94%
	50% Conversion	1.17%	0.63%	-5.21%	-2.31%
	90% Conversion	1.40%	0.70%	-5.90%	-2.70%
Public	25% Conversion	1.40%	0.10%	-3.38%	-3.22%
	50% Conversion	2.28%	0.22%	-6.31%	-5.80%
	90% Conversion	3.10%	0.30%	-7.40%	-6.90%

Finally, the assumption that no IVTT costs will be perceived by SAV users is relaxed. Two additional scenarios, where SAV clients are charged with an additional 25% and 50% of IVTT costs, are developed. Access to labor are then re-estimated given the updated assumptions. Some sectors, such as construction, TCU, FIRE, and public are sensitive to changes in IVTT costs, as shown in Table 7. The results are as expected, as the larger portion of perceived IVTT costs, the less changes in employment distribution compared with BAU results are observed.

Moreover, changes in employment density are not linearly correlated with the percentage of charged IVTT costs. Meanwhile, the results for sectors, such as manufacturing, wholesale, and retail, do not vary significantly across different sensitivity tests, because the labor accessibility related variables are not significant in the corresponding location choice models. The changes in these sectors stem primarily from variations in other sectors that are sensitive to changes in human capital accessibility related variables.

Table 7: Changes in Employment Density (vs. BAU results) by Different Percent of Charged IVTT

Industry Sectors	Charged Percent of IVTT	Ring			
		Downtown	Inner City	Inner Suburban	RingOuter Suburban
Construction	0% IVTT	-15.60%	-16.70%	10.53%	4.39%
	25% IVTT	-12.88%	-14.77%	7.75%	3.47%
	50% IVTT	-2.82%	-2.86%	1.98%	0.65%
Manufacture	0% IVTT	-6.90%	-6.00%	0.20%	1.00%
	25% IVTT	-6.41%	-5.11%	0.19%	0.81%
	50% IVTT	-5.79%	-4.64%	0.15%	0.82%
TCU	0% IVTT	-17.50%	-9.40%	0.50%	4.50%
	25% IVTT	-15.19%	-8.73%	0.47%	3.80%
	50% IVTT	-13.63%	-6.56%	0.26%	2.83%
Wholesale	0% IVTT	-12.00%	-1.80%	6.60%	8.30%
	25% IVTT	-11.83%	-1.45%	6.49%	8.16%
	50% IVTT	-10.03%	-1.45%	6.03%	6.17%
Retail	0% IVTT	0.80%	4.90%	0.00%	0.60%
	25% IVTT	0.70%	4.41%	0.02%	0.59%
	50% IVTT	0.62%	4.42%	0.01%	0.56%
FIRE	0% IVTT	11.80%	0.00%	-7.80%	-2.50%
	25% IVTT	9.27%	0.00%	-6.07%	-1.94%
	50% IVTT	1.94%	0.00%	-1.44%	-0.40%
Service	0% IVTT	1.40%	0.70%	-5.90%	-2.70%
	25% IVTT	1.16%	0.66%	-5.62%	-2.50%
	50% IVTT	0.70%	0.43%	-2.96%	-1.84%
Public	0% IVTT	3.10%	0.30%	-7.40%	-6.90%
	25% IVTT	2.63%	0.26%	-6.68%	-6.74%
	50% IVTT	1.77%	0.22%	-5.25%	-4.47%

CONCLUSIONS

The results of our study suggest that different economic sectors may move in different directions in the SAV scenario. Secondary economic sectors, including manufacturing, construction, TCU, and wholesale sectors, are more likely to concentrate in cities at the periphery of the urban region. Meanwhile, tertiary sectors, such as FIRE, service, and public, are going to agglomerate more densely in cities at the core of the region. The density of retail employment will increase slightly in all cities, but the ones in the core of the region will gain more. This is because retail sector follows the

distribution of markets or population in the region more closely than other sectors. Most large cities in the U.S. have started deindustrialization decades ago, i.e., the employment density of secondary sectors have declined together with increasing employment in the tertiary sectors. The vast literature on this subject have identified several causes, including globalization and robotic automation technologies. The results from this study indicate that the introduction of the SAVs will accelerate the existing deindustrialization trends in major U.S. cities.

The simulation results together with the sensitivity tests also offer insights on how variations in labor accessibility and parking space redevelopment will influence the spatial distribution of employment across different sectors. The agglomeration patterns are not linearly correlated with job accessibility or parking space redevelopment. The marginal effects of variations diminish with the increase in these factors. Moreover, our research suggests that the changes in labor accessibility and parking land use redevelopment induced by SAVs will not significantly alter the trends in industrial agglomeration in the future.

The model validation results suggest that the developed employment location choice and relocation choice models are robust, given the high correlation between the results obtained in business-as-usual scenario for 2015 and the 2015 observed employment distribution.

Additionally, the sensitivity tests also validate the design of the model, as the outputs change in expected directions given changes in various model assumptions. Finally, the sensitivity test results also indicate that the changes in access to human capital and commercial and industrial land density will not affect all industry sectors equally. For instance, the location choice in the retail sector is not sensitive to both variables. Firms in the manufacturing and wholesale sectors are only sensitive to commercial and industrial land density.

The developed model has limitations that merit future research. First, this model only considers the demand side of the location decision making; the supply side is not considered in the model. Therefore, the model results cannot provide insights on land value changes, which may influence the landscape of firms in the long run. Additionally, this study only examines the impact of SAVs on employment patterns. However, there are some other AV deployment models, such as privately-owned AVs (PAVs) and transit complementary AVs (TCAVs) and separate studies are needed to explore the impacts of alternative AV business models on the spatial distribution of employment in the region. Finally, this study does not provide insights regarding the employment distribution in the transition period. More research should be dedicated to examining potential changes in scenarios where the AVs co-exists with conventional vehicles (CVs).

REFERENCES

- AAA. (2016). *Your Driving Cost: How much are you really paying to drive? (2016 Edition)*. Retrieved from <http://exchange.aaa.com/wp-content/uploads/2016/04/2016-YDC-Brochure.pdf>
- Albright, J., Bell, A., Schneider, J., & Nyce, C. (2016). *Marketplace of change: Automobile insurance in the era of autonomous vehicles*. KPMG.
- Barclays. (2016). *Disruptive Mobility: A Scenario for 2040*. Barclays Research.
- Basile, R., Castellani, D., & Zanfei, A. (2009). National boundaries and the location of multinational firms in Europe. *Papers in Regional Science*, 88(4), 733–748.
- Bhat, C. R., Paleti, R., & Singh, P. (2014). A spatial multivariate count model for firm location decisions. *Journal of Regional Science*, 54(3), 462–502.
- Bridges, R. (2015). *Driverless Car Revolution: Buy Mobility, Not Metal*. Retrieved from Amerzon.com
- Burns, L. D., Jordan, W. C., & Scarborough, B. A. (2013). Transforming personal mobility. *Earth Island Institute, Columbia University*.
- CAP. (2014). *Parking Today: Downtown Atlanta Parking Assessment Existing Conditions*. Retrieved from <http://www.atlantadowntown.com/files/docs/existing-conditions-download.pdf>
- Christaller, W. (1966). *Central places in southern Germany*. Prentice-Hall.
- Collie, B., Rose, J., Choraira, R., & Wegscheider, A. K. (2017). *The Reimagined Car: Shared, Autonomous, and Electric*. The Boston Consulting Group. Retrieved from <https://www.bcg.com/en-us/publications/2017/reimagined-car-shared-autonomous-electric.aspx>
- Fagnant, D. J., & Kockelman, K. M. (2014). The travel and environmental implications of shared autonomous vehicles, using agent-based model scenarios. *Transportation Research Part C: Emerging Technologies*, 40, 1–13.
- Fujita, M., & Thisse, J.-F. (2003). Does geographical agglomeration foster economic growth? And who gains and loses from it? *The Japanese Economic Review*, 54(2), 121–145.
- Gabe, T. M., & Bell, K. P. (2004). Tradeoffs between local taxes and government spending as determinants of business location. *Journal of Regional Science*, 44(1), 21–41.
- Greenblatt, J. B., & Saxena, S. (2015). Autonomous taxis could greatly reduce greenhouse-gas emissions of US light-duty vehicles. *Nature Climate Change*.
- Guerra, E. (2016). Planning for cars that drive themselves: Metropolitan Planning Organizations, regional transportation plans, and autonomous vehicles. *Journal of Planning Education and Research*, 36(2), 210–224.
- Guimaraes, P., Figueiredo, O., & Woodward, D. (2004). Industrial location modeling: extending the random utility framework. *Journal of Regional Science*, 44(1), 1–20.
- Harper, C. D., Hendrickson, C. T., Mangones, S., & Samaras, C. (2016). Estimating potential increases in travel with autonomous vehicles for the non-driving, elderly and people with travel-restrictive medical conditions. *Transportation Research Part C: Emerging Technologies*, 72, 1–9.
- International Transport Forum. (2015). *Urban Mobility System Upgrade: How shared self-driving cars could change city traffic*.
- Jofre-Monseny, J., & Solé-Ollé, A. (2010). Tax differentials in intraregional firm location: evidence from new manufacturing establishments in Spanish municipalities. *Regional Studies*, 44(6), 663–677.
- Kornhauser, A. (2013). *Uncongested mobility for all: New Jersey's area-wide aTaxi system*. Princeton University. *Operations Research and Financial Engineering*. Retrieved September, 23, 2013.
- Krugman, P., Cooper, R. N., & Srinivasan, T. N. (1995). Growing world trade: causes and consequences. *Brookings Papers on Economic*

Activity, 1995(1), 327-377.

Litman, T. (2008). Valuing transit service quality improvements. *Journal of Public Transportation*, 11(2), 3.

Losch, A. (1954). Economics of location.

Marshall, A. (2009). *Principles of economics: unabridged eighth edition*. Cosimo, Inc.

Mota, I., & Brandão, A. (2013). The determinants of location choice: Single plants versus multi- plants. *Papers in Regional Science*, 92(1), 31-49.

NuTonomy. (2016). nuTonomy and Grab Launch Partnership to Expand Public Trial of On- Demand Self-Driving Car Service in Singapore. Retrieved from <http://nutonomy.com/press.html>

Shladover, S., Su, D., & Lu, X.-Y. (2012). Impacts of cooperative adaptive cruise control on freeway traffic flow. *Transportation Research Record: Journal of the Transportation Research Board*, (2324), 63-70.

Siegel, Robert. (2016). Pittsburgh Offers Driving Lessons For Uber's Autonomous Cars. Retrieved September 24, 2017, from <http://www.npr.org/sections/alltechconsidered/2017/04/03/522099560/pittsburgh-offers-driving-lessons-for-ubers-autonomous-cars>

Tientrakool, P., Ho, Y.-C., & Maxemchuk, N. F. (2011). Highway capacity benefits from using vehicle-to-vehicle communication and sensors for collision avoidance. In *Vehicular Technology Conference (VTC Fall), 2011 IEEE* (pp. 1-5). IEEE.

Waddell, P., & Ulfarsson, G. F. (2003). Accessibility and agglomeration: discrete-choice models of employment location by industry sector. In *82nd annual meeting of the Transportation Research Board, Washington, DC* (Vol. 63).

Weber, A. (1929). *Theory of the Location of Industries*. University of Chicago Press.

Zhang, W. (2017). *THE INTERACTION BETWEEN LAND USE AND TRANSPORTATION IN THE ERA OF SHARED AUTONOMOUS VEHICLES: A SIMULATION MODEL*. Georgia Institute of Technology.

Zhang, W., & Guhathakurta, S. (2017). Parking Spaces in the Age of Shared Autonomous Vehicles: How Much Parking Will We Need and Where? *Transportation Research Record: Journal of the Transportation Research Board*, (2651), 80-91.

Zhang, W., Guhathakurta, S., Fang, J., & Zhang, G. (2015). Exploring the impact of shared autonomous vehicles on urban parking demand: An agent-based simulation approach. *Sustainable Cities and Society*, 19, 34-45.

Zhang, W., Guhathakurta, S., & Khalil, E. B. (2018). The Impact of Private Autonomous Vehicles on Vehicle Ownership and Unoccupied VMT Generation. *Transportation Research Part C: Emerging Technologies*, 90, 156-165.

1622 AN ANALYSIS OF PERFORMANCE OF INDIAN LEATHER INDUSTRY ACROSS STATES, ORGANIZATIONAL STRUCTURES AND LOCATION OF THE FIRMS

ABSTRACT

The Indian leather industry holds a place of prominence in the economy by meeting two important policy goals of employment and export generation. Recognizing its potential to generate 250 jobs for every INR 1 crore investment, the central government has put the leather industry under the focus areas of 'Make in India' scheme with the aim to increase leather exports to \$15 billion by 2020 from the current \$6 billion. However, the industry is facing issues of access to high-quality raw materials, and loss of competitiveness in the international leather market. The leather exports fell by 10% (value terms) in 2015 relative to 2014 which was one of the worst drops after 2008 global crisis. In addition, the pollution-intensive nature of leather tanning industry has created a negative impact on the society. With increased competition from China, Bangladesh and Vietnam, it is imperative for the industry to become more efficient in order to maximize its returns from the given resources. This requires a study of its production performance and to determine factors that can boost its potential in the future. The present paper evaluates its economic performance across different states, organizational structures, urban/rural location, and sub industrial groups using Meta- Group frontier DEA framework for measuring technical efficiency of the leather firms in India. Plant-level data from Annual Survey of Industries post 2000-01 is used for the study. The efficiency analysis shows a relatively poor performance of leather industry post-crisis period of 2008-09. Efficiency differs between different organizational structures, location, and sub industrial groups of the leather industry. Tamil Nadu and Uttar Pradesh leather clusters are found to be less efficient relative to other states. Firms from rural location experience infrastructural constraint and have shown low efficiency. The public and private limited companies perform relatively worse in comparison to the individual proprietorship or partnership firms. While examining factors to enhance technical efficiency, the paper suggests investing in skilled labors, new plant and machinery, pollution abatement equipment, higher vertical integration, and merging of small firms to take advantage of economies of scale. Further, reducing energy consumption by leather firms will not only boost the overall efficiency of the leather industry but also reduce carbon emissions.

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RS06.3. Location of Economic Activity~

1070 THE CONCENTRATION OF ECONOMIC ACTIVITIES IN EAST GERMANY. CHANGES IN LOCATION PATTERNS IN THE COURSE OF TRANSITION

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- Preliminary and incomplete version – please do not quote -

ABSTRACT

This paper investigates changes in the spatial concentration of economic activities in East Germany between 1992 and 2010. To this I draw on detailed plant data for manufacturing and services. Overall, East Germany features a substantial degree of concentration that strongly decreased until 1998 and since then slowly increased again. This pattern is consistent with the profound structural changes going along since German reunification. Concentration in manufacturing is substantially higher than in services. The main drivers of the deconcentration process in the 1990s were contracting plants within agglomerations. Since then, their impact diminished. A crucial role can be ascertained towards the closure of plants in agglomerations, which greatly reduced the overall degree of concentration. Evidently, the profound process of restructuring the East German economy brought along massive changes in the industrial location patterns. The results also provide evidence that agglomerative forces might have (re-)developed to some extent, which might also foster the emergence of successful economic clusters.

Keywords: geographic concentration, transition, East Germany

JEL classification: R11, R12, O14, P25

1. INTRODUCTION

This paper investigates changes in the spatial concentration of economic activity in East Germany between 1992 and 2010. During Socialism, location decisions of firms were strongly influenced by political reasoning. In the course of the German reunification and the exposure to free market forces, the East German economy was struck by a massive shock (Burda 2006). As a consequence, many formerly large combines were closed down or broken up into several smaller firms. At the same time, many new plants were being set up. On the one hand, the economic upheavals brought along profound changes in the location patterns of single industries. On the other hand, some industries have retained their concentration in space, successfully adapting to the new economic environment.

So far, the few studies investigating the changes in location patterns in East Germany have mainly dealt with single industries or undertaken case studies (see Heimpold 2015, 2016a, 2016b, 2016c). A comprehensive investigation of the overall processes and the underlying determinants is still missing (see, e.g., Rosenfeld/Franz/Heimpold 2007; Kosfeld/Titze 2015). The present paper aims at filling this research gap. For the measurement of concentration, I relate to the index of Ellison/Glaeser (1997) (EG index) and draw on detailed plant data of 187 industries at the district (NUTS-3) level. The data comes from the Establishment History Panel of the Institute for Employment Research, which comprises information on all German establishments with at least one employee required to make social security contributions. I assess the patterns and changes between 1992 and 2010 in all economic industries and in manufacturing and services separately. Furthermore, I also shed light on which mechanisms drive the long-run changes in geographical concentration. In line with Dumais/Ellison/Glaeser (2002), I decompose aggregate concentration changes into portions attributable to plant births, expansions, contractions, and closures. These dynamics act together in changing the level of industrial concentration over time. Last, the results are contrasted to those for West Germany (Dauth/Fuchs/Otto 2016). This provides evidence as to how the East Germany's economic structure still deviates from that in West Germany and how much its economic landscape has possibly converged.

The results show a strong decline of geographic concentration in East Germany until around 1998 in all sectors under consideration. Since then, the EG index has slowly increased again to an overall value of 0.046 in the year 2010, with concentration in manufacturing higher than in services. According to first results, the main drivers of the deconcentration process in the 1990s were contracting plants within agglomerations. Since then, their impact diminished. A crucial role can be ascertained towards the closure of plants in agglomerations, which greatly reduced the overall degree of concentration until 2008. Plant expansions, in contrast, play only a minor role. Evidently, the profound process of restructuring the East German economy brought along massive changes in the industrial location patterns.

The paper is structured as follows. In chapter 2, a short overview over the theoretical background and the related empirical literature is provided. Chapter 3 contains information on the data set and the EG index. Empirical results for East Germany are at the center of chapter 4, and chapter 5 draws conclusions.

2 THEORETICAL BACKGROUND AND RELATED LITERATURE

The question why economic activity is not evenly distributed across space has been subject to intense theoretical thought. A substantial part of the observed geographical concentration can be traced back to so-called first-nature forces. Firms that rely on natural advantages such as fertile soil, raw materials or the existence of navigable waterways locate close to

where these are abundant (Krugman 1993).²³¹ The other explanation for geographic concentration are economies of scale, external to individual firms but internal to co-located firms. These centripetal forces lead to a concentration of economic activities in space. In contrast, centrifugal forces or urban congestion costs act as agglomeration disadvantages that negatively influence benefits and profits. Economic agents have incentives to avoid proximity, which ultimately results in the geographical dispersion of economic activities.

There are several theoretical explanations as to the causes of agglomeration economies (for an overview, see Duranton/Puga 2004). Rooted in the seminal work of Alfred Marshall (1890), three agglomeration forces have become prominent. First, the proximity of firms reduces transport costs and enables them to benefit from sharing suppliers producing with increasing returns. Second, the local concentration of firms of one sector creates a pool of skilled personnel, reducing search costs for qualified labor and enhancing the probability and quality of successful matches. Third, geographical proximity promotes the flow of knowledge and technology spillovers between firms and people. Knowledge and ideas can be transmitted through formal and informal channels fostering innovation and technological change. Jacobs (1969), on the other hand, emphasizes the importance of the exchange of ideas between economic agents from different sectors that inspire each other.

The existence and the sources of agglomeration economies are generally scrutinized for the manufacturing sector (see, e.g., Rosenthal/Strange 2001). For the service sector, much less evidence is available in both theoretical and empirical terms. Kolko (2010) argues that services are more urbanized, but also less agglomerated than manufacturing. He stresses that services rely much less on physical inputs than manufacturing, thereby reducing the necessity to locate near natural resources. In addition, transports costs for services output and the necessity of face-to-face contact with customers make it important for some service industries to be close to their customers. Moreover, for those firms that serve customers across different industries, the optimal location choice is within a dense and diverse net of businesses that also provides a thick labor market. In his empirical analysis for the USA, Kolko (2010) confirms that services are less concentrated than manufacturing at the county level and much less so at the state level. Natural resources do not statistically explain the location of service firms, whereas the share of workers with graduate degrees as proxy for knowledge spillovers is the only measure that is positive and significant. For Germany, Alecke/Untiedt (2008) and Koh/Riedel (2014) find that the vast majority of service industries is strongly localized and that agglomeration forces play an equally important role as in manufacturing.

From a static point of view, agglomeration advantages provide an answer as to why firms locate close to each other, which explains the geographical concentration of economic activities. However, there is no reason to assume that positive external effects prevail in the same magnitude or even increase over time. In the long run, agglomeration advantages may alter due to technological progress or structural or geopolitical changes. For example, because of the rapid technological progress especially in the telecommunications sector, the way individuals or firms can interact has changed fundamentally in the last decades. Likewise, improvements in traffic infrastructure have resulted in much lower transport costs of goods. Moreover, vertical disintegration of production has led to outsourcing parts of the production process to intermediate suppliers that may even be located in different countries. These latter developments might well foster the dispersion of once concentrated structures.

Based on the concept of agglomeration economies, several theoretical models have been developed to explain changes in the geographical concentration of economic activities. One explanation in this respect is provided by the industry life cycle framework (Klepper 1997). As Neffke et al. (2011: 53) note, industries have different agglomeration needs in different stages of their life cycles because their mode of competition, innovation intensity, and learning opportunities change over time. During its growth phase, an industry can be expected to benefit from agglomeration advantages, and hence firms seek mutual proximity. As a consequence, the industry becomes geographically concentrated. When the maturity phase is reached and positive externalities eventually cease to exist, concentration remains simply because it would be too costly to relocate. In traditional manufacturing industries, for example, past agglomeration patterns might still be in place, whereas specific externalities have become obsolete due to declining demand and modern production technologies. When finally demand decreases too strongly, establishments die and concentration dissolves. In the same vein, Audretsch/Feldman (1996) link the propensity for innovative activity to spatially cluster to the different stages of the industry life cycle. They argue that location matters most during the early stages, whereas the positive agglomeration effects become replaced by congestion effects during later stages. Similarly, in outlining an evolutionary agglomeration theory, Potter/Watts (2011: 419) argue that the Marshallian forces create larger economic performance and increasing returns at the start of the industry life cycle, but declining economic performance and diminishing returns during the later stages. This focus on the development of the economic landscape is also at the heart of the evolutionary economic geography that deals with the processes by which the spatial organization of economic production, distribution and consumption is transformed over time (Boschma/Martin 2007: 539).

A slightly different way to catch the dynamics of geographical concentration is taken by Dumais/Ellison/Glaeser (2002). They define concentration as the outcome of a life cycle process in which new plants are created, existing plants expand and contract, and ultimately plants are closed down. Decomposing the EG index into these four components, they account for the fact that the aggregate trends in geographical concentration change only slowly, whereas there is a high degree of employment turnover at the level of the individual plants. Knowledge on the precise channels through which localization

²³¹ Ellison/Glaeser (1999) find that at least half of the observed geographical concentration in the USA is due to natural advantages. For Germany, Roos (2005) attributes about one third of the agglomeration of economic activity to natural features.

patterns remain constant is important for various reasons. For example, the EG index might not change simply because the employment decrease due to plants closing down is substituted by employment needs of newly created plants. This provides evidence for a process of creative destruction within the industry with links to the theoretical approaches mentioned above.

3 EMPIRICAL STRATEGY

In this section, the data set used for the empirical analysis will be presented as well as information on the EG index.

3.1 The Ellison-Glaeser index

Several measures can be used to analyze the geographical concentration of industries (see Combes/Overman 2004 for a discussion). I resort to the agglomeration measure proposed by Ellison/Glaeser (1997, henceforth EG) that is widely used in empirical research on assessing geographical concentration. EG begin by constructing a measure of an industry's 'raw' geographical concentration defined as $G = \sum_{r=1}^N (s_r - x_r)^2$, where s_r is the share of the industry's employment in region r , and x_r is the share of total employment in that region. G is very similar to the Gini coefficient and measures concentration relative to total employment. It takes the value of one if an industry is located in a single regions and zero if it is distributed across regions according to each region's size.

The raw concentration index G does not yet control for the structure of the respective industry, because it cannot distinguish between internal and external economies of scale. If an industry in a region consisted of one large establishment instead of a number of smaller establishments, G would still indicate geographical concentration. EG take this into account by deriving their index from a model of location choice.²³² They assume that, in the absence of agglomeration forces, firms choose their location as if dartboards were thrown at a map and that there exists an allocation process that yields the observed employment distribution in expectation. Under these assumptions, $E(G) = (1 - \sum_{r=1}^R x_r^2)(\gamma + (1 - \gamma)H)$, where γ is a combined measure of the strength of natural advantages and spillovers between firms in a broad sense. H is the industry's Herfindahl index $H = \sum_{j=1}^B z_j^2$, with z_j denoting firm j 's share of the industry's employment. Solving for γ yields the EG index of geographical concentration:

$$\gamma \stackrel{\text{def}}{=} \frac{G - (1 - \sum_{r=1}^N x_r^2)H}{(1 - \sum_{r=1}^N x_r^2)(1 - H)}$$

γ is a sophisticated measure of the geographical concentration of an industry that explicitly takes into account its establishment size structure and the aggregate distribution of economic activity. Unlike other measures of geographical concentration, it also allows to test if the observed spatial concentration is significantly stronger than what would be expected by a purely random location choice where positive externalities due to locational advantages do not play a role. In the absence of agglomeration effects, γ would be equal to zero, and consequently, $E(G) = (1 - \sum_{r=1}^R x_r^2)H$. Assuming normality, EG propose that, in the case of significant concentration, G is at least two standard deviations larger than its expected value $E(G)$.²³³ This offers the unique possibility to test the significance of geographical concentration, which distinguishes the EG index from comparable measures.

There are several restrictions of the EG index that should be kept in mind. From a theoretical point of view, the EG index does not distinguish between concentration due to natural advantages and due to true spillovers. This must be taken into account when concentration patterns of different industries are compared. Moreover, it is difficult to interpret absolute index values. Even though Ellison/Glaeser (1997: 890) argue that their index is designed to facilitate comparisons between countries and different levels of aggregation, one should be careful when comparing countries with huge disparities in their economic structure. From a methodological point of view, it should be noted that the EG index neither controls for the relative position of geographical units in space nor for the size of an industry.

3.2 Data

The Establishment History Panel (EHP) of the Institute for Employment Research (IAB) is a comprehensive database that comprises information on the full universe of German establishments with at least one employee required to make social security contributions as of June 30 of a given year (see Gruhl/Schmucker/Seth 2012 for further details). From 1999 onwards, the EHP also contains plants with at least one marginal part-time employee not obliged to pay social security contributions. To obtain consistent time series data, they are excluded from the analysis. The EHP consists of worker-level information from the social security insurance system, aggregated to the establishment level via unique firm-specific identifiers. Due to its original use to calculate retirement pensions, this data is highly reliable. I refer to a time span of 12 years that covers the years from 1992 to 2010.

The industrial classification system in the EHP has undergone several revisions. The greatest change took place when the WZ 1973 (up to the 3-digit level) was replaced by the more disaggregated German versions of the NACE classifications (up to the 5-digit level) from 1999 onwards: NACE 1.0 (1999-2003), NACE 1.1 rev (2003-2008) and NACE 2.0 rev (since 2008). To obtain a consistent industry coding system over time, the NACE 1.0 classification is used as reference. Following the method of Eberle et al. (2011), correspondence tables are constructed between the different classifications and, subsequently, to each plant one unique industry code of the NACE 1.0 is assigned that covers the entire time period. I disregard the primary sector, since agriculture and fishing are made up largely by self-employed persons who are not

²³² Maurel/Sédillot (1999) develop an alternative index of geographical concentration that also takes account of the firm size structure.

²³³ The variance of G can be obtained as $\sigma_G^2 = 2H^2[\sum_{r=1}^N x_r^2 - 2\sum_{r=1}^N x_r^3 + (\sum_{r=1}^N x_r^2)^2] - 2\sum_{j=1}^B z_j^4[\sum_{r=1}^N x_r^2 - 4\sum_{r=1}^N x_r^3 + 3(\sum_{r=1}^N x_r^2)^2]$.

covered by the EHP, and since mining plants are clearly primarily subject to first-nature forces. I also disregard the public sector, as location decisions are only remotely subject to market-based forces and agglomeration economies. In addition, the 3-digit industries ‘Processing of nuclear fuel’ (class 233), ‘Space transport’ (class 623), and ‘Other computer-related activities’ (class 726) are excluded, because they consist for most of the years of only one firm. The final sectoral setting consists of a total of 187 3-digit industries.

Table 1: Descriptive statistics by sectors, 1992 and 2010

Number of...	Total	Manufacturing	Services
1992			
industries	187	102	76
employees	5.898.899	1.169.703	2.033.742
plants	359.910	45.440	200.322
employees per plant	16.4	25.7	10.2
2010			
industries	187	102	76
employees	4.432.015	803.047	2.013.218
plants	521.360	40.103	313.063
employees per plant	8.5	20.0	6.4
Δ employees	-24.9	-31.3	-1.0
Δ plants	44.0	-11.7	56.3

Source: Establishment History Panel; own calculations.

The final data set contains information on half a million firms and up to 5.8 million full-time equivalent employees per year in East Germany (see table 1). In 2010, the service (manufacturing) sector accounted for 45.4 (18.1) % of total employment. Its prevalence is the result of a dynamic employment growth and to a simultaneous decline in manufacturing. The average number of employees per firm in manufacturing clearly exceeds the mean firm size in services.

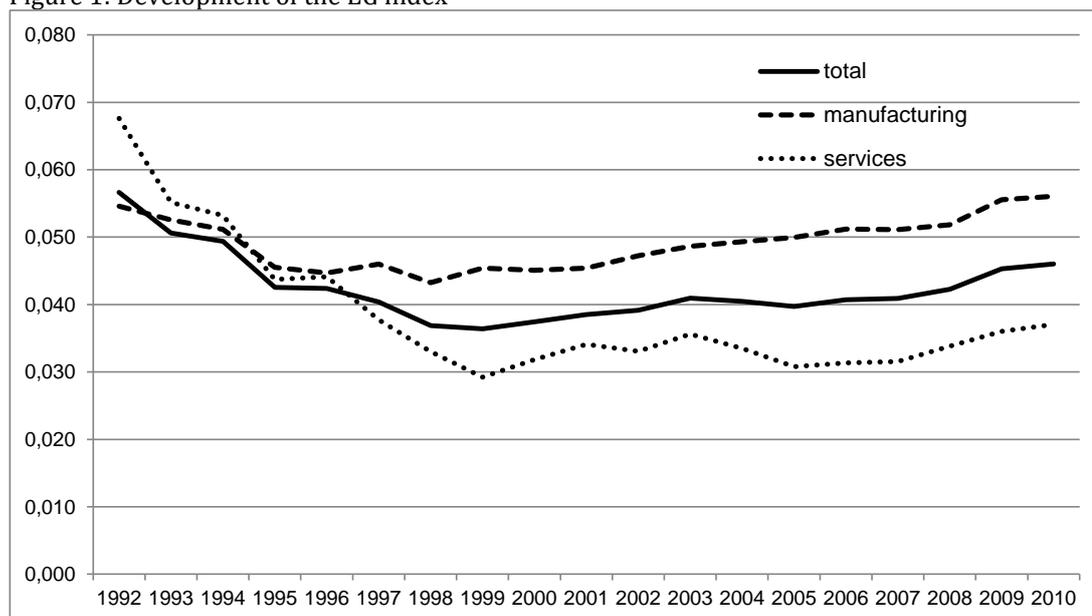
4 RESULTS

4.1 Overall development

The size of the EG index yields information on the degree of an industry's concentration and allows a comparison of different industries. For East Germany, the average EG index amounts to 0.057. This points towards a much higher degree of geographical concentration than in West Germany, where the comparable EG index took on a value of 0.016 in 1990 (Dauth/Fuchs/Otto 2016). Over time, its value decreased to 0.036 in 1999 and since then increased again (see figure 1). In 2010, it amounted to 0.046.

There are distinct differences between the three sectors under consideration. As can be seen in figure 1, the EG index fell until 1999 and since then roughly remained around a value of 0.05. The EG index in manufacturing is higher than in services. In both sectors, the large decrease in geographic concentration becomes evident until 1999, implying that the profound structural changes in the course of transformation also influenced the spatial distribution of economic activities.

Figure 1: Development of the EG index

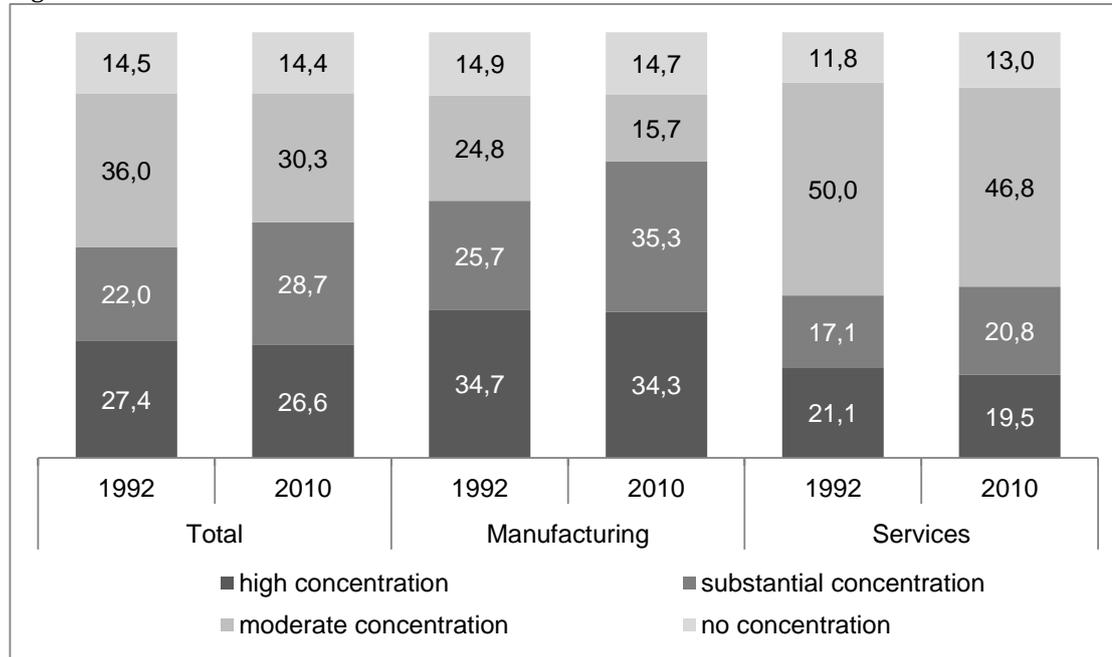


Source: Establishment History Panel; own calculations.

Alterations in the spatial patterns of economic activities become even more visible when comparing the respective fractions of concentrated and non-concentrated industries. Following Ellison/Glaeser (1997), I categorize industries as

highly concentrated if the EG index is higher than 0.05, and as substantially concentrated if it is between a range of 0.05 and 0.02. If the EG-Index is equal or lower than 0.02, there is only moderate concentration, and for values smaller than 0, the industry is not concentrated. Figure 2 depicts the resulting distributions. According to this classification, about half of all industries were not or only moderately concentrated in 1992. This share declined until 2010, with the share of substantially concentrated 3-digit industries increasing. In services, the proportion of the moderately concentrated industries is highest.

Figure 2: Structure of the size classes of the sectoral EG index



Source: Establishment History Panel; own calculations.

4.2 Agglomeration patterns in individual industries

In this section, the agglomeration of individual industries is explored. Table 3 lists those 3-digit industries that were most strongly concentrated in 2010. As evidenced for other countries, agglomeration patterns vary widely between the single industries. The highest degree of geographical concentration can be ascertained for the manufacture of watches and clocks. In 2010, the EG index reached a value of 0.753. Since 1992, it had increased considerably. It is followed by sea and coastal water transport that is traditionally found on selected maritime sites.

Table 2: The 20 most concentrated industries, 1992 and 2010

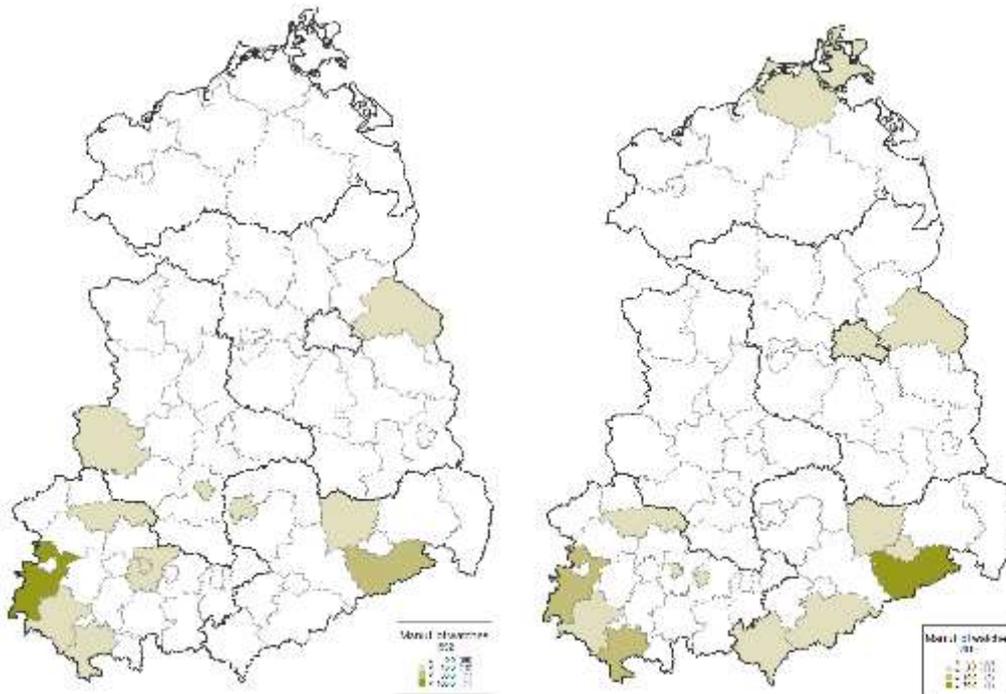
3-digit industry	2010				1992		
	sector	rank	EG	employment	rank	EG	employment
335 Manufacture of watches and clocks	m	1	0.753	1,011	5	0.331	2,305
611 Sea and coastal water transport	s	2	0.716	2,359	3	0.791	7,294
363 Manufacture of musical instruments	m	3	0.287	1,731	29	0.109	2,155
176 Manufacture of knitted and crocheted fabrics	m	4	0.239	1,511	23	0.125	8,433
177 Manufacture of knitted and crocheted articles	m	5	0.234	464	53	0.049	613
724 Database activities	s	6	0.199	1,035	1	1.075	25
622 Non-scheduled air transport	s	7	0.197	323	2	0.809	165
365 Manufacture of games and toys	m	8	0.197	1,954	19	0.155	4,212
921 Motion picture and video activities	s	9	0.188	11,676	27	0.111	7,061
296 Manufacture of weapons and ammunition	m	10	0.168	314	12	0.226	1,720
174 Manufacture of made-up textile articles	m	11	0.143	2,828	13	0.199	3,032
193 Manufacture of footwear	m	12	0.126	1,732	50	0.052	5,308
172 Textile weaving	m	13	0.124	1,946	42	0.076	6,992
181 Manufacture of leather clothes	m	14	0.115	170	14	0.192	313
924 News agency activities	s	15	0.102	3,305	4	0.400	1,379
175 Manufacture of other textiles	m	16	0.099	4,715	17	0.155	9,917
232 Manufacture of refined petroleum products	m	17	0.096	3,135	28	0.110	8,394
152 Processing and preserving of fish and fish products	m	18	0.095	1,601	68	0.033	2,311
732 R&D on social sciences and humanities	s	19	0.095	2,820	34	0.097	2,279
241 Manufacture of basic chemicals	m	20	0.950	15,219	6	0.299	37,235

m: manufacturing, s: services.

Source: Establishment History Panel; own calculations.

The strong concentration of the manufacturing of watches and clocks is visualized in figure 3. It contains the location coefficient based on the number of employees across the East German districts in the years 1992 and 2010. It becomes evident that production is mainly concentrated in two regions, namely the *Wartburgkreis* in Thuringia and the *Erzgebirgskreis* in Saxony. Manufacturing of watches in the city of *Glashütte* in Saxony has a long tradition (see Neiberger 2014).

Figure 3: Location coefficient for manufacturing of watches in the East German regions, 1992 and 2010 (%)



Source: Establishment History Panel; own calculations.

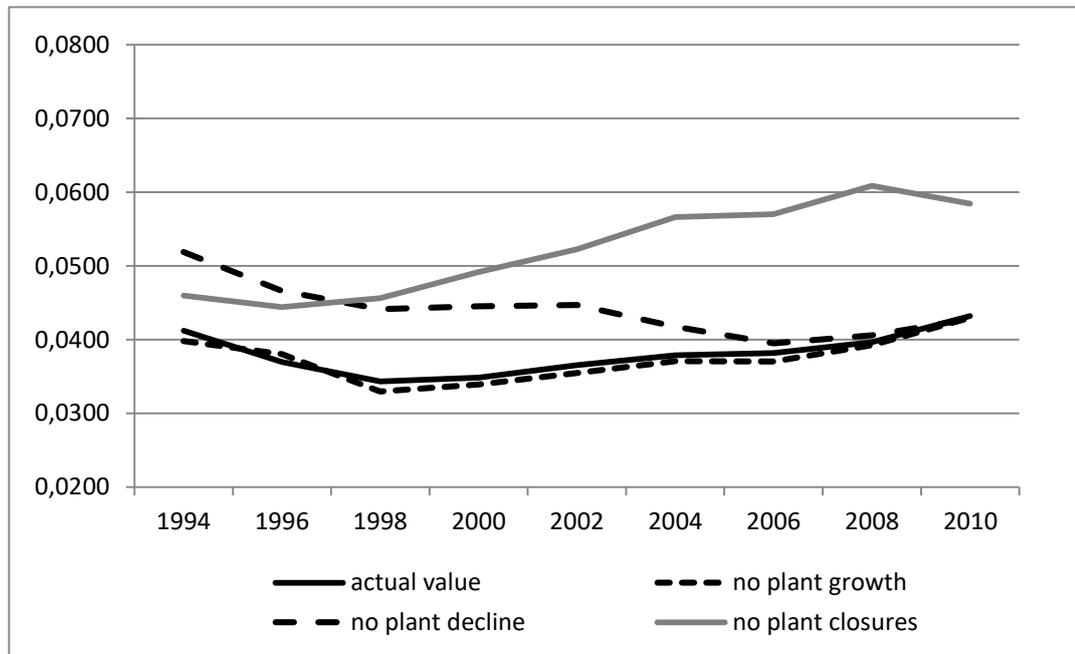
4.3 What drives the changes in concentration?

Which forces have driven the large changes in concentration in East Germany? To shed light on the underlying mechanisms, I decompose the aggregate concentration changes into the four factors constituting the life cycle of plants as applied by Dumais/Ellison/Glaeser (2002). They encompass the entire 'life' of a firm from its creation on to the subsequent stages of (employment) growth until (employment) decline and firm closure.

Intuitively, the formation of a new plant could contribute to concentration or dispersion depending on where it is established. If a new firm is opened in a region where others are already located, the industry's concentration increases and vice versa. Analogously, a plant closure has the opposing effect on the industry's overall concentration.

To implement the plant life cycle concept into our analysis, four counterfactual plant distributions for manufacturing and for services, respectively, are constructed. Each counterfactual mirrors the geographical distribution of an industry if the respective factor would not have been drawn upon by the firms. Figure \{fig5\} displays how the EG index would have developed if there were no plant creation, plant growth, plant decline, plant closure, respectively, between 1992 and 2010. Figure 4 contains first preliminary results. They provide tentative evidence that, obviously, plant closures contributed profoundly to the decrease of geographic concentration especially since 1996, whereas in the first years under observation it was rather the declining plants that exerted an influence on changes in the geographical setting of economic activities. Plant growth virtually played no role. These first results hint towards grave impacts of structural change in the course of transformation on the spatial distribution of economic activities.

Figure 4: Counterfactual EG indices in the absence of plant growth, decline and closure



Source: Establishment History Panel; own calculations.

5 CONCLUSIONS

This paper has investigated the geographical concentration of economic activities in East Germany, using the index developed by Ellison/Glaeser (1997). We have assessed the changes between 1992 and 2010 in all economic sectors and in manufacturing, services, and the knowledge-intensive sector separately. We have also shed light on which mechanisms drive the long-run changes in geographical concentration. The results yield, as we believe, first-time information on the development of agglomeration for several sectors simultaneously over such a long time span of 30 years, thereby expanding the existing empirical literature on location patterns and their dynamics over time.

Evidently, the profound process of restructuring the East German economy brought along massive changes in the industrial location patterns. First tentative results show that plant contractions and closures worked together in reducing the degree of concentration until the late 1990s. Since then, the results provide evidence that agglomerative forces might have (re-)developed to some extent, which might also foster the emergence of successful economic clusters.

REFERENCES

- Alecke, Björn; Untiedt, Gerhard (2008): Die räumliche Konzentration von Industrie und Dienstleistungen in Deutschland: Neue empirische Evidenz mit dem Ellison-Glaeser-Index. In: *Jahrbuch für Regionalwissenschaften*, Vol. 28, p. 61–92.
- Audretsch, David; Feldman, Maryann (1996a): Innovative clusters and the industry life cycle. In: *Review of Industrial Organisation*, Vol. 11, No. 2, p. 253–273.
- Audretsch, David; Feldman, Maryann (1996b): R&D spillovers and the geography of innovation and production. In: *American Economic Review*, Vol. 86, No. 3, p. 630–640.
- Barrios, Salvador; Bertinelli, Luisito; Strobl, Eric; Teixeira, Antonio Carlos (2009): Spatial Distribution of Manufacturing Activity and its Determinants: A Comparison of Three Small European Countries. In: *Regional Studies*, Vol. 43, No. 5, p. 721–738.
- Boschma, Ron; Martin, Ron (2007): Editorial: Constructing and evolutionary economic geography. In: *Journal of Economic Geography*, Vol. 7, No. 5, p. 537–548.
- Burda, Michael C. (2006): Factor Reallocation in Eastern Germany after Reunification. In: *The American Economic Review*, Vol. 96, No. 2, p. 368–374.
- Combes, Pierre-Philippe; Overman, Henry (2004): The Spatial Distribution of Economic Activities in the European Union. In: Vernon Henderson and Jacques-Francois Thisse (Eds.), *Handbook of Urban and Regional Economics*, Vol. 4. Amsterdam: Elsevier-North Holland, p. 2845–2910.
- Dauth, Wolfgang; Fuchs, Michaela; Otto, Anne (2016): Long-run processes of geographical concentration and dispersion: Evidence from Germany. *Papers in Regional Science*, online first, doi:10.1111/pirs.12271.
- Dumais, Guy; Ellison, Glenn; Glaeser, Edward (2002): Geographic concentration as a dynamic process. In: *The Review of Economics and Statistics*, Vol. 84, p. 193–204.
- Duranton, Gilles; Puga, Diego (2004): Micro-foundations of urban agglomeration economies, Vol. 4 of *Handbook of Regional and Urban Economics*. Amsterdam: Elsevier-North Holland.
- Eberle, Johanna; Jacobebbinghaus, Peter; Ludsteck, Johannes; Witter, Julia (2011): Generation of time-consistent industry codes in the face of classification changes. Simple heuristic based on the Establishment History Panel (BHP). FDZ Methodenreport 05/2011(en).
- Ellison, Glenn; Glaeser, Edward L. (1997): Geographic Concentration in U.S. Manufacturing Industries: A Dartboard Approach. In: *Journal of Political Economy*, Vol. 105, No. 5, p. 889–927.
- Ellison, Glenn; Glaeser, Edward L. (1999): The Geographic Concentration of Industry: Does Natural Advantage Explain Agglomeration? In: *American Economic Review*, Vol. 89, p. 311–316.
- Gruhl, Anja; Schmucker, Alexandra; Seth, Stefan (2012): The Establishment History Panel 1975–2010, Handbook Version 2.2.1. FDZ Datenreport 04/2012(en).
- Heimpold, Gerhard (2016a): Im Fokus: Industrielle Kerne in Ostdeutschland und wie es dort heute aussieht - Das Beispiel des Chemiestandorts Schkopau. In: *Wirtschaft im Wandel*, Vol. 22, No. 4, p. 73–76.

- Heimpold, Gerhard (2016b): Im Fokus: Industrielle Kerne in Ostdeutschland und wie es dort heute aussieht - Das Beispiel des Metallurgiestandorts Eisenhüttenstadt. In: *Wirtschaft im Wandel*, Vol. 22, No. 3, p. 57–60.
- Heimpold, Gerhard (2015): Im Fokus: Industrielle Kerne in Ostdeutschland und wie es dort heute aussieht - Das Beispiel des Chemiestandorts Bitterfeld-Wolfen. In: *Wirtschaft im Wandel*, Vol. 21, No. 6, p. 110–113.
- Jacobs, Jane (1969): *The Economy of Cities*. New York: Vintage.
- Klepper, Steven (1997): Industry Life Cycles. In: *Industrial and Corporate Change*, Vol. 6, No. 1, p. 145–182.
- Koh, Hyun-Ju; Riedel, Nadine (2014): Assessing the localization pattern of German manufacturing and service industries: A distance-based approach. In: *Regional studies*, Vol. 48, No. 5, p. 823–843.
- Kolko, Jed (2010): *Agglomeration Economics*, chap. Urbanization, Agglomeration, and coagglomeration of service industries. The University of Chicago Press, p. 151–180.
- Kosfeld, Reinhold; Titze, Mirko (2015): Benchmark value-added chains and regional clusters in R&D-intensive industries. In: *International Regional Science Review*, doi: 10.1177/0160017615590158.
- Krugman, Paul (1993): *Lessons of Massachusetts for EMU*. Cambridge: Cambridge University Press, p. 241–269.
- Marshall, Alfred (1890): *Principles of Economics*. London: Macmillan.
- Maurel, Françoise; Sédillot, Béatrice (1999): A measure of the geographic concentration in French manufacturing industries. In: *Regional Science and Urban Economics*, Vol. 29, No. 5, p. 575–604.
- Neffke, Frank; Henning, Martin; Boschma, Ron; Lundquist, Karl-Johan; Olander, Lars-Olof (2011): The dynamics of agglomeration externalities along the life cycle of industries. In: *Regional Studies*, Vol. 45, No. 1, p. 49–65.
- Neiberger, Cordula (2014): *Uhrenherstellung in Deutschland*. Nationalatlas aktuell 8 (12.2014) 10 [12.12.2014]. Leipzig: Leibniz Institut für Länderkunde (IfL).
- Potter, Antony; Watts, H. Doug (2011): Evolutionary agglomeration theory: increasing returns, diminishing returns, and the industry life cycle. In: *Journal of Economic Geography*, Vol. 11, No. 3, p. 417–455.
- Roos, Michael (2005): How important is geography for agglomeration? In: *Journal of Economic Geography*, Vol. 5, No. 5, p. 605–620.
- Rosenfeld, Martin; Franz, Peter; Heimpold, Gerhard (2007): Economic „clusters“ in East Germany: Evidence on the location and characteristics of spatially concentrated industries. In: *Post-Communist Economies*, Vol. 19, No. 1, p. 73–92.
- Rosenthal, Stuart; Strange, William (2001): The Determinants of Agglomeration. In: *Journal of Urban Economics*, Vol. 50, p. 191–229.

1125 GEOGRAPHY OF CREATIVE FIRMS IN ISTANBUL

ABSTRACT

Creative economy has become a key feature of the landscape of urban politics. Recent studies have stressed the importance of creativity for the economic development and competitiveness of cities. Therefore, if cities want to increase their competitiveness they need to attract firms and employees who belong to the creative economy. In this paper, creative firms in Istanbul are analyzed by examining their location in accordance with the characteristics of firms. The analysis of firm location has been attracting a growing interest from scholars in recent years. The main objective is to analyze creative activities regarding to creative firms for understanding trends of geography. It aims to contribute to the creative economy debate by discussing the relationships between the creative firms and the space in the city. Based on questionnaire surveys conducted in 2016, the results offer an insight into the preferences of the geography of creative industries. Determinants of the firm location accordingly creative clusters, are different depending on the characteristics of the firm. It is aimed to provide some empirical basis for the urban development policies of creative based urban spaces. Keywords: Creative economy, creative firms, creative industries, creative cities, Istanbul

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1238 SPACES OF CIRCULAR ECONOMY: FROM GLOBAL VALUE CHAINS TO CLOSING THE LOOP AND CLOSE PROXIMITY

ABSTRACT

Circular Economy represents a promising approach to a sustainable transition from the linear socioeconomic paradigm. As such, it entails the necessity to address some specific challenges. In particular, the objective of the Circular Economy is to maintain and to share value along the time, rather than adding value. Systemic change may be addressed from different perspectives, usually top-down and bottom-up approaches are distinguished. The important aspect that emerges from the literature overview is that the shift towards Circular Economy requires taking into account systemic thinking, especially to note the importance of synergies, cooperation and rebound effects. The apparently positive effects need to be contrasted with rebound effects such as increased consumption of the same or new products, the transference of impacts from one stage of the supply chain to another one, and the green consumerism linked to planned obsolescence. In order to pave the way to Circular Economy business models are considered a key instrument. The business model is seen as a holistic approach towards the way of doing business. Overall it is defined as the way of creating, producing and delivering value. From the spatial perspective, a business model needs to add ecological and social value to the value proposal and changing the producer and the consumer practices. The spatial set-up of business model is key to evaluate the ecological (material and energy) and social impacts of the logistic-transport activities along the Global Value Chain, the distribution and consumption patterns and the management of post-consumption activities devoted to re-using, repairing, remanufacturing and recycling products and components. Circular Economy business models should be focused on activities that follow the hierarchy reuse, repair, remanufacture and recycle, consider the geographical dimension and trying to increase value preservation as much as possible. The objectives of closing the loop are clearly linked to the spatial proximity (clustering) of activities and also the proximity of production-consumption and the subsequent activities. The present globalisation patterns poses a clear concern for the widespread diffusion of Circular Economy Business Models. For business models to work and to foster real shift towards Circular Economy, important changes are need both at international and national level.

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1760 FACTORS AFFECTING THE SPATIAL DISTRIBUTION OF HOSPITALS: THE CASE OF ISTANBUL

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ABSTRACT

Healthy is indispensable for human and states must supply healthy services to everybody. Turkish healthy system is insufficient in comparison to developed countries. Public and private sector work together in healthy services. Public sector aims to efficient and accessibility, so these factors affect public hospitals' location decision. On the other hand private sector aims to maximize profit and it prefers high income residential areas.

Location decisions, which may be made by individuals, companies and public institutions, play an essential role in how the urban form is shaped. While the location decisions made by the private sector prioritize profit maximization, the maximization of social benefit is aimed when selecting the locations of public facilities. On the other hand, due to the constraints on budget and the necessity to avoid the waste of resources, the spatial distribution of public facilities and how 'equity/efficiency' will be achieved remain on the agenda.

Accessibility is the most important for healthy services, so most of hospitals located in high accessible areas, highways, main roads, subways. Private hospitals prefer being near public hospitals. Most of them are Fatih and Şişli area which have large public hospitals.

During the last 35 years, Istanbul's population has increased unexpected values, and governments was not efficient for supplying public services. In 1980s public hospitals' locations were not efficient and equal. For instance, Sultanbeyli, Pendik, Avclar were residential areas, but there were any public and private hospitals, people had to go far away, when they were ill. On the other hand first private hospitals were racial minority hospitals. Between 1980 and 1990 private hospitals number increased by effects of globalization. In 1990s, neoliberal economic policies affected private sectors, 72 private hospitals were opened between 1990 and 2000. Private hospitals located in high income districts such as Kadıköy, Şişli, Bakırköy. In these years public hospitals began to spread out to peripheries. In the beginning of 2000s, Adapazarı earthquake and economic crisis affect private sectors, the ratio increasing of private hospitals number began to fall. Transformation in Health Program (government decision, 2003) is important for private hospitals. These decisions encouraged public sectors and private hospitals began to trigger again after 2006. Today's, total public hospitals' bed number and total private hospitals' bed number are very closest. Private hospitals are opened not only high income residential areas but also middle income districts no longer.

1 INTRODUCTION

Health is the most important element of our life. In every breath and step we take, health is our constant element in the whole life. Health is a birth-right and this right is emphasized by WHO with the "health for everyone" motto in 2000. There is a need for effective health treatment and efficient patient examination processes to realize WHO's health policies.

The purpose of this paper is to determine distribution of public and private hospitals in Istanbul, between 1980 and 2014. Especially to analyse private hospitals' location decisions. The scope is; researching the existing spatial distribution of the hospitals in Istanbul.

Limitations, firstly, instead of the entire health system, the research only addresses healthcare services. Secondly, it only focuses on hospitals instead of all of the healthcare facilities in Istanbul. Finally, the evaluations and proposals expressed in the research were developed on a district basis.

In my case study, I used Esri Maps and GIS to show how is the public and private hospitals' locations.

The questions that I want to prove are;

- 'How is the distribution of public and private hospitals in Istanbul?'
- 'Is there any relation between location public hospitals and private hospitals?'
- 'Is there any increase number of private hospitals after 2003 government decision?'

2 METHODOLOGY

In order to achieve the study and find out the answers of the question, I assessed addresses establish years of public and private hospitals. I used ESRI Maps and GIS programme to indicate the distribution of hospitals location in Istanbul.

Legal/administrative framework and health policies in Turkey and the distribution of healthcare services and Istanbul's position within this distribution. The characteristics of and the relation between the distribution of healthcare supply (hospitals) and demand for healthcare services (population) in Istanbul. Statistical data reveals that healthcare services in Istanbul are accumulated in districts which have higher accessibility and/or higher income.

Such a distribution causes certain areas in the city to be deprived of using the healthcare services supplied. The deprivation is more significant in areas which developed recently.

3 HOSPITAL LOCATION

Location decisions, which may be made by individuals, companies and public institutions, play an essential role in how the urban form is shaped. While the location decisions made by the private sector prioritize profit maximization, the maximization of social benefit is aimed when selecting the locations of public facilities. On the other hand, due to the constraints on budget and the necessity to avoid the waste of resources, the spatial distribution of public facilities and how 'equity/efficiency' will be achieved remain on the agenda.

The behavioral evolution of location decision-making and the diversification of the factors which influence the location decisions should be tackled in parallel to the transformation of settlements. Globalization and technological advances are the dynamics behind this transformation. In recent years, location processes are influenced by not only economic concerns but also social, spatial and cultural factors. The role and importance of planning during this process still constitute a primary topic of debate.

'Health geography' is among the major areas on which the location theory is focused. Access to healthcare services and achieving a healthy environment are still current topics and keep on drawing further attention. The location theory is based on the understanding that increased distance leads to decreased human interaction. As healthcare services are space/time dependent, it becomes more important that healthcare facilities are located in order to optimize the distance between healthcare demand and supply. In addition, it is necessary to consider the needs and preferences of the patients.

Although administrative bodies take regulatory precautions in order to steer the facility location decisions for healthcare services in Turkey and Istanbul, increased number of healthcare facilities owned by private entities and non-profit organizations (such as foundations, associations, NGOs) impair accessibility, and consequently, the spatial distribution presents an increasingly uneven structure. In spatial orders which achieve a higher quality of life, it is important to locate healthcare facilities so that they are easily accessible by all segments of society while they also function efficiently.

4 CURRENT HEALTHY SITUATION OF TURKEY

Our country with a 75.627 million population is one of the twenty most crowded countries in the world. There exists a young population as a result of high fertility and growing rates in the past. 30% population is below the age of 15 and 11% of the population is below the age of 5. More than 28.7 million (38%) women are in the fertile period (15-49 years) (TUIK, 2012).

However, a decreasing trend observed in these rates. Total fertility number was 5 children per woman at the beginning of 1970s and less than 3 in 1990s (Transformation in healthy report, 2003).

As of December 2013 a total of 129 383 doctors in Turkey is actively working. 74.562 doctors work in Ministry of Health, 28.283 doctors work in university hospitals, and the others (26.538) work in private hospitals. (Health education and health status report of manpower in turkey, 2013).

171 doctors per 100.000 fall in Turkey. This ratio is 346 doctors per 100.000 EU and 334 doctors are the average of WHO European district. 15.870 doctors (6.272 public hospitals,

7.315 private hospitals, 2.283 university hospitals) work in Istanbul and total population of İstanbul is 13.854.740 people (TUIK, 2012), and 873 doctors per 100,000 fall in Istanbul. (Health education and health status report of manpower in turkey, 2013).

4.1.Spatial Distribution of Beds in Health Institutions in Turkey

As of the year 2012, According to TUIK data, there are 1.483 hospitals in Turkey, 832 of them are Ministry of Health, 45 are connected other public services, 65 are university and 541 of them are private hospitals.(TUIK,2012)

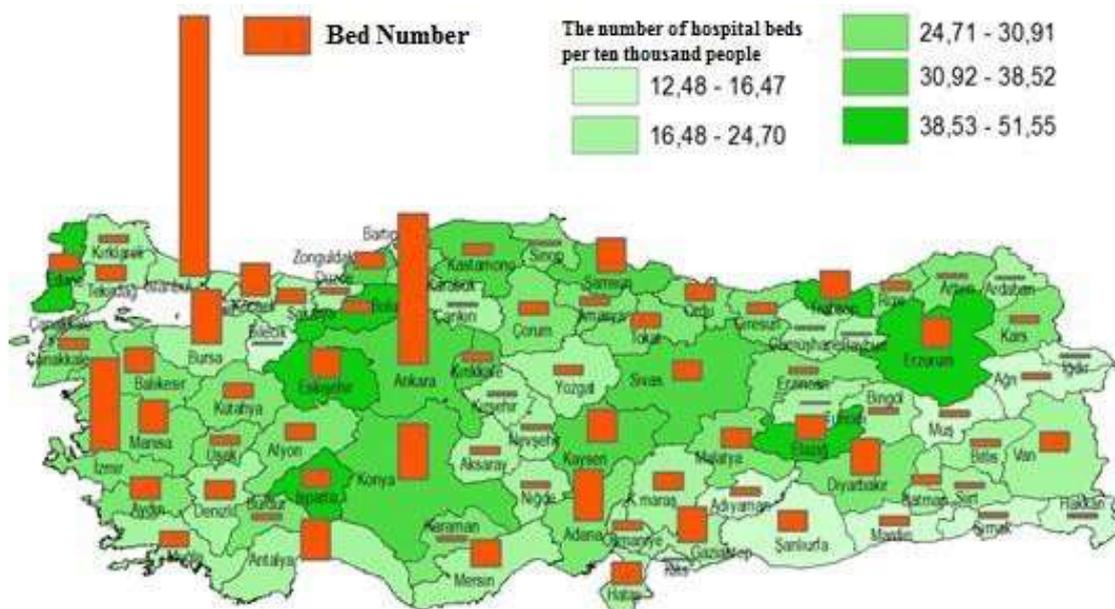


Figure 4.1: Distribution of hospital beds across Turkey

Total number of beds per ten thousand persons in a total of 34 provinces in Turkey Turkey, are higher average, which is on average 26.45.

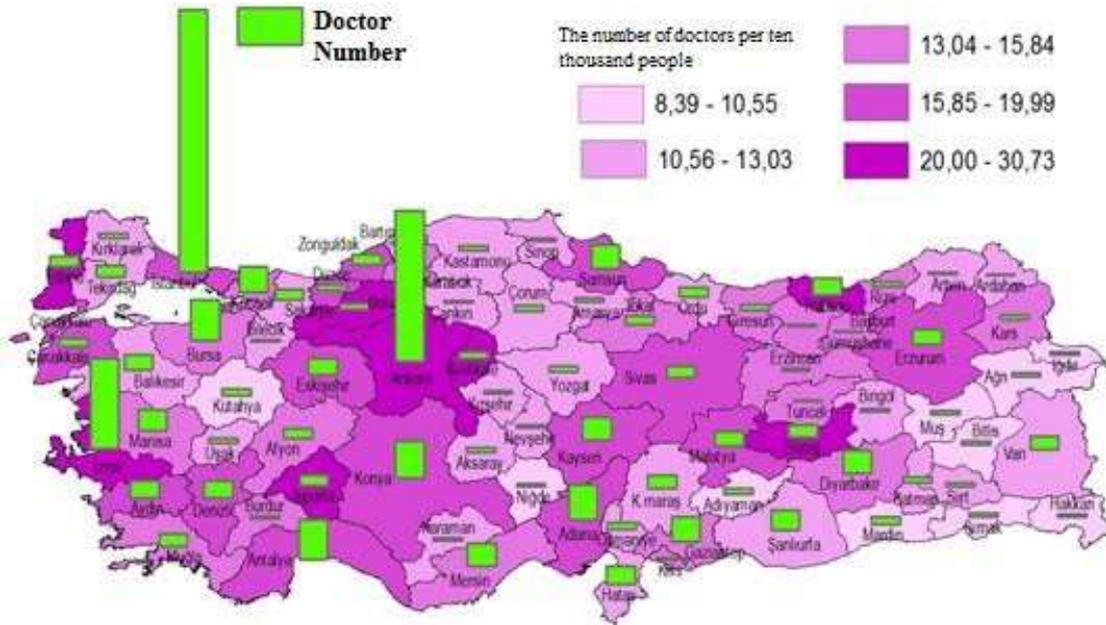


Figure 4.2: Distribution of doctor number across Turkey

The functioning of the private sector is based on the activity. Therefore, private hospitals want to make the choice in such a way to maximize profits. Multiple placements at the hospital opened the site selection behavior of private health institutions in Turkey, regional and urban scale, guiding with a hospital site selection model. This settlement is connected to the central hospital of the health care provider are shown in Table 4.1.

Table 4.1: Distribution of some private healthy group hospitals and branches in Turkey and Istanbul

ACIBADEM İstanbul (Kadıköy) İstanbul (Maslak) İstanbul (Kozyatağı) İstanbul (Bakırköy) İstanbul (Fulya) İstanbul (Bahçelievler) Adana Ankara Bodrum (Muğla) Bursa Eskişehir Kayseri Kocaeli <i>Sistina</i>	MEDICAL PARK İstanbul (Acarkent) İstanbul (Bahçelievler) İstanbul (Fatih) İstanbul (Göztepe) İstanbul (Sultangazi) Antalya Batman Bursa Elazığ Gaziantep Gebze (Kocaeli) İzmir Ordu Samsun Tarsus (Mersin) Tokat Uşak	ÜNİVERSAL İstanbul (Kadıköy) İstanbul (Çamlıca) İstanbul (Taksim) İstanbul (Aksaray) İstanbul (Beyoğlu) Diyarbakır Ereğli (Konya) İzmir Kuşadası(Aydın) Manisa Malatya LOKMAN HEKİM Ankara (Etlik) Ankara (Sincan) Van	DÜNYA GÖZ İstanbul (Altunizade) İstanbul (Ataköy) İstanbul (Beylikdüzü) İstanbul (Etiler) İstanbul (Feneryolu) İstanbul (Maltepe) İstanbul (Pendik) Adana Ankara Antalya Bursa Gaziantep Kocaeli Samsun <i>Frankfurt Köln Londra Amsterdam</i>
MEDICANA İstanbul (Bahçelievler) İstanbul (Çamlıca) İstanbul (Avclar) Ankara Konya Samsun	MEMORIAL İstanbul (Şişli) İstanbul (Ataşehir) Antalya Diyarbakır	MEDLINE Adana Antalya Aydın Eskişehir Konya Kütahya	TEKDEN İstanbul (Bağcılar) Denizli Kayseri
ANADOLU İstanbul (Silivri) İstanbul (Avclar) Çanakkale Ereğli (Zonguldak)	BAYINDIR İstanbul (İçerenköy) Ankara (Söğütözü) Ankara (Kavaklıdere)	ECHOMAR İstanbul (Ataköy) İstanbul (Göztepe) İstanbul (Şişli) Ereğli (Zonguldak)	ŞİFA İzmir (Üniversite) Erzurum
KOLAN İstanbul (Bayrampaşa) İstanbul (Beylikdüzü) İstanbul (B.çekmece) İstanbul (Esenyurt)	KOLAN (devam) İstanbul (Güngören) İstanbul (Sefaköy) İstanbul (Silivri) İstanbul (Şişli)	AVICENNA İstanbul (Esenler) İstanbul (Ataşehir) İstanbul (Kartal) İstanbul (Gültepe)	SAFA İstanbul (Bağcılar) İstanbul (Yenibosna) İstanbul (Çengelköy)

Source: It has been compiled from hospitals' official website. (Access date: 26.12.2014)

As seen in the table, the first site selection choice of almost every health group is in Istanbul. Respectively in Istanbul, major cities follow İstanbul such as, Ankara, Antalya, Adana, Bursa, Izmir, İstanbul, İzmir, Konya, Kayseri, İzmir, Eskişehir, Diyarbakır. It is observed that, public hospitals chose regional district such as Erzurum, Elazığ, Van, Malatya and touristic district such as Tarsus, Bodrum, Kuşadası.

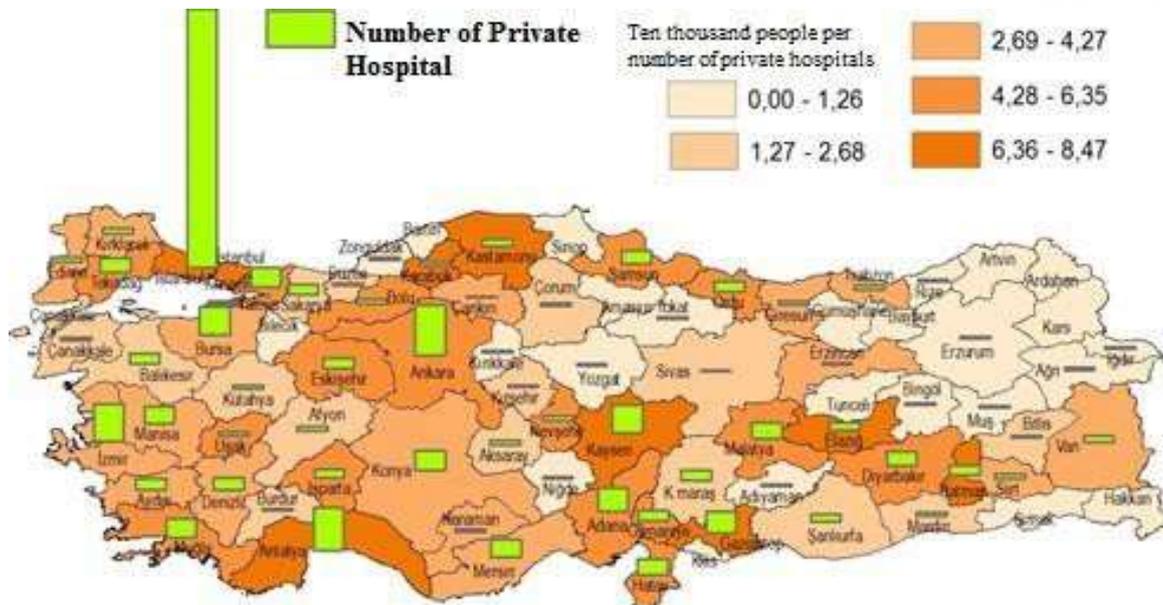


Figure 4.3: Distribution of Private Hospitals across Turkey (2012)

However, not all of the private hospitals are in the same capacity and capabilities. Therefore, the number of private hospital beds in the province and the total number of beds in the ratio of this number is important. The provinces that have the highest number of private hospitals' bed respectively Batman (0.42), Istanbul (0.36), Antalya (0.34) are the provinces.

5 CASE STUDY AREA: ISTANBUL

5.1 General Information

Istanbul is the most developed city in the Turkey. Most of government and private investments locate in Istanbul because of its attractiveness. Major health investment is to place in Istanbul, as well.

Istanbul is Turkey's most populous and dynamic city. In the city, both of the public and private sectors, from the local level up to the international level, take place every hospital and city's multicultural and complex character which represent all Turkey, makes important that understanding spatial distribution of health services and hospital locations.

15.870 doctors (6.272 public hospitals, 7.315 private hospitals, 2.283 university hospitals) work in Istanbul and total population of İstanbul is 13.854.740 people (TUIK, 2012), and 873 doctors per 100,000 fall in Istanbul. (Health education and health status report of manpower in turkey, 2013).

5.2 Hospitals in the historical process (between 1980-2014)

In this paper situations of public and private hospitals, between 1980 and 2014, were explored.

5.2.1 Hospitals' Location at 1980

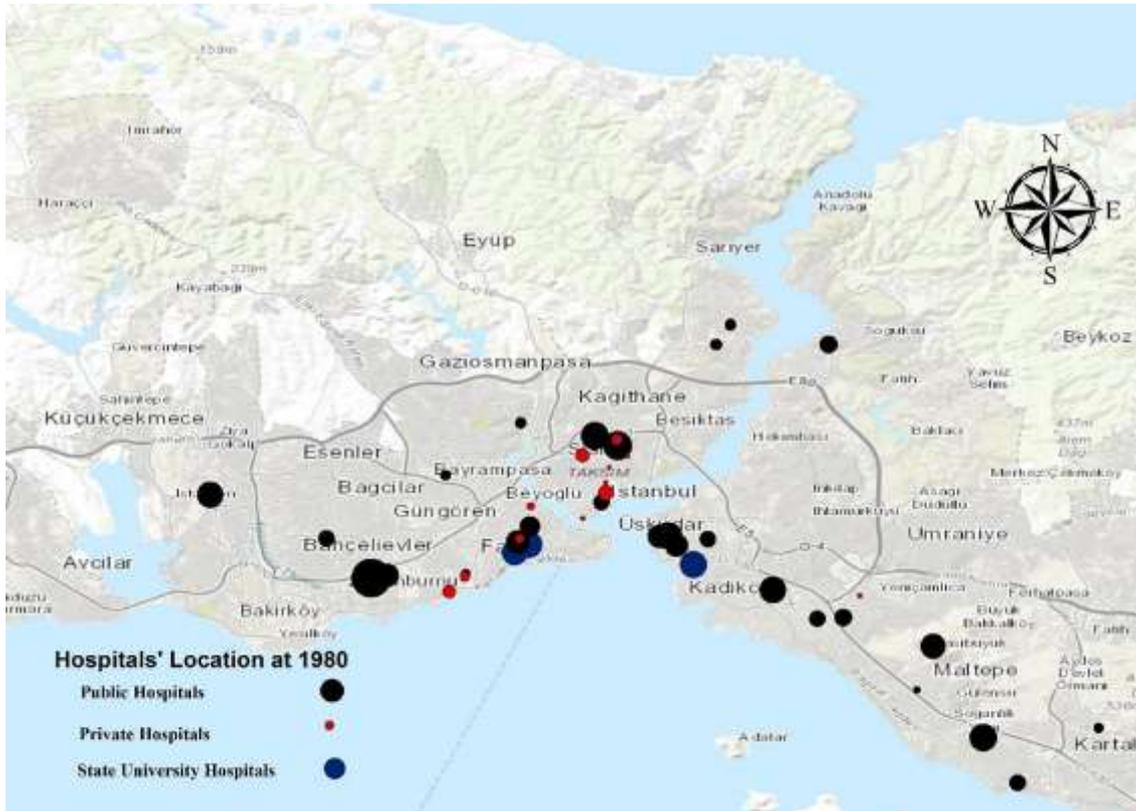


Figure 5.1: Distribution of public and private hospitals in Istanbul in 1980

In 1980, total population of Istanbul was 2.772.708 (Seçilmiş göstergelerle İstanbul, 2012). There was 29 public hospitals and public hospitals' bed number is 11.809. 3 university hospitals (İstanbul Fakültesi Hastanesi, İstanbul Cerrahpaşa Tıp Fakültesi Hastanesi and Marmara Üniversitesi Tıp Fakültesi Hastanesi) were located in Istanbul. On the other hand 12 private hospitals were in İstanbul. Private İstanbul Balıklı Rum Hospital is the first private hospital in Istanbul. It opened in Zeytinburnu district in 1753. The first private hospitals in Istanbul were racial minorities hospitals like Private Austria You Jorj Hospital, Private German Hospital, Private Surp Agop Hospital, ext.

Most of public hospitals were in high population district especially European Part. After construction of highway hospitals spread out periphery. Private hospitals preferred parts of Istanbul, which mostly racial minorities lived.

5.2.2 Hospitals' Location at 1985

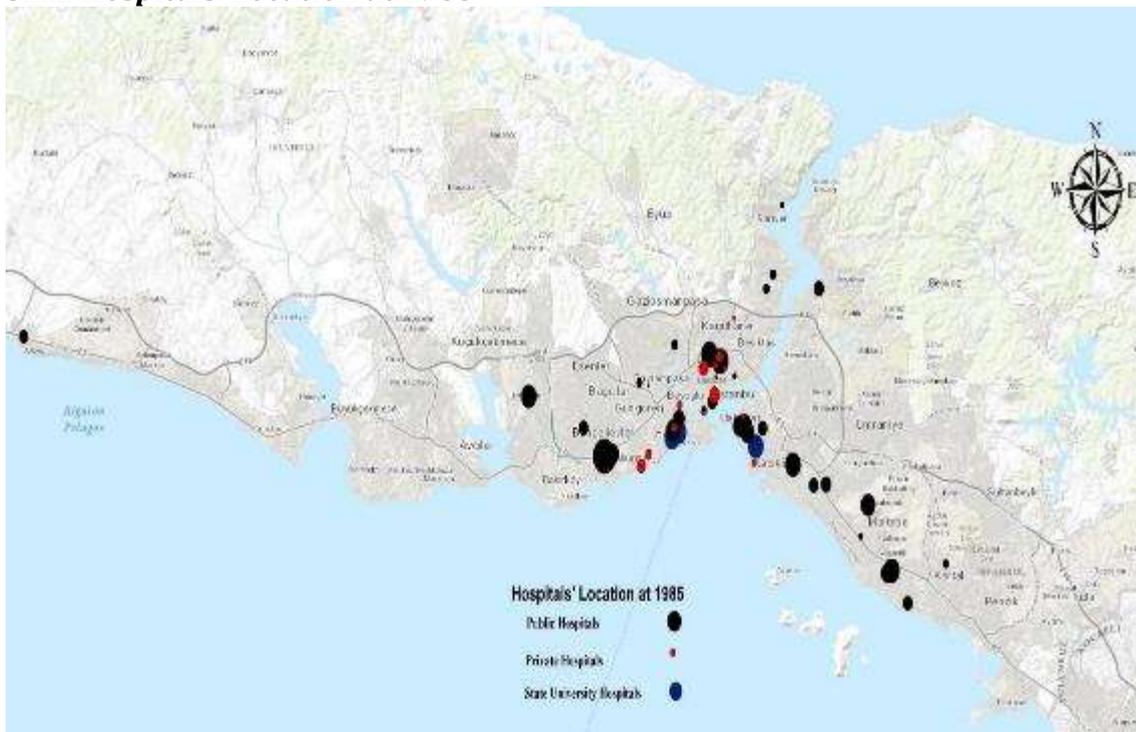


Figure 5.2: Distribution of public and private hospitals in Istanbul in 1985

In 1985, the population of Istanbul increased double, it was 5.475.982 (Seçilmiş göstergelerle İstanbul, 2012) there were 35 public hospitals versus 18 private hospitals. 6 private hospitals were opened in a 5 years. Increase in population

triggered both public hospitals and private hospitals. The other important effect of increasing hospital number was 1. And 2. Bridges and connection roads.

Private hospitals were not only racial minorities hospitals. Globalization affected most private investment and number of private hospitals increased in high income districts like Kadıköy, Şişli.

5.2.3 Hospitals' Location at 1990

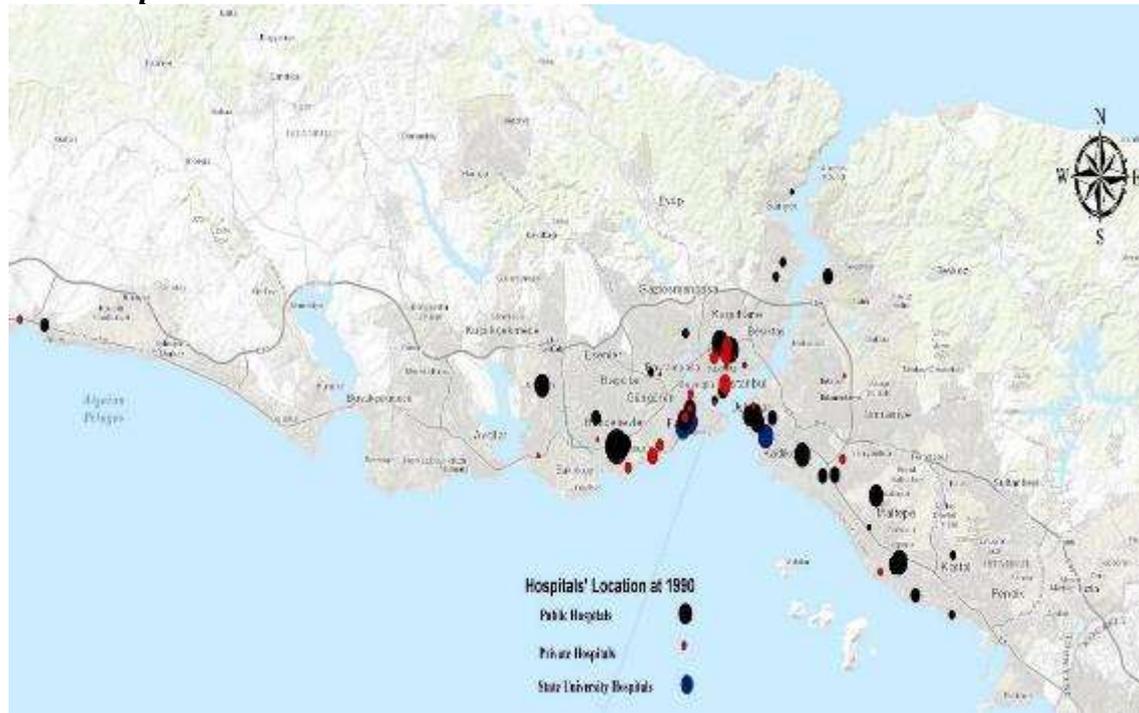


Figure 5.3: Distribution of public and private hospitals in Istanbul in 1990

In 1990, total population of Istanbul was 6.629.431 (Seçilmiş göstergelerle İstanbul, 2012). Increasing public hospital number was only 1. On the other hand this ratio was 8 in private hospitals. Total private hospitals number was 26. Private hospitals began to spread out new residential areas like Bahçelievler, Kartal, Ümraniye, but most of them preferred old and high income locations Beyoğlu and Fatih districts.

5.2.4 Hospitals' Location at 1995

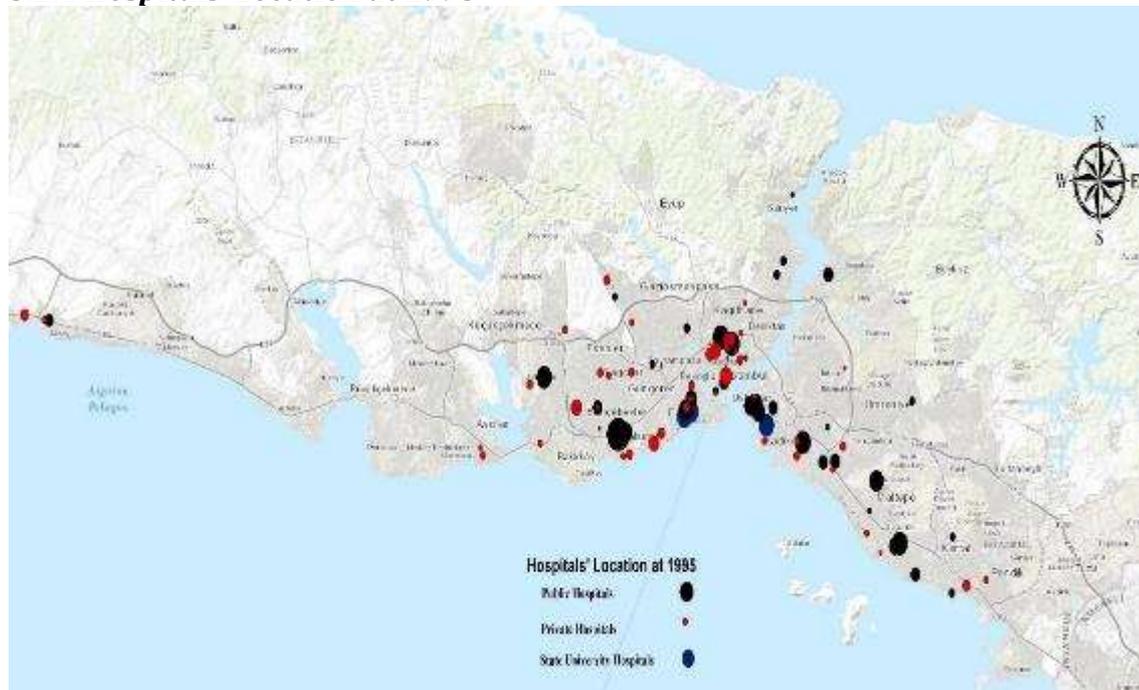


Figure 5.4: Distribution of public and private hospitals in Istanbul in 1995

In 1995, population of Istanbul was 9.260.438 people (Seçilmiş göstergelerle İstanbul, 2012). Public Hospitals number was 39, 4 new hospitals were opened in developing periphery areas, such as Çatalca, Sultanbeyli, Sultangazi. In 1990s Neoliberal Economies began to affect private sectors. Government has undertaken the task of establishing the legal framework only. Private sector began to make investment and to operate. In other words, private sectors gained strength.

In terms of hospitals, it verifies Neoliberal Economies, because number of private hospitals increased. 27 new private hospitals began to work between 1990 and 1995. Total Private hospitals number was 53 in 1995.

5.2.5 Hospitals' Location at 2000

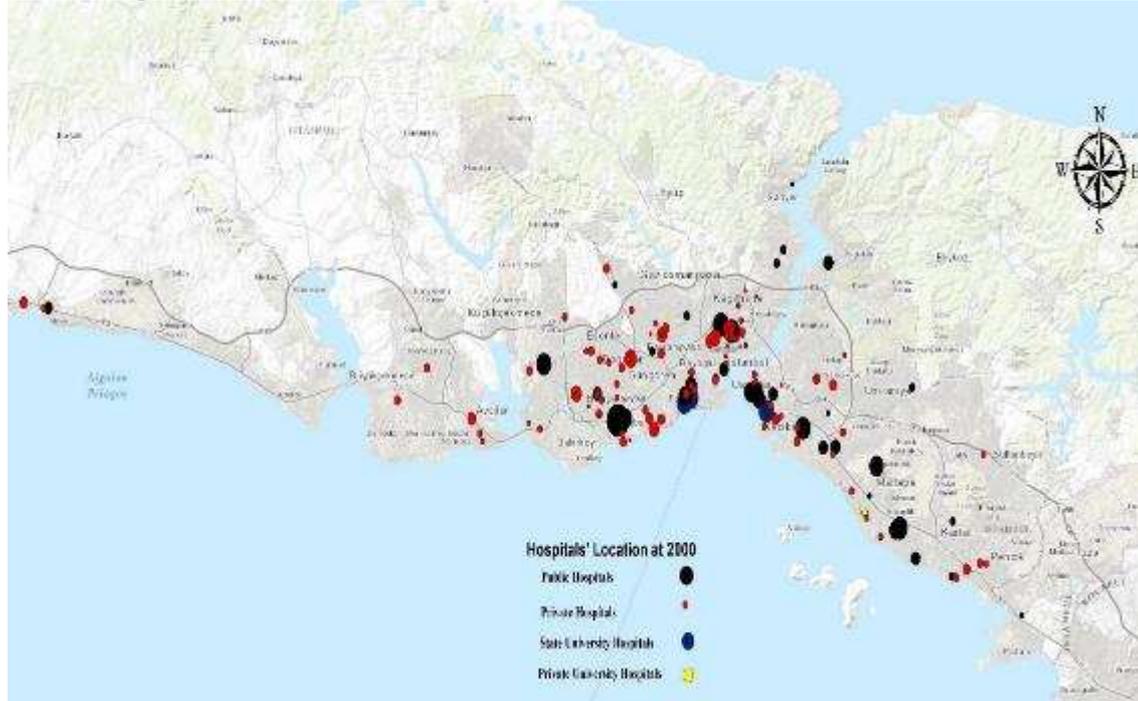


Figure 5.5: Distribution of public and private hospitals in Istanbul in 2000

In 2000, Istanbul's total population was 8.803.468 people (Seçilmiş göstergelerle İstanbul, 2012). Only Tuzla State Hospital was opened and total public hospital number was 40. It means that government began to be far from building new public hospitals. On the other hand total private hospitals number was 98. 45 private hospitals were done between 1995 and 2000. It is obvious that new economic situations encouraged private sectors. Private hospitals began to open middle income districts such as Bayrampaşa, Bahçelievler, Güngören. In addition first private university (Private Maltepe University Hospital) was established in 1997.

5.2.6 Hospitals' Location at 2005



Figure 5.6: Distribution of public and private hospitals in Istanbul in 2005

In 2005, the population of Istanbul was 9.260.438 people (Seçilmiş göstergelerle İstanbul, 2012). Total public hospitals number was 43 and total private hospitals number was 120. Increasing public hospitals number was normal, but increase ratio of private hospitals were law according to previous time periods. It might be because of 1999 earthquake and 2001 economic crisis. In 2002 a new one (Private Yeditepe University Hospital) private university hospital was opened. Most

of private hospitals which opened between 2000-2005 were located middle income residential areas such as Pendik, Kağthane, Esenler.

5.2.7 Hospitals' Location at 2010

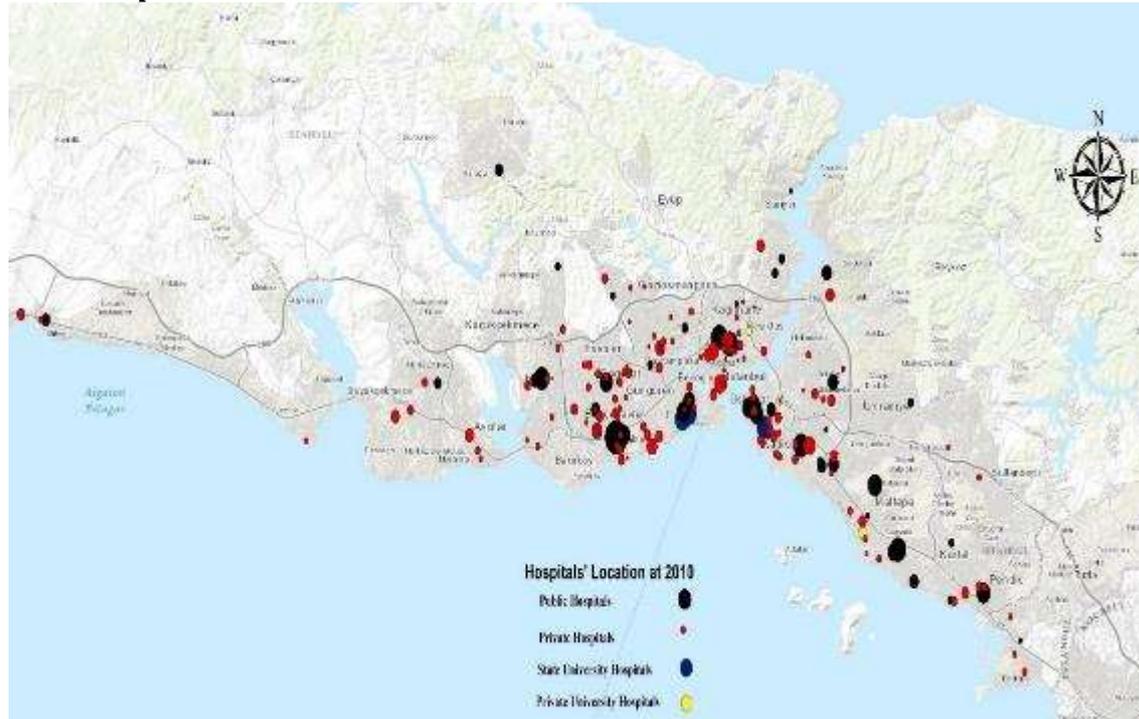


Figure 5.7: Distribution of public and private hospitals in Istanbul in 2010

In 2010, total population of Istanbul was 12.782.960 people (Seçilmiş göstergelerle İstanbul, 2012). There were 49 public hospitals versus 148 private hospitals. Private university hospitals number was 4. While government opening 6 new hospitals in the past 5 years period, private sectors opened 28 new private hospitals and 2 new private university hospitals were added existings. 2003 is an intersection year in terms of healthy sector, because of government's decisions (Transformation in Health). Briefly private healthy investments were encourage via this programme, it's effects began to be in sight after 2005 and will be continue to being seen.

5.2.8 Hospitals' Location at 2014



Figure 5.8: Distribution of public and private hospitals in Istanbul in 2010

Current population of Istanbul is 13.854.740 people (TUIK,2012). 52 public hospitals are exist in Istanbul. There are 164 private hospitals and 6 private university hospitals. Only 3 state university hospitals are located in Istanbul. In 2010 Marmara Satate University Hospital was hold on Health Minister and the same year, Bezm-i Alem Valide Sultan Hospital happened state university hospital. Namely number of state university hospitals are not changed. Current situation public

hospitals' bed number is 15.422, state university hospitals' bed number is 3.535 and private hospitals' bed number is 12.146, private university hospitals' bed number is 571. In other words public sector has 18.957 beds versus private sector has 12.717 beds. It is clear that government decision in 2003 has enhanced private hospital sector. Changes of the delivery of health services according to the year(2000-2014)

Between 2000 and 2014, total number of beds offering health care has increased approximately 18%. Current hospital bed number is 34.672. Number of beds in 4474 with the largest share of this increase is the private hospitals. Number of beds in private hospitals showed an increase of 62.3% over the same period. Increase the number of beds in public hospitals of 1536, while the increase in the number of university hospital bed is 373. The main reason for the increase in university hospitals as well, is a common private university hospital. In Table 5.2, the change in the number of hospitals and beds in Istanbul between the years 2000 to 2014 are shown.

Table 5.2: Changes in the number of hospitals and beds in Istanbul.

	Total		Ministry of Health		University		Private		Other Public Services	
	Hospital	Bed Number	Hospital	Bed Number	Hospital	Bed Number	Hospital	Bed Number	Hospital	Bed Number
2000	186	26.298	43	13.886	5	3.733	132	7.184	6	1.495
2001	192	27.210	44	14.661	5	4.120	137	6.821	6	1.608
2002	192	27.927	44	15.052	5	4.084	137	7.473	6	1.318
2003	192	26.949	45	14.601	5	3.624	136	7.471	6	1.253
2004	195	27.335	48	14.696	6	4.320	136	7.334	5	985
2005	195	27.399	50	14.261	6	3.931	136	7.764	3	1.443
2006	197	26.753	51	14.017	7	4.049	137	7.324	2	1.363
2007	200	26.133	52	13.327	7	3.989	139	7.473	2	1.344
2008	206	29.193	53	14.919	9	4.295	142	8.591	2	1.388
2009	213	30.020	52	14.637	9	4.295	150	9.700	2	1.388
2010	217	30.881	52	15.326	10	4.690	154	10.387	1	478
2011	214	30.219	52	15.310	9	4.270	152	10.539	1	100
2012	221	31.186	52	15.422	9	4.106	159	11.658	1	100
2013	225	31.505	52	15.422	9	4.106	163	11.877	1	100
2014	228	31.674	52	15.422	9	4.106	166	12.146	1	100

Source: It has been compiled from www.tuik.gov.tr (Access date: 26.12.2014) and Istanbul Provincial Health Directorate (Access date: 05.11.2014)

Şentürk and others (2011) tested by using regression analysis that there is a significant relationship between characteristics of the district (population, income and education level), and state and private hospitals, number of beds in Istanbul. Study area Istanbul was divided into 3 zones, first zone is core area (3 km. radius), 1.ring (3-10 km radius) and 2. Ring (other zones). Spatial distribution of public and private hospitals were explored in these zones. As a result of this analysis, education and income are related to private hospitals' bed number and, the most significant factors affecting it. On the other hand according to results there is no meaningful relationship between public hospitals' bed and population, income and education. Generally, distribution of public and private hospitals are not proportional to population especially university hospitals affect the distribution of hospitals' beds number was emphasized.

Dökmeci (2002), analysed location decisions private surgeries and population density and income by using regression. According to Dökmeci, proximity to major transportation routes economic polarization (high income zones) and existing hospitals affect location decisions of private surgeries which are clustered mostly Şişli and Kadıköy districts.

In 2014, when distribution of hospital location is analysed, it can be understood that distribution indicates unbalanced character. Hospitals center European part, Şişli, Fatih, Bahçelievler and Bakırköy, Asian part Kadıköy and Üsküdar. These districts have high accessibility values. There is no hospital in Adalar and Çekmeköy. Table 5.3. shows that bed number of public, private and university hospitals; Table 5.4. shows that distribution of hospitals to districts.

Table 5.3: According to the district in Istanbul, the private, public and university hospitals and bed capacity

COUNTIES	PRIVATE			PUBLIC			UNI.		TOTAL		
	Hospital	Bed Number	N.P.H.B. PR.T.P.*	Hospital	Bed Number	N.P.H.B. P.T.P.*	Hospital	Bed Number	Hospital	Bed Number	N.T.H.B. P.T.P.*
Adalar											
Arnavutköy	1	34	1,65	1	211	10,23			2	245	11,88
Ataşehir	4	391	9,88	1	300	7,58	1	152	6	843	21,30
Avclar	3	260	6,58						3	260	6,58
Bağcılar	7	764	10,20	1	498	6,65			8	1.262	16,85
Bahçelievler	13	962	16,03	1	267	4,45			14	1.229	20,48
Bakırköy	6	380	17,17	4	1.930	87,20			10	2.310	104,37
Başakşehir				1	100	3,16			1	100	3,16
Bayrampaşa	2	30	1,11	1	100	3,71			3	130	4,82
Beşiktaş	8	440	23,65	1	50	2,69			9	490	26,33
Beykoz	1	103	4,18	1	300	12,18			2	403	16,36
Beylikdüzü	3	279	12,18						3	279	12,18

Beyoğlu	4	399	16,21	2	349	14,18			6	748	30,39
B.çekmece	1	58	2,88	1	50	2,49			2	108	5,37
Çatalca				1	50	7,88			1	50	7,88
Çekmeköy									0	0	0,00
Esenler	4	245	5,34						4	245	5,34
Esenyurt	1	34	0,61	1	175	3,16			2	209	3,78
Eyüp	2	88	2,47	1	125	3,51			3	213	5,97
Fatih	9	519	12,10	2	1.040	24,25	5	3537	16	5.096	118,83
GOP	7	525	10,75						7	525	10,75
Güngören	4	215	6,99						4	215	6,99
Kadıköy	10	954	18,31	3	1.033	19,83			13	1.987	38,14
Kâğıthane	2	61	1,45	1	51	1,21			3	112	2,66
Kartal	3	146	3,29	4	1.503	33,91			7	1.649	37,20
K.çekmece	7	388	5,37	2	908	12,58			9	1.296	17,95
Maltepe	3	128	2,78	3	657	14,25	1	200	7	985	21,37
Pendik	6	534	8,53	2	643	10,27			8	1.177	18,81
Sancaktepe	1	31	1,11						1	31	1,11
Sarıyer	1	138	4,76	3	301	10,38			4	439	15,14
Silivri	3	205	13,65	1	223	14,85			4	428	28,50
Sultanbeyli	2	85	2,81	1	100	3,31			3	185	6,12
Sultangazi	3	157	3,19	1	75	1,52			4	232	4,71
Şile				1	25	8,27			1	25	8,27
Şişli	15	1.448	45,50	2	1.537	48,30	1	112	18	3.097	97,32
Tuzla	2	94	4,76	1	38	1,92			3	132	6,68
Ümraniye	6	349	5,41	1	326	5,05			7	675	10,46
Üsküdar	10	685	12,78	4	1.998	37,28	1	105	15	2.788	52,02
Zeytinburnu	4	529	18,09	2	459	15,70			6	988	33,79
TOTAL (AVARAGE)	158	11658	8,41	52	15422	11,13	9	4106	219	31186	22,51

N.P.H.B.PR.T.P.: The number of private hospital beds per thousand people N.P.H.B.P.T.P.: The number of public hospital beds per thousand people N.T.H.B.P.T.P.: The number of total hospital beds per thousand people

It has been compiled from Istanbul Provincial Health Directorate (Access date: 05.11.2014).

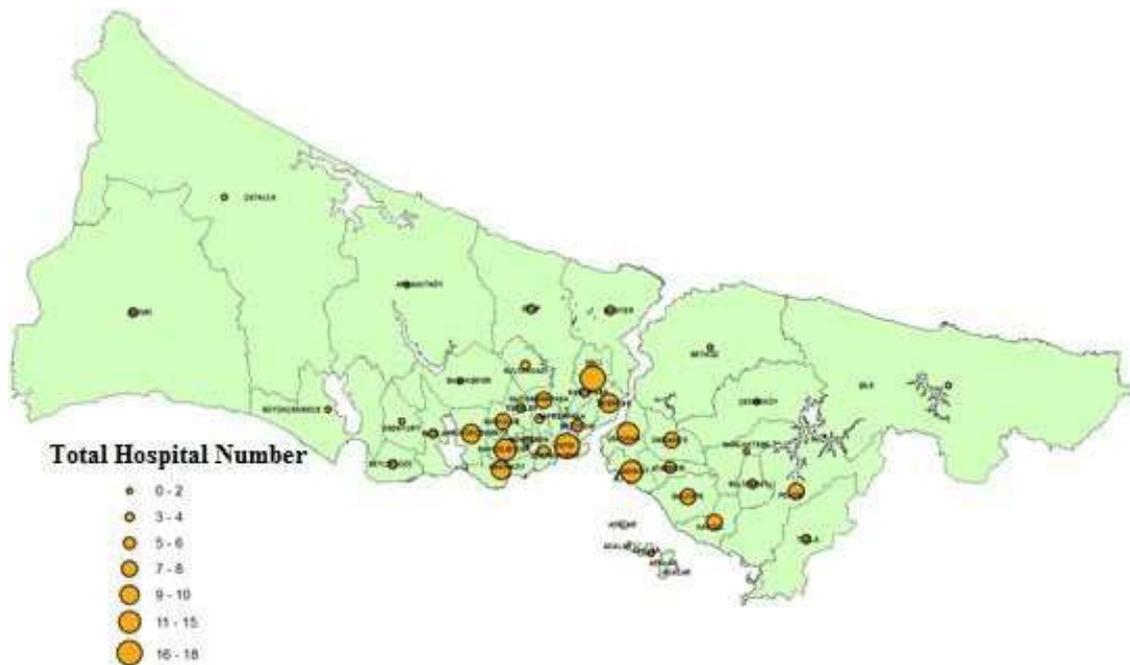


Figure 5.9: Distribution of hospitals in Istanbul(2014)

Distribution of hospitals' bed numbers are the same characters. European district, Şişli, Fatih, Bakırköy, Küçükçekmece, Bağcılar and Bahçelievler and Asian district Üsküdar, Kadıköy, Kartal and Pendik come forward. Locations of university and regional hospitals are decisive in distribution of hospitals. Figure 5.10 shows that distribution of bed number across counties.

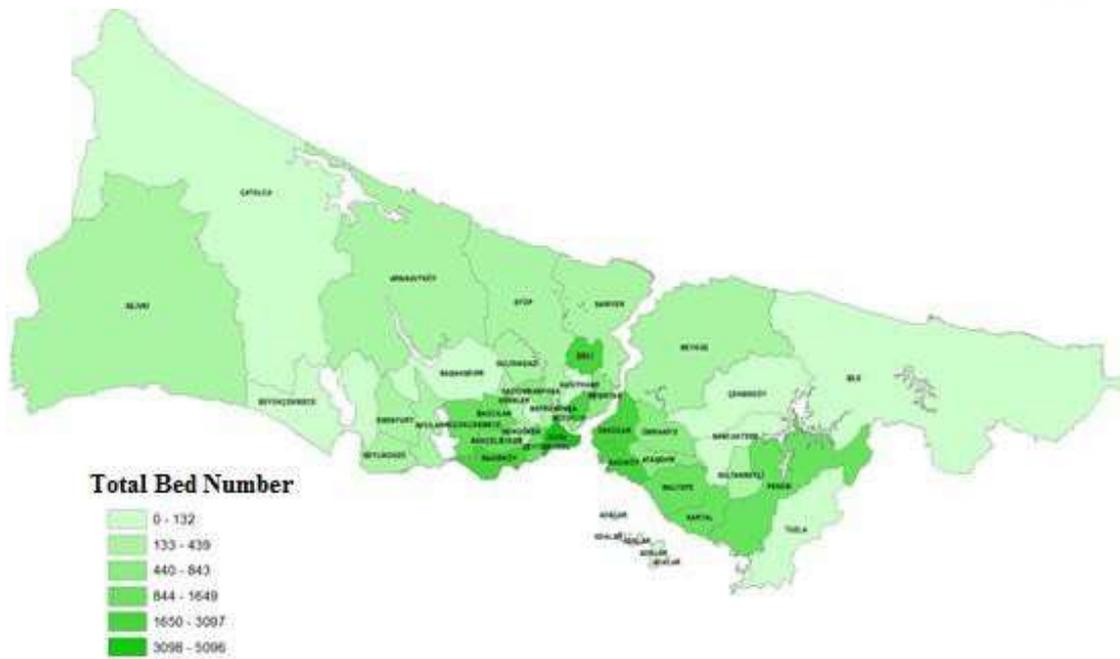


Figure 5.10: Distribution of bed number(2014)

To understand that, number of hospitals and bed numbers distribute proportional to counties or not, can be clear by analyzing number of hospital bed per ten thousand people. Fatih (118,83), Bakırköy (104,37) and Şişli (97,32) have highest hospital bed numbers, main cause is university hospitals and regional hospitals are located in these counties. Üsküdar, Kadıköy, Kartal, Zeytinburnu, Beyoğlu, Silivri and Beşiktaş, are the others counties which have high ratio up to Istanbul awarage. Distribution of hospitals bed numbers per ten thousand people is shown by Figure 5.11.

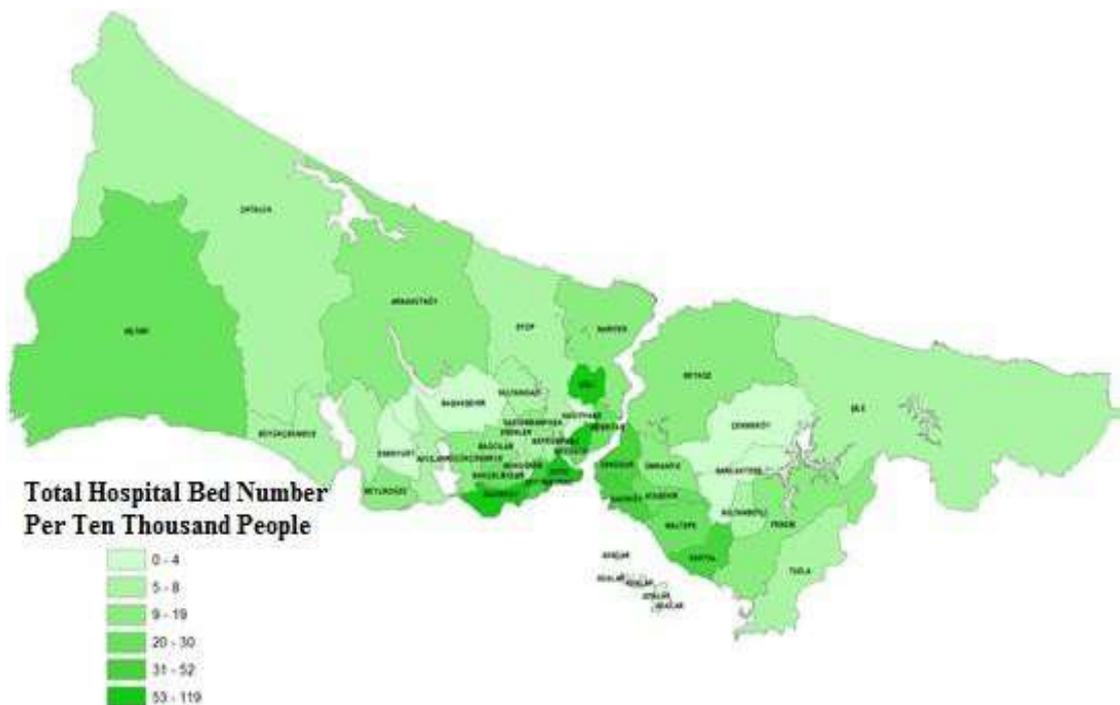


Figure 5.11: Distribution of hospitals bed number per ten thousand people

Spatial dispersions of private hospitals have more unbalanced character than public hospitals, because private hospitals' main purpose is effectiveness. Private hospitals are located in counties which have high accessibility and high income such as Şişli, Bahçelievler, Üsküdar, Kadıköy, Fatih, Beşiktaş and Bakırköy besides, they are located in high population density areas like Gaziosmanpaşa, Ümraniye and Pendik. There is no private hospital in Adalar, Çatalca, Çekmeköy, Başakşehir and Şile. Figure 5.12 indicates that distribution of private hospitals in Istanbul.

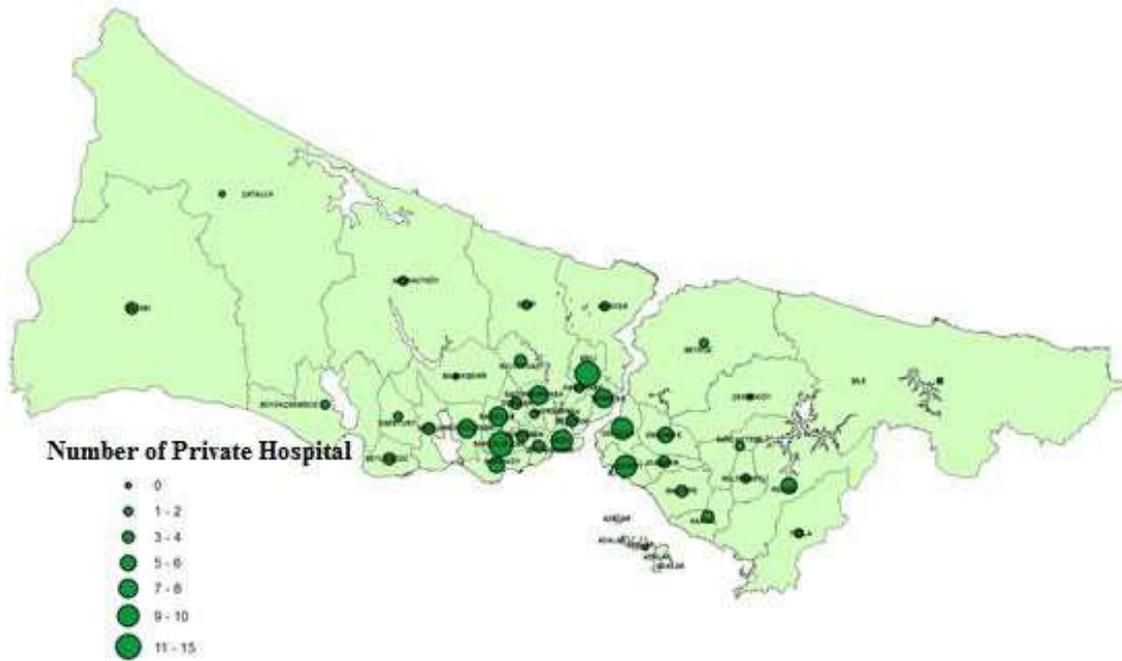


Figure 5.12: Distribution of private hospitals in Istanbul (2014)

Şişli county (1448 beds) has the highest number of private hospital bed. Bahçelievler, Kadıköy, Bağcılar and Üsküdar follow Şişli. Although Fatih and Beşiktaş counties have more private hospitals, hospital bed numbers are not more. On the other hand Zeytinburnu has less private hospital, but it has more hospital bed number.

The number of hospital bed number per ten thousand people in Istanbul is 8.41. Şişli county has the highest private bed number per ten thousand people via 45,5 ratio. Beşiktaş, Kadıköy, Zeytinburnu, Bakırköy, Beyoğlu, Bahçelievler, Silivri, Üsküdar, Beylikdüzü, Fatih, Gaziosmanpaşa, Bağcılar, Ataşehir and Pendik are the other counties which are up to Istanbul ratio. Figure 5.13 and Figure 5.14 show that dispersions of private hospitals' bed number across to counties in Istanbul.

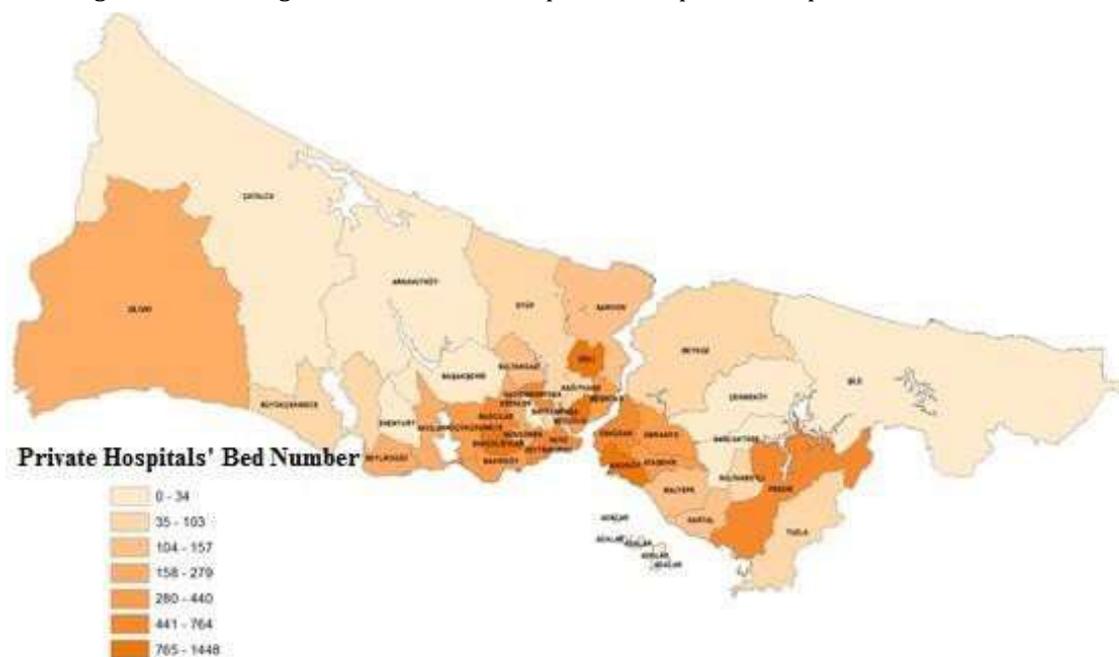


Figure 5.13: Distribution of private bed numbers (2014)



Figure 5.14: Distribution of private bed numbers per ten thousand people(2014)

Income level affects hospital preferences more than hospital admissions. Income level increases, the rate of private hospitals increase. On the other hand education level increases prevention of diseases and the consciousness of being treatment timely, and it affects hospital demand.

In 2009 The average annual income per person is 14.786 TL in Istanbul. (It has been produced from the results of household surveys conducted under Transportation Department İUAP, İBB). Huge income differences have seen between Adalar county (40.198 TL) which has highest income level and Sultanbeyli (8.103 TL) which has lowest income level. Other districts with above average income level in Istanbul are respectively Beşiktaş, Bakırköy, Kadıköy, Şişli, Beylikdüzü, Başakşehir, Sarıyer, Üsküdar, Ataşehir, Maltepe, Büyükçekmece and Kartal.

In general Istanbul, high school and college graduates over the age of 15 over the proportion of the total population is 0.38. The districts which have highest ratio are Beşiktaş (0,68), Kadıköy (0,66) and Bakırköy (0,62), the districts which have lowest ratio are Arnavutköy (0,18), Sultanbeyli (0,19) and Sultangazi (0,21).

In general in Istanbul, spatial distribution of education and income levels indicate parallelism. There is a highly correlation between education level and income level with 0.81ratio. Figure

5.15 and Figure 5.16 and Table 5.4 show that changes in income and education level in Istanbul.

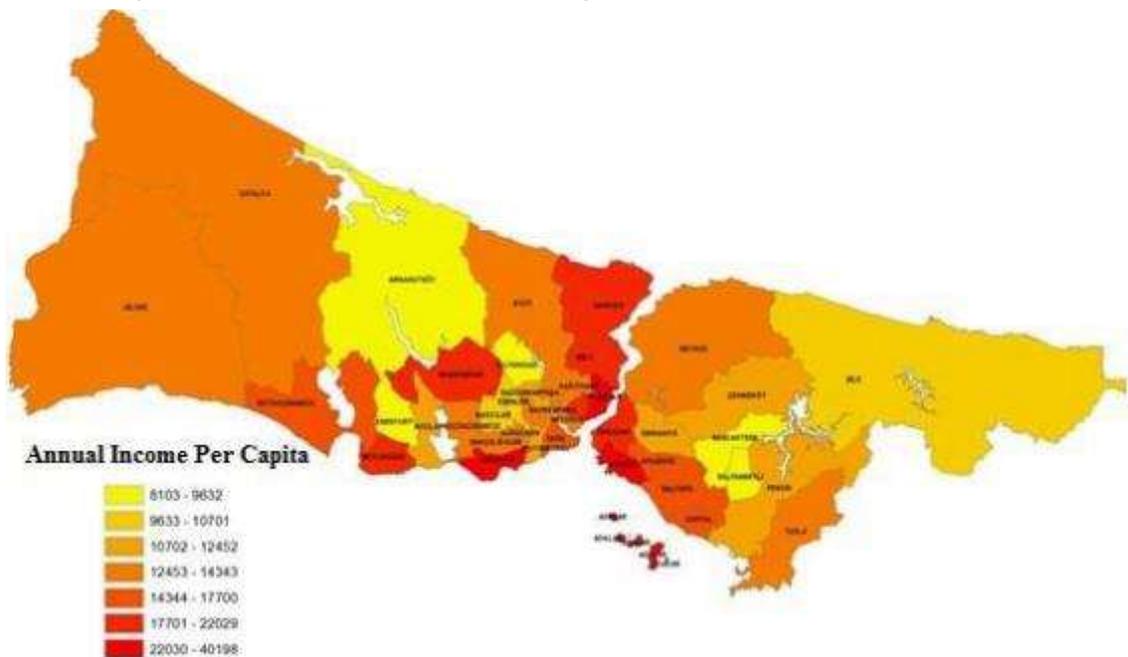


Figure 5.15: Dispersions of annual income per capita

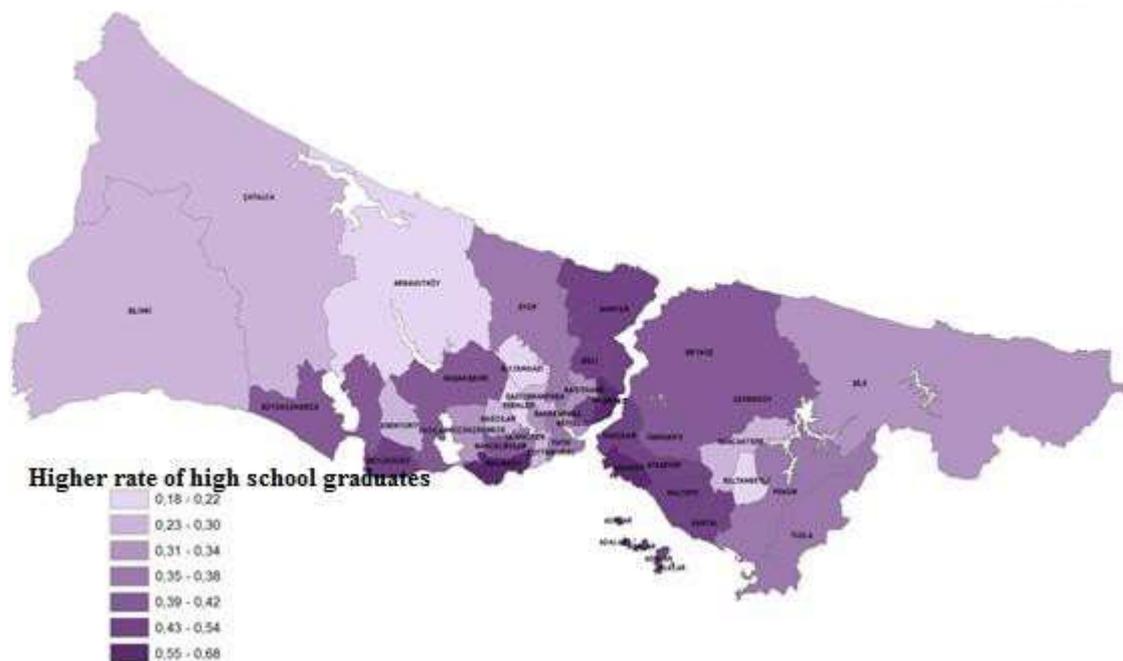


Figure 5.16: The ratio of high school and higher school graduates and total population above 15 years.

Table 5.4: Education and income level according to districts in Istanbul

COUNTIES	POPULATION 2009	DISTRICT MONTHLY TOTAL INCOME 2009	Annual per capita INCOME 2009	POPULATION 2012	High School and Higher School Graduates Population 2012**	Ratio of High school and higher school graduates and total population above 15 years old.
Adalar	14.341	48.039.387	40198	14.552	5648	0,45
Arnavutköy	175.871	141.159.526	9632	206.299	25164	0,18
Ataşehir	361.615	533.372.498	17700	395.758	138745	0,45
Avclar	348.635	343.473.151	11822	395.274	117199	0,39
Bağcılar	724.268	606.367.387	10047	749.024	131964	0,25
Bahçelievler	576.799	687.932.413	14312	600.162	179671	0,39
Bakırköy	218.352	543.475.103	29868	221.336	116299	0,62
Başakşehir	226.387	381.960.236	20246	316.176	88247	0,40
Bayrampaşa	269.425	288.344.254	12843	269.774	69016	0,33
Beşiktaş	185.054	532.473.944	34529	186.067	108902	0,68
Beykoz	244.137	273.806.430	13458	246.352	75643	0,39
Beylikdüzü	193.972	352.181.450	21788	229.115	93944	0,54
Beyoğlu	244.516	270.095.010	13255	246.152	58921	0,31
Büyükkçekmece	171.222	217.839.144	15267	201.077	64216	0,42
Çatalca	63.277	68.580.014	13006	63.467	13486	0,26
Çekmeköy	154.103	151.756.104	11817	193.182	54252	0,38
Esenler	459.980	386.243.747	10076	458.694	71377	0,22
Esenyurt	403.895	318.921.994	9475	553.369	112957	0,29
Eyüp	331.548	371.708.147	13454	356.512	99093	0,36
Fatih	433.796	533.767.283	14765	428.857	129857	0,38
Gaziosmanpaşa	461.230	447.826.275	11651	488.258	103988	0,29
Güngören	311.672	372.515.665	14343	307.573	88918	0,37
Kadıköy	529.191	1.272.337.601	28852	521.005	296839	0,66
Kağıthane	413.797	474.536.887	13761	421.356	107676	0,33
Kartal	426.680	528.391.643	14861	443.293	152935	0,44
Küçükçekmece	674.795	739.547.646	13152	721.911	184996	0,34
Maltepe	427.041	577.865.725	16238	460.955	177182	0,48
Pendik	562.122	556.263.674	11875	625.797	166055	0,36
Sancaktepe	241.233	184.011.436	9154	278.998	51739	0,26
Sarıyer	278.527	458.280.773	19744	289.959	110094	0,47
Silivri	134.660	147.586.154	13152	150.183	35367	0,30
Sultanbeyli	286.622	193.547.566	8103	302.388	38317	0,19
Sultangazi	452.563	362.201.621	9604	492.212	71208	0,21
Şile	28.325	25.257.858	10701	30.218	7748	0,31
Şişli	316.058	580.202.357	22029	318.217	124620	0,48
Tuzla	181.658	192.333.620	12705	197.657	54474	0,37
Ümraniye	573.265	585.390.244	12254	645.238	191421	0,39

Üsküdar	524.379	862.739.227	19743	535.916	216762	0,50
Zeytinburnu	290.147	301.064.799	12452	292.407	64720	0,30
TOTAL/AWA REGA	12.915.158	15.913.397.996	14.786	13.854.740	3999660	0,38

*Counties' income levels have been produced from the results of household surveys conducted under Transportation Department İUAP, İBB.

**Counties' population and education level, are compiled from TUIK data (www.tuik.gov.tr, Access date: 19.11.2014)

6 EVOLUTIONS

Healthy is indispensable for human and states must supply healthy services to everybody. Turkish healthy system is insufficient in comparison to developed countries. Public and private sector work together in healthy services. Public sector aims to efficient and accessibility, so these factors affect public hospitals' location decision. On the other hand private sector aims to maximize profit and it prefers high income residential areas.

Accessibility is the most important for healthy services, so most of hospitals located in high accessible areas, highways, main roads, subways. Private hospitals prefer being near public hospitals. Most of them are Fatih and Şişli area which have large public hospitals.

During the last 35 years, Istanbul's population has increased unexpected values, and governments was not efficient for supplying public services. In 1980s public hospitals' locations were not efficient and equal. For instance, Sultanbeyli, Pendik, Avcılar were residential areas, but there were any public and private hospitals, people had to go far away, when they were ill. On the other hand first private hospitals were racial minority hospitals. Between 1980 and 1990 private hospitals number increased by effects of globalization. In 1990s, neoliberal economic policies affected private sectors, 72 private hospitals were opened between 1990 and 2000. Private hospitals located in high income districts such as Kadıköy, Şişli, Bakırköy. In these years public hospitals began to spread out to peripheries. In the beginning of 2000s, Adapazarı earthquake and economic crisis affect private sectors, the ratio increasing of private hospitals number began to fall. Transformation in Health Program (government decision, 2003) is important for private hospitals. These decisions encouraged public sectors and private hospitals began to trigger again after 2006. Today, total public hospitals' bed number and total private hospitals' bed number are very closest. Private hospitals are opened not only high income residential areas but also middle income districts no longer.

BIBLIOGRAPHY

- Dear, M.J. (1978). Planning for mental health facilities: reconsideration of public facility location, *International Regional Science Review* 3: 93-111.
- Dökmeci, V. (2005). *Planlamada Sayısal Yöntemler*, İTÜ Yayınevi, İstanbul.
- Dökmeci, V. (2002). Spatial Analysis of Physicians' Offices with Respect to Population and Hospital Beds in Istanbul, *European Planning Studies*, 10:3, 405-412
- Dökmeci, V. ve Özus, E. (2004): Research briefing, Spatial Analysis of Urban Pharmacies in Istanbul, *European Planning Studies*, 12:4, 585-594.
- Dökmeci, V. ,Terzi, F. and Şentürk, T. (2011): *Privatization of Health-care Facilities in İstanbul*, *European Planning Studies*, 19:6, 1117-1130
- Kara, F. and Egresi, I. O. (2013): *Accessibility of Health Care Institutions: A Case Study By Using GıS Seçilmiş Göstergelerle İstanbul* (2012)
- Şentürk, T. , Terzi, F. ve Dokmeci, V. (2011). Privatization of Health-care Facilities in Istanbul, *European Planning Studies*, 19:6, 1117-1130
- Transformation in Healt Report** (2003) Health Minister
- TUİK**. (2013). Sağlık İstatistikleri, http://www.tuik.gov.tr/PreTablo.do?alt_id=1095
- TUİK**, 2009. Hanehalkı Bütçe Araştırması, Tüketim Harcamaları, Ankara
- TUİK**, 2010. Sağlık Araştırması, Ankara.

RS06.4. Location of Economic Activity

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ABSTRACT

Firstly, I choose this topic, because I am interested in finance, but I would like to examine a complex system of the financial institutions. The local governments, financial institutions and inhabitants affected are essentially taking on the role of key factors, but the connection among them not always visible clearly. In my humble opinion, several (Hungarian) regional researchers do not devote enough time to attend to the impacts of finance. The problem with this mentality is that it does not take account of important financial factors. Why it is relevant to take account of finance in the regional science? In my esteem, financial institutions should be positioned as essential drivers of the settlements' economy. This sector of service gives many possibilities to the citizens as well as to small and medium-sized enterprises to save and invest their money or finance their purchases and projects. Secondly, the geography of finance is a new field of science which provides opportunities to examine the effects of financial institutions' strategic decisions. In my presentation/research paper, I would like to reveal the rising importance of this topic through the Hungarian example. In the course of my research, I would collect localization data from the financial institutions' websites, interview with at least two people (work in different financial institutions). After this, I would use the collected data to make illustrative diagrams and maps to make decisions. From my point of view location theories are play an important part of financial markets, thus I check in my study the positions and numbers of branches settlement by settlement in Hungary. There are two various types of financial institutions in the country because the Hungarian history caused different demands on financial services. The research shows that the differences between the mentality of the two main institutions have been being huge since their establishment of the second half of the twentieth century. All in all, I would like to present some of data and results of my research in this paper, because it provides curiosity for everyone who interested in financial or/and regional sciences.

Keywords: bank, financial geography, local government, regionalism, settlement

INTRODUCTION

Individual is meant to be a segment of the economic sector which is hard to be accessed and scrutinized, since everyone shares different ideas, habits of the mind and opinions. My research is partially linked to the analysis of savings and financial cultural habits of the individuals among the Hungarian population. At present, in another context – examining the territorial locations, penetration of banks and cooperative credit institutions – I tend to assess and scrutinize the geographic strategic parameters of these financial institutions. The survey, thanks to the triple typology of vicinity-distance-digitalization is closely connected to the demands of population, thus my research scope tends to focus on the factors of establishing banks or cooperative credit institutions. I would outline an important factor at this point, which in my opinion significantly affect the operational strategy of financial institutions and business corporations as well as the habits of the residential customers. The new informational technologies, digitalization, the internet's virtual reality, the cyber space do affect and inspire progress and development in such an incredible pace that we cannot simply bypass it without a word. I'd like to quote a few lines from the book of Thomas L. Friedman that had a really great impact upon me when reading, revealing the idea that corporations and individuals, as well must inevitably take the ride of progress: „It is important that we possess the knowledge and stay in the game ... the world is like a football pitch and we must perform well to remain in the team.. Unless you are good enough, you must watch the match from the side-line...” (Friedman 2005: 129.) The financial sector, nowadays is in the stage of quest for the right direction, since its traditional actors are facing brand new challenges.

BANKS AND COOPERATIVE CREDIT INSTITUTIONS

Before getting deeper into the theory and practice of choosing the right location for financial institutions, I need to present the brief history of the before-mentioned institutions, since their past formations can be traced back to different causes. In the aftermath of the devastating world wars, the economy of Hungary desperately needed development and rebuilding projects both in the field of agriculture and the corporate business world. By the second half of the 20th century – following the abolishment of the small credit institution-system – it became evident that the National Savings Bank (OTP) solely cannot satisfy the needs of the regions of the countryside. Due to the ensuing social, political changes the regional financial institutions catering for the needs of the country population ceded to exist. The needs of the rural people differ from those living in the cities, moreover the territorial distances used to play a significant role those days, so even besides modest profitability it was necessary to establish locally embedded and adoptive financial institutions, namely small cooperative credit institutions serving the special requirements of the local people. Thus, the rural cooperative credit institutions functioned as financial institutions serving the needs of the impoverished rural population, linked to more central rural locations with good agricultural and industrial connections. Following the political system-change, the operating financial institutions were also forced to change and transform themselves as a consequence of the ensuing alterations in the national banking system. The small cooperative credit institutions realized that centralization, the

²³⁴This research was supported by the „Internationalisation, initiatives to establish a new source of researchers and graduates and development of knowledge and technological transfer as instruments of intelligent specialisations at Széchenyi István University” EFOP-3.6.1.-16-2016-00017 Project.

continuous common development projects provide a more stable, cost-efficient and economical operation scheme for them. (Moizs 2012) The cooperative credit institutions in our country, based on the given territorial penetration of the share voucher-holders established the financial institutions since the owners' interest meant to be of utter importance in selecting the locations of the institutions. Their foundation – as we could witness – proved to be inevitable due to the local rural features so different from the urban conditions. The commercial banks, primarily were the Hungarian branches, affiliates of foreign banks, so their location selection would be a primarily a profit-driven choice, though for quite a long time, the cooperative credit institutions were to be the only genuinely Hungarian financial institutions. In my opinion, the operational schemes and strategies of these financial institutions must start to correlate and get closer as time goes by, and as their customers become basically the same. Their strategy must primarily rely and focus on the needs of the new generation for the sake of their future success.

It is also an interesting question the participation of a given bank-system in a special region in the regional economy as well as its dependency rate on the given region. Approaching this aspect from the before-mentioned vantage point, the current academic literature differentiates between two main trends. According to the neoclassic theory, we must focus on the integrated national banking system, thus taking advantage from sizeable economical measures flowing the capital towards the most appropriate targets. (Kohn, 1998) The other direction is that of the post-Keynesianism, which proclaims that the best thing for the capital is to remain at the location where it has been produced, promoting the embeddedness of the bank-system into the local economy. (Dow, 1994; Gál, 2010)

cooperative credit institutions do share this kind of locally embedded features, promoting and prioritizing the local interests, though their operations are significantly influenced by their popularity, good fame, as well. According to their core philosophy, they tend to promote and financially contribute to the success of the local regional interests. However, due to the current globalizing trends they could fulfill their mission in this respect only as being part of a national network. The residential as well as the corporate business clientele raise new challenging needs, while the continuously updated professional (technological) demands are getting higher and more complicated, too. Therefore, the cooperative credit institutions tend to create even bigger financial power-hubs through mergers in order to be able to keep afloat both on local and global level. (Kiss, 2009) Thus, in the following chapter, I tend to outline the impact of the institutional, regulatory as well technological changes upon the financial institutions.

THEORY OF BRANCH LOCATION SELECTION

I would like to present briefly the essential factors, elements of branch location selection displayed in the professional literatures. Within the regional way of thinking, even back in the 1700's *Johann Heinrich von Thünen* was meant to deal with regionalism, taking into account the importance of distance and location of marketplaces. Following the expansion and development of theories, Lengyel Imre et alia concluded that the economic actors when making a thorough decision take into account various business-specific criteria. Economic and even broader factors do altogether affect the ideas, projects of the business corporations, while the optimal conditions may vary based on their very own size, capacities and extension. (Lengyel 2004) It is quite difficult for an outsider to define the most appropriate choice for the various actors of an economy, though we must accept the fact that everyone should adopt and comply with the global changes of our world. Thanks to the continuity of the development processes, Manuel Castells back in 1996 called the attention upon the losing importance of time and distance in business, when the information society is about to expand in such an unprecedented pace and manner (Castells 1996). Shifting from the general theories to the world of financial markets, it can be observed that these institutions tend to pursue a trend-following attitude in this matter. With the prevalence of electronic banking transfer methods the time-frame barriers tend to disappear from business. Drawing into a closed network the remotest affiliates, branches is getting to be a routine furthermore the idea of vicinity/neighborhood is getting more room and importance. (Boschma 2005, Lengyel 2010).

It can be also observed the suspicious attitude of researchers concerning the emergence of newer and newer technologies, since they tend to highlight the importance of diminishing of time and space/distance. Peter Haggett in his book 'Geography global synthesis' argues about the idea that nowadays it is not geography which loses importance rather distance. The significance of geographic distance is undeniable, only the importance of distance diminished as a consequence of technological advancements. (Haggett 2006)

Based upon the literature analysis performed so far, I do consider that it is obvious that distance is losing ground as primary factor for establishing a branch or performing any kind of business activity, nowadays. Concerning the financial institutions, Gál Zoltán concluded a very sympathetic definition as follows: "By the implementation of info-communicational devices the capital markets witnessed the fastest transformations, predicting the 'likelihood' of the dawn of a virtual world without distances" (Gál 2014: 184.).

The diminishing importance of distances shared an outstanding attention in this chapter, since this is the topic I wish to highlight through my analyses, naturally paying attention to the other factors substituting distance when choosing a location for a depot or branch. I tend to present the branch network of the biggest financial institute of our country from a practical point of view, also dealing with the options of alternative agglomerations. In the forthcoming chapters, the great revelations and wisdoms of the above presented theories as well as the practically implemented strategic ideas are going to be supported by various maps, charts and interview findings carried out by the author.

THE PRACTICE OF CHOOSING A BRANCH LOCATION

Most of the researchers have created all sorts of theories concerning the definition of all those factors which may ensure the most benefitting positioning of the productive companies. In my opinion, the financial institutions play a significant role in fostering and developing economy, thus getting to know the set of criteria proves to be essential for them, too.

Interview findings

The discussions carried out with two interviewees of mine were related to the relationship and adaptation of financial institutions to the current economic conditions. Along the interviews, I asked 1-1 employee in mid-level manager position from a bank and from a cooperative credit institution, too, regarding the effects of digitalization, branch location selection and cooperative credit institution-mergers upon their own institutions. Along the discussions, inevitably we touched on issues of historic past, especially the events of the 1950's and of the 1990's. From the cooperative credit institutions' standpoint, the 1950-1960's were considered to be their peak, golden age ever since their foundations. From the banks vantage point, the abolishment of the small credit institutions and the establishment of a big state-owned bank proved to be of outstanding importance from that era. By the end of the 1990's the first really big challenge loomed in by the task of establishing a great, new unified data-base system. For the banks, this time period meant the 'overbanking' era of Hungary, since following the political system change the foreign banks considered a huge market opening in this sector. Thus, rationalizing the number of financial institutions and closing down the loss-producing branches goes on even nowadays in both financial sectors. Nevertheless, certain installation factors have also been revealed, which may be accounted as essential factors for preserving the operation and explaining the present location of the branches. From the banks point of view, the sales potential is supposed to be the most essential factor, which can also be considerably affected by the age, demographic and migratory trend as well as by the unemployment rate of the given settlement. The cooperative credit institutions are rather characterized by smaller scale profitability focus, thus even their less profitable branches can go on operating. The analyzed financial institutions were established in order to serve their residential customers' needs irrespective of their age. All the same, it can be stated that this primary goal currently seems to be unsustainable for the cooperative credit institutions because their residential customers are drastically aging. The younger and middle-aged customers generally choose the financial institutions closer to their workplaces or educational institutes instead of their permanent residential address. For the older generation customers trust, personal direct information-flow and local business management options are more important, therefore they tend to prefer the cooperative credit institutions' local branches.

Let's have a look at the picture deciphered by the two colleagues from the two financial institutions on the issue of cooperative credit institutions' merger presented in the media. From the part of the cooperative credit institutions, the initial goal is to create similar size branch mergers in all the regions with the headquarter being the Takarékbank (The Savings Bank). Later on it would be feasible to merge the cooperative credit institution branches into the Takarékbank, establishing a nationwide branch network with a regional penetration, size and capitalization similar to that of the National Savings Bank (OTP). The synergy effect linked to this merger would promote the creation of a territorial structure resembling to that of the big national banks, which would also imply the emergence of new competitive factor for those banks, too. It would also offer the option to lure away those customers rejecting the cooperative credit institutions merger and it would also be a challenge to decrease or neutralize the effect of the cooperative credit institutions' synergies.

Applying the new digital technologies for reaching out for the younger generation customers proves to be of utmost significance. Some parts of the regulations compiled by the Hungarian National Bank refer to this topic, consequently complying with these regulations and applying the new technologic developments²³⁵ (e.g. PSD2) are also meant to be organic part of the task allocation of the financial institutions. The envisaged development projects, most likely will not cause any disruption or problem for the banks or the cooperative credit institutions, either. The advantage of the impersonal banking services is also manifested in the decrease of importance of the geographic positioning of the branches.

Analysis of financial institutions data

I have collected the data concerning the geographic positioning of the branches of the 10 biggest Hungarian banks as well as of the currently operating cooperative credit institutions (61 altogether) in Hungary. In my study, I am going to present the various analyses of this data amount, which I presume contain really interesting information and results. Chart 1 illustrates the sphere of banks analyzed as well as all the settlements where these banks operate branches. The examined banks are present in several settlements, in the case of cooperative credit institutions this number is considerably higher, precisely there are 1,237 settlements in the country with operating cooperative credit institution branches.

Chart 1. Sphere of commercial banks analyzed (2017)

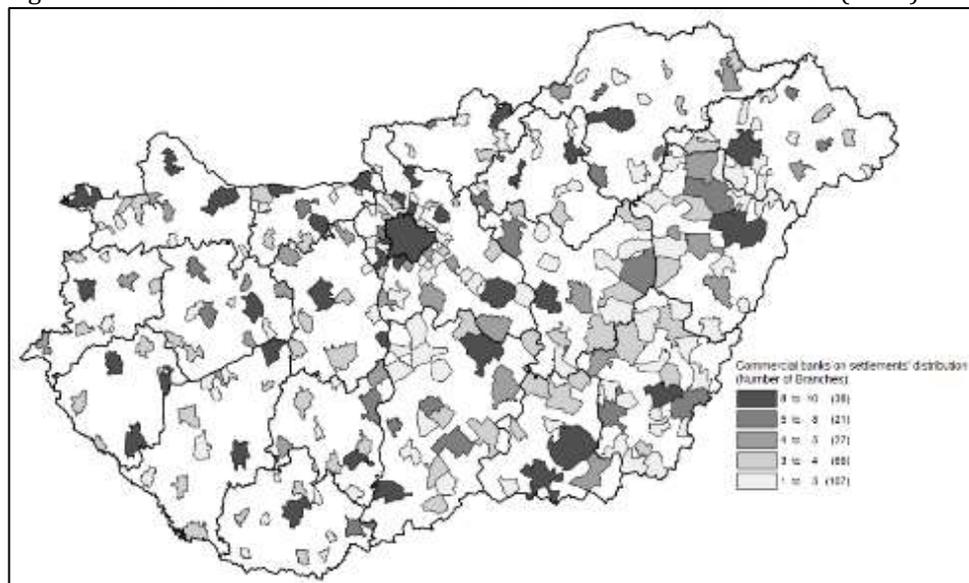
Bank	Budapest Bank	Erste Bank	Cib Bank	K&H Bank	FHB Bank	MKB Bank	Raiffaisen Bank	UniCredit Bank	Sber Bank	OTP bank
settlement (no.)	64	77	42	152	33	52	36	33	19	247

(own compilation based on data from the banks' websites)

²³⁵ See <https://www.mnb.hu/letoltes/az-azonnali-fizetesi-szolgaltatas-mukodesi-modellje-magyarorszagon.pdf> (downloaded on: May 06, 2017)

Cooperative credit institution branches can be found particularly in villages, while bank affiliates are present mostly in towns. Naturally, one reason for this penetration scale lies in the more profit-oriented strategy of the banks compared with the cooperative credit institutions, this way banks are quite unwilling to open branches in any small settlement. In figure 1. we can depict the distribution rate of the number of branches in a settlement of those banks mentioned above. It seems that the typically the capital city and the county towns share the biggest number of various commercial banks competing for the customers.

Figure 1.: Ratio of several commercial banks on settlements' distribution (2017)

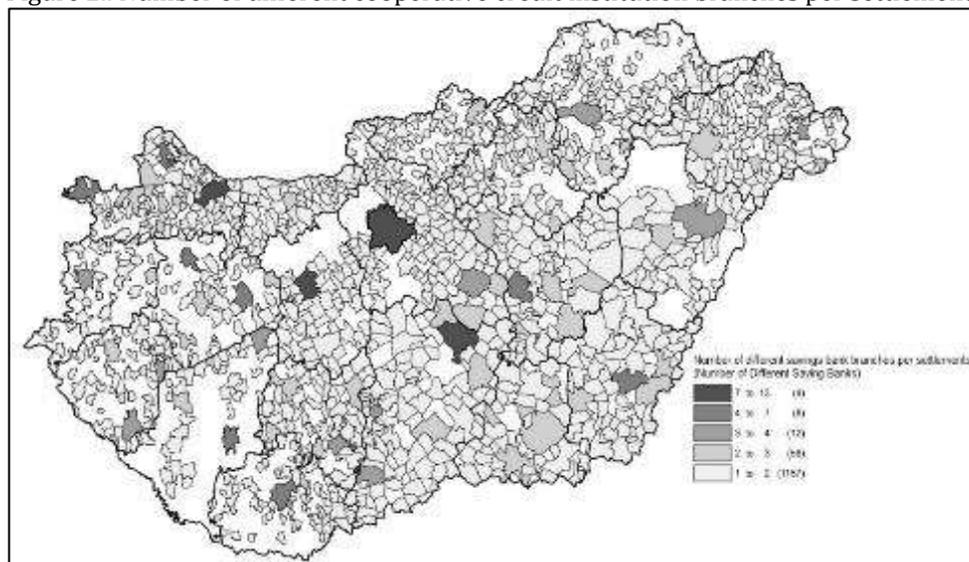


(own compilation based on the banks' websites)

Interesting detail reveals from the map concerning the western part of the country, which shares lower bank penetration scale than the southeastern region. One reason for this might be the fact that in the western countryside the settlements geographic location is more sporadic and scattered, and they also function as financial centers, agglomerations unlike the eastern settlements. Austria is neighboring Hungary from the west, thus the abundant potential workplaces over there may create customer migration to the Austrian bank branches, as well. For the more significant southeastern concentration another reason may be the bigger number of population in comparison with the rate of the central and southwestern region of the country.

For the financial institutions, the lack of hamlets and tiny rural areas may as well mean an advantage – contrary to the western region – since the infrastructural and economic development and benefits stemming from this fact prove to be positive factors for them. Consequently, the banks with bigger branch networks are also present in several settlements in the eastern region. In Figure 2. I tend to illustrate the number of cooperative credit institution branches with different names per settlements, thus we can compare it with the number of bank affiliates.

Figure 2.: Number of different cooperative credit institution branches per settlements (2017)



(own compilation on data driven from cooperative credit institutions websites)

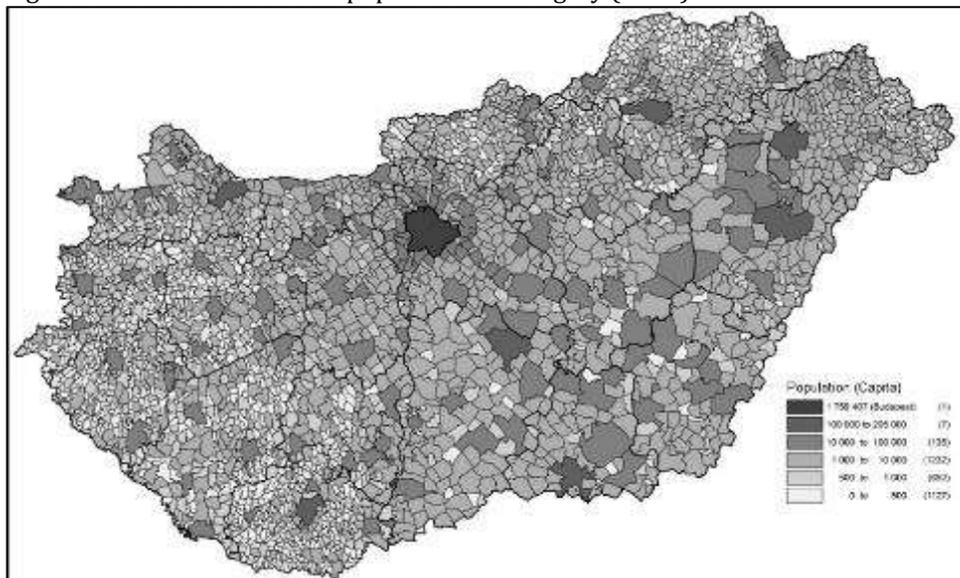
When interpreting the figures of the map, we should also take into account the fact that in 2013 the market penetration ratio of cooperative credit institutions in Hungary was merely 4-6% (Gál 2013), which I assume has not changed

considerably up to the present moment, yet in contrast to this fact, the size of the geographic area covered by their branch network is really enormous. The reasons for this disproportionateness may vary, separately operating cooperative credit institution branches which are present almost in one county thus they cannot provide a nationwide, single network penetration similar to the banks' networks. The significance of the capital and of the county towns is really striking, nevertheless the number of those settlements with only 1-2 operating cooperative credit institution branches is even higher, and thus their volatility must be rather symbolic. The difference of cooperative credit institution branch numbers on the East-West axis is also noteworthy, which may have a similar explanation to that of the banks and partly may be the consequence of the industrial and agricultural development projects prior to the political system change,

Supporting the data of the two previous figures, I'd like to present the Figure 3. illustrating the number of resident population of our country as of the latest 2015 survey, based on the data of the Central Bureau of Statistics (KSH) distribution per settlements.

The population distribution supports my assumption namely that its penetration on the western region of our country is much lower, partly due to the tiny village structure areas in that region. Examining the Western and South-TransDanubian region it is striking the great penetration of small and tiny rural settlements with 500 and 200 or even less population consequently, obviously the infrastructural build-up of the region is greatly affected by this condition. The analyzed financial institutions in the western region – particularly the banks – considered as their primary target to win over the potential customers from these areas rather than focusing on their local branch operations. Therefore, the relationship between the number of financial institution branches and the number of population proves to be deterministic, also supported by the revealed distinctions between the discussed branch number alterations on the east-west axis.

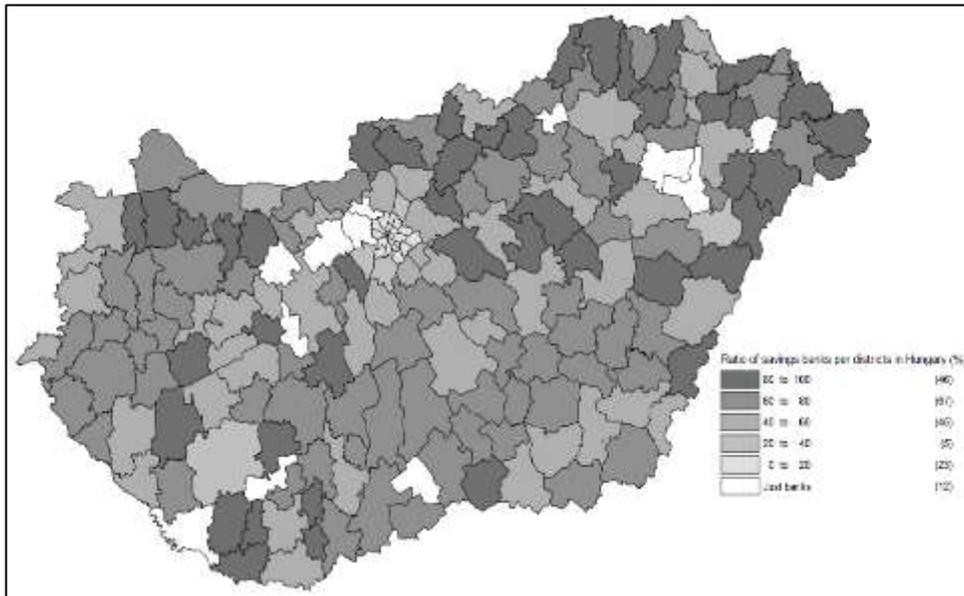
Figure 3.: Number of resident population in Hungary (2015)



(own compilation based on KSH website data)

After discussing the settlements level issues, let's have a look at the figures of the sub-regional districts in Hungary, where compiling my analysis I have taken into account the total number of financial institution branches. In figure 4. we can see the total number of cooperative credit institution branches in a district within the ratio of all the financial institutions examined in the area. Along my analysis I have taken into consideration the latest 2014 advancement, development ranking order of social and financial profiles of districts made by the Economy and Business Enterprise Research Institute of the Hungarian Chamber of Commerce and Industry. The research ranks the districts from 1 to 5 according to a 25 indicator-scale (HCCI IEER 2016).

Figure 4.: Ratio of cooperative credit institutions per districts in Hungary (2017)



(own compilation based on data from cooperative credit institutions and banks websites)

Having a closer look at the map, we can realize that 12 districts do not possess any cooperative credit institution branches only bank affiliates, while from these districts only 1 can be ranked into the 25 most developed districts based on the above-mentioned ranking scale. Four are listed among the 25 most advanced districts, and the remaining 7 are positioned in the mid-ranking field of districts. The map also suggests that, nevertheless even banks are willing to show up with branches in underdeveloped regions, too, to fill the market gap. Based upon the cooperative credit institution branches I need to emphasize the Northern-Hungarian and the Northern-Great Plain region, since their presence seem to be very significant in these regions. The two regions together with Southern Great Plain and Southern-TransDanubian regions, based on the statistic indices of the EUROSTAT 2015 GDP/capita²³⁶ accounts are supposed to be listed among the most under-developed and under-performing regions of the EU. Consequently, we can note that the cooperative credit institution network is typically present in the more under-developed regions. This revelation also makes us assume that the territorial economic development of the regions have not been transformed or restructured in our country, so far.

CONCLUSIONS

From the research findings we can assert that neither the commercial banks nor the cooperative credit institutions plan to open new branches, thus the branch-opening factors can be disregarded from this vantage point. Branch mergers and rationalization are meant to be those processes which do call need certain social, economic factors to be taken into account. Banks are featured by more profit-oriented traits contrary to the cooperative credit institutions operational style, which do share more locally embedded presence because they tend to operate and maintain their branches with margin-profitability rate. Due to the branch mergers, the cooperative credit institutions are facing tough challenging decisions to be made in the future concerning the allocation of regional financial centers (hubs) and partly on selecting the branches to be merged without problems. This process must necessarily involve the closure of certain branches with repositioning or laying off the present workforce, so these factors all must be taken into account by the management.

The future, likely national merger into the Takarékbank may have significant positive effects considering the profitability rate of the institutions. They could assume and benefit from the single network of non-competitive cooperating branches – similar to the efficient networks of banks –with significant amount of capital and effective institutional system. However, I would also highlight on the fact that the inspiring idea of this ambitious merger of the cooperative credit institution is basically historically missing from the set of thoughts from their part, not mentioning the really challenging, extremely time and energy-consuming task of transforming their business cultures.

The continuous advancement of the digital world and of globalization make some researchers consider the ensuing ‘death of geography’, since enormous transnational corporations may operate worldwide benefitting from this trend. (Morgan 2001) In my opinion, the financial institutions may launch the full access of impersonal digital financial services for their customers, although people will change their habits in this respect in quite a long time. Stemming from their personality traits trust and physical presence plays an important role for many customers when making decisions in this matter. My position is also supported by Graham and Morgan in this respect claiming that due to the high level of information carried by non-verbal communication tools the digital info-communication measures will not supplement personal appearance for the time being (Graham 1998, Morgan 2001).

Trust is particularly important factor both for the financial institutions and their clients – especially the corporate ones – since both parties share outstanding economic interests and cooperation in the background. For the inter-operating business parties the well-developed informational technological architecture is meant to be of key importance, and from

²³⁶<http://ec.europa.eu/eurostat/documents/2995521/7962764/1-30032017-AP-EN.pdf/4e9c09e5-c743-41a5-afc8-eb4aa89913f6> (downloaded on: May 08, 2017)

this respect I assume the bigger cities are in much more advantageous situation than the smaller settlements. Therefore, I consider the geographic space, physical location and territory will keep their significance even in new forms, yet these still tend to be important factors for the financial institutions as well as for their clients. Concerning the digitalization coverage and opportunities there are enormous regional differences in our country. Consequently, the banks and cooperative credit institutions when discuss their rationalization processes and branch mergers they must take this factor into account, as well. The applications and options offered by the digital world are getting ground and more importance for the customers, yet the total depersonalization of the financial services is not a current issue for the time being.

REFERENCES

- Boschma, R. (2005): Proximity and Innovation: A Critical Assessment. *Regional Studies* (39) 1, 61-74.
- Castells, M. (1996): *The Rise of the Network Society*. Oxford: Blackwell.
- Dow, S. (1994): European monetary integration and distribution of credit availability. In: Corbridge, Stuart et al. (Eds.): *Money, Power and Space*. Oxford: Basil Blackwell.
- Friedman, L. Thomas (2005): *The World is Flat: A Brief History of the Twenty-first Century*. Picador, New York.
- Gál, Z. (2010): Pénzügyi piacok a globális térben – A válság szabdalta pénzügyi tér. Akadémiai Kiadó, Budapest.
- Gál, Z. (2014): Geographical Aspects of Financial Markets: Front-Lines and Research Fields of Financial Geography. *Geographical Review* (138) 3, 181-196.
- Gál, Z. et al. (2013): A vidék bankjai? A magyar takarékszövetkezeti szektor hitelezési aktivitása. *Közgazdasági szemle* (60) 4, 373-401.
- Graham, S. (1998): The end of geography or the explosion of place? Conceptualizing space, place and information technology. *Progress in Human Geography* (22) 2, 165-185.
- Haggett, P. (2006): *Geográfia – Globális szintézis*. Typotex Kiadó, Budapest.
- HCCI IEER (2016): *Developing and lagging districts – 2012-2014: Socio-economic profiles of Hungarian districts (járás) based on the District Development Index*. HCCI IEER – Institute for Economic and Enterprise Research Hungarian Chamber of Commerce and Industry, Budapest.
- Kiss Gy. Kálmán (2009): A „vidék bankja” megteremtésének dilemmái Magyarországon. *Financial and Economic Review* (8) 6, 496-515.
- Kohn, M. (1998): *Bank- és pénzügyek, pénzügyi piacok*. Osiris Kiadó, Nemzetközi Bankárképző. Budapest.
- Lengyel, I. (2010): Gaining space' of Regional Science: Real Chance or False Illusion? *Space and Society* (24) 3, 11-40.
- Lengyel, I. et al. (2004): *Regionális gazdaságtan*. Dialóg Campus Kiadó, Budapest-Pécs.
- Moizs, A. et al. (2012): A szövetkezeti hitelintézetek története, jelenlegi rendszere és sajátosságai Magyarországon. *Financial and Economic Review* (11) 1, 67-85.
- Morgan, K. (2001): The exaggerated death of geography: localised learning, innovation and uneven development. The Future of Innovation Studies Conference, The Eindhoven Centre for Innovation Studies, Eindhoven University of Technology. pp. 33.

1600 LOCATION BASED AGRICULTURAL PRODUCTS AND ECONOMIC CHALLENGES: A CASE STUDY OF BHALIA WHEAT IN GUJARAT

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1 INTRODUCTION

Gujarat is one of the developed states of India but agriculture has been the major source of labor absorption with 70.5 per cent of the workers being rural based of which 52 per cent of the workers are cultivators and agricultural labourers (Swain *et.al*, 2012). Out of total geographical area of 196 lakh hectares, 99.66 lakh hectares is under net cultivable area which is 50 per cent of total geographical area. Total gross cropped area is about 122.11 lakh hectares of which total gross irrigated area is 56.14 lakhs hectares which is accounted for 45.97 per cent of total crop area. In the irrigated areas, cropping intensity is high (GoI, 2016).

Total operational land holders in the state are 48.86 lakh, who possess the cultivable land with an average of 2.03 hectares per land holders. Out of total land holders, 37.16 per cent are marginal farmers, 29.25 per cent are small farmers, 22.10 per cent are Semi-medium farmers, 10.49 per cent are medium farmers while only 1.00 per cent of farmers own large lands (Gujarat 2015). Agriculture in Gujarat is characterized by natural disparities such as (i) drought prone areas and lowest annual rainfall amounting to only about 345 mm at the North West end of the states; and assured and highest annual rainfall amounting to about 2500 mm at the South-East end; (ii) well drained deep fertile soils of central Gujarat and shallow and undulating soils with poor fertility in hilly rocky areas in the east; (iii) moisture starved degraded areas and low lying waterlogged and saline areas; (iv) areas prone to frequent scarcity and areas prone to frequent cyclone or floods or locusts hectares (Swain *et.al*, 2012).

Major agricultural products of the state include cotton, sugarcane, castor, ground nut, mustard etc. Gujarat is also known for its largest share in the production and productivity of cumin seeds, fennel and *isabgul* production in the country. However, the relative share of agriculture and allied sectors to both gross and net state domestic product has been declining significantly. Share of agriculture to Gross State Domestic Product (GSDP) (at current prices) which was at 19.8 per cent in 2010-11 has declined to 14.25 per cent in 2015-16. Gujarat, Goa, Kerala, Maharashtra, Sikkim, Uttarakhand, and Tamil Nadu are the few states where the contribution of agriculture to SDP has been less than 15 per cent (GoI, 2016).

The study report of The Agro-Economic Research Centre (AERC), observes that the share of area under cotton and wheat have been increasing in the past two decades. Particularly the area under wheat production accounts for 11.9 per cent of the total gross cropped area (Swain *et.al*, 2012). This paper focuses on wheat that is cultivated in rainfed saline areas known as Bhal region. The wheat cultivated here is very unique and has been appropriately registered with the Geographical Indications (GI) registry by the name Bhalia wheat in 2009-10. GI registration is conferred on those products which demonstrate a very strong link with the region where they are cultivated. This link could be the soil or water or any natural resources or climatic factor or the human skills that gives the uniqueness to the product either in the production or in the processing. Such location based goods are known for their uniqueness and have consumers who look for such uniqueness and are willing to pay a premium price for such unique products registered with GI. This paper looks into the economic challenges in the production of Bhalia wheat. In doing so this paper is organised in to the following sections. Section 2 following this introduction provides a discussion on GI products and their advantages. Section 3 and its sub sections discuss the case of Bhalia wheat. Section 4 presents the likely future scenario of Bhalia wheat, followed by Conclusion.

2. LOCATION BASED GOODS

Location based goods are also known as place goods like Darjeeling tea, Banarasi sari, Guntur Chili, Gir Kesar mango and other products. Since the (Trade-Related Aspects of Intellectual Property Rights) TRIPS Agreement, such place goods have been protected legally through appropriate framework. While the European nations protect with Appellation of Origin, some of the Asian countries have developed a sui-generis system of protection. Another choice exercised by a few countries is to use the Trade Mark or the certification mark route. There has been no separate legislation in India until the Geographical Indications of Goods (Registration and Protection Act), 1999 (GI Act) which came in to practice in 2003. Prior to this, GIs were governed by common law principles, which enabled the aggrieved person to file an action of 'passing off' for protection of his right. The sui-generis system provides protection to agriculture, handicrafts, natural and manufactured goods. It is important to note that agricultural products account for the highest proportion (33 per cent) of the total registered GIs in the country. As of March 2018, 320 products were protected with GI Registry, which includes the logo and products from foreign countries. Out of this, 28 per cent were agricultural/ horticultural products.

2.1. Advantages of Location Based Goods

The advantages of location based products registered with GI is that they help the producers to stand apart in a crowded market place of similar goods and enables the producer to make economic returns based on the uniqueness. Hence, GI registration provides the information and authenticates for the quality of the product and its origin.

The economic rationale for GIs is the correction of a market failure caused by an asymmetric information between sellers and buyers, where if the buyers are uncertain that the quality of product A is better than that of product B, buyers will not be willing to pay a higher price for product A. GI institutionalizes the reputation of a product, where due to information asymmetries free riding on reputation of a product happens. Thus it acts both as a consumer and a producer protection measure (Cerkia *et al.*, 2011) and has the potential to improve rural livelihoods emanating from local resources. Consumers revert to the making of repeat purchases, developing a strong sense of brand loyalty and also are willing to pay a premium for reputation. In response, producers adopt strategies for creating reputation in their products.

Cerkia *et al.* (2011) notes that in the context of European Union (EU) where more than 70 per cent of all registered GIs in the EU are linked with economically lagging regions and therefore, GIs are likely to support rural development in regions that are in most need of it. Lagging regions that focus on superior quality goods authenticated by geographical origin and traceability could be linked with the regional and national markets (Librey and Kneafsay, 1998). Librey and Kneafsay (1998) point out that after the 1990 Food Safety Act by the UK, emphasis on standards of production and traceability have become important aspects for the consumers and the producers. A GI certified product with the strong emphasis on the use of 'quality and local' resources in the making of the product, can reach a specific and sustainable market, which rewards with a premium price and recognition. Thus, the objectives of GI and rural development converge in realising the market potential of local resources through sustainable use. Moreover, the major concern of policy makers across the world today, is to mitigate out-migration from rural to urban areas especially distress migration and production and marketing of 'rural cultural distinction' has become a catchword in local development strategies (Coombe, 2005).

By enabling communities to continue producing their traditional products instead of finding alternative means for survival outside their traditional activities, GIs contribute to the preservation of cultural heritage. This factor, strengthens regional identity and again reinforces the inter linkages in support of rural development.

Sylvander (2004) cautions that the institutionalization of the resource origin does not *per se* set the conditions for development. Instead, he argues that it depends on how this process is developed and on the effectiveness of the valorisation strategies built upon it. These strategies could be defining production methods and area, quality standards, implementation, authentication and traceability enforced by institutions owned by the stakeholders themselves or external agencies (Hayes *et al.*, 2003; Soam and Sastry, 2008). In the EU and Latin American context, GI products have been linked to the rural development strategies and this has resulted in: (a) strengthening the producer associations who have filed the GI applications; (b) specific standards for production of the GI product that are strictly followed by all the identified authorized users; and (c) setting up quality councils that certify the products resulting in a highly distinguished premium market for the GI products. Depending on the rightful beneficiaries who develop or market the product and the relative reputation of the product (local, national, international), the need and efficacy of the protection is determined (Folkesson, 2005). In other words, creation of value, based on these regional identities are dependent on the ability of producers to coordinate the production process (capacity to form an association and implementing standards of production), strengthening vertical linkages and fostering trust through institutional mechanism (Lalitha, 2014; Vinayan, 2012; Rich, 2011; Bowen, 2010).

Reviron *et al.* (2009, p.12) positions GIs in the Maslow pyramid in the following way: with promise of origin, the immaterial component of the products increase and consumers move up the Maslow pyramid with "their hedonistic (taste), food safety (quality control), belonging (link with a territory and a social identity), beauty (aesthetic landscapes)" characteristics. As consumers' demand increase, self-actualization needs are also fulfilled through critique of mass production of food, concerns over environmental degradation leading to willingness to pay premium prices for such products. Thus, registration for GI with active labeling for origin coupled with other characteristics of the products can be a powerful marketing tool.

There are successful evidences from European countries, where GI for agricultural products originated. Champagne is a celebrated example from France, Columbian Coffee is an example from the developing country. Kintamani Bali coffee from Indonesia is another example. It is in this context of the advantages of the locational based goods, which have the potential to get higher returns based on their locational identity authenticated by GI registration, this paper is exploring the possibility whether Bhalia wheat protected by GI could reap such advantages.

3. BHALIA WHEAT IN THE STUDY AREA

The study on 'Bhalia wheat' is part of a larger study on GI registered agricultural products supported by the Indian Council of Social Science Research, New Delhi. The study area is in the 'bhal region' of Gujarat, also known as 'bhal area/ belt/ tract' which is located around the gulf of Khambhat. The 'bhal region' is only one of its kinds in the world, renowned for cultivating a unique variety of wheat known for its nutritional values. This tract is spread across six administrative districts in the state. The districts are Ahmedabad, Anand, Bharuch, Bhavnagar, Kheda and Surendranagar. 'Bhalia Wheat' or *GW-1* (an improved variety of durum wheat) is unique variety of its kind. The features of the grain are bold, very hard and vitreous (GoI, 2010).

3.1. The Study Area

The study area comprises of two districts viz. Ahmedabad and Surendranagar. The rationale behind the selection of these two districts was that they ranked higher in producing 'unirrigated wheat' (Table 1). Among the list of six districts falling under bhal region for the years 2010-11, 2011-12 and 2012-13. These years were taken into consideration for choosing the districts as this was the latest data available with the Directorate of Agriculture, Gujarat State. (Table 1).

Table 1: Averages of area, production and yield for unirrigated Wheat for the years 2010-11, 2011-12 and 2012-13 by districts in Gujarat

S.No.	District	Area*	Production#	Yield+
1.	Ahmedabad	544	428	786
2.	Anand	41	32	782
3.	Bharuch	40	20	488
4.	Bhavnagar	0	0	0
5.	Kheda	1	1	1000
6.	Surendranagar	67	77	1155

Source: Directorate of Agriculture, Gujarat State (2015 p.14)

Keys: *=in 00 Ha.; #=in 00 Metric Tonn; +=in Kg/Ha.

3.2. Objective and Methodology

The broad objective of the study was to look into a case of bhalia wheat cultivators to understand whether the GI registration of this location good would help in improving their economic returns. The discussion in this paper is based on the information drawn from the focus group discussions (FGDs) conducted in the 12 villages spread across the two districts of Ahmedabad and Surendranagar. The data is further supplemented by in-depth discussions and interviews with various stakeholders involved in Bhalia wheat production, distribution and technical support providers (like the Agriculture University staff including scientists based at Anand and Arnej Research Centre of Anand Agricultural University, Anand, Gujarat, mill owners, traders, retailers, Agricultural Produce Market Committee (APMC) Staff and the officials of Agriculture and Panchayat Departments respectively at village, taluka and district level in the state. Only those villages which were cultivating wheat entirely on unirrigated conditions were chosen for the study. The participants were selected randomly and all the participants were male farmers.

Table 2: Land Profile of the Farmers Participated in the FGD

S.No.	Name of the District	Name of the Taluk	Name of the Village	Total No. of Farmers Present in the FGD	Combined Land Holding	Land used for Bhalia Cultivation	Range-Yield per Ha.	Per cent of Land Share Cultivated for Bhalia
1.	Ahmedabad	Dhandhuka	Pachcham	8	NA	324	5-6	NA
2.	Ahmedabad	Dhandhuka	Fedra	5	NA	32	1.6-2	NA
3.	Ahmedabad	Dhandhuka	Rayka	7	111	75	2-2.4	67.7
4.	Ahmedabad	Dholera	Khamiyala	8	88	61	2.4-3	68.8
5.	Ahmedabad	Dholera	Gamph	17	472	272	1.6-2	87.5
6.	Ahmedabad	Dholka	Moti Boru	9	60	42	2.4-3	69.2
7.	Ahmedabad	Dholka	Nani Boru	8	32	30	2.4-3	94.9
8.	Ahmedabad	Dholka	Samani	8	31	31	1.6-1.8	100.0
9.	Surendranagar	Limdi	Devpara	8	72	35	1-1.2	48.3
10.	Surendranagar	Limdi	Jansali	8	229	132	1.2-1.4	58.6
11.	Surendranagar	Limdi	Ballol	8	110	15	0.8-1.2	13.4
12.	Surendranagar	Limdi	Ghanshyampar (Karsangarh)	7	47	37	1-1.6	78.9

Note: All Lands in Hectares; Yield=in Quintals; NA=Not Available

Source: Field Survey, GIDR, March-April 2018.

3.3. Discussion

Among the 12 villages studied, eight villages fall under the administrative jurisdiction of Ahmedabad, while the other four belong to Surendranagar. Ahmedabad happens to be the major producer of Bhalia wheat both in terms of area and production. The main occupation of the people in the selected villages revolves around agriculture. Majority of land less people in the villages were agriculture labourers. However, there were about 10 per cent of the village population in the selected villages were artisans and others who were involved in non-farming activity or work in the pharmaceutical factories surrounding areas of Ahmedabad.

It is evident from Table 2 that in the chosen villages, out of the total land, 68 per cent of the land has been allocated for Bhalia wheat cultivation. The average yield for the FGD participants ranged between 1.65 on the lower side and 2.32 on the higher side. In contrast, the National level productivity of wheat is 2872 kg per hectare in 2014-15 (Government of India 2016). While this shows that the productivity is very low compared to the national average, even in comparison with the other varieties of wheat known as tukadi and sharbadi, which yield in the range of 10-13 quintals, Bhalia wheat yield is very low.

If the members present in the FGDs is taken as representation of the respective villages visited for the study, except for Ballol and Devpara villages, Bhalia wheat appears to be the most preferred crop by the farmers in the remaining 10 villages. The reason for this is not only lack of irrigation facility but also the characteristics of soil in the bhal tract. According to staff at Research Centre, Arnej, Anand Agricultural University (AAU) the bhal region is characterised by soil (top) that is medium to heavy black. In some of the areas the land is reddish or 'goralu' as local call it. This layer is about 1 to 1.5 meter deep and it can hold the water for about 6-7 months. The next layer of the soil is yellowish soil that is hard and then it is sand at the depth of 400-500 meters. This layer is highly saline as a result of minerals deposited over the years. The water is extremely saline and it cannot be used for drinking or agricultural purpose. Contrarily, if it is used,

the soil is bound for damage. The region also faces very erratic rainfall. This becomes a challenge for cultivation, hence the farmer has to depend only on rain water for his cultivation. Given such conditions, they don't see any alternative other than traditional Bhalia wheat.

However, there is also an acknowledgement by some section of farmers in the FGD to the fact that the preference for Bhalia wheat is gradually coming down since last decade for the reason that the famous bhal region in low land areas is now gradually receiving Narmada River through canals. Besides, every village has their own ponds (the government encourages the villages to maintain them by regularly de-silting them). All this is encouraging the traditional Bhalia wheat cultivators to move to other crops that fetch them lucrative prices. Besides, they get to grow those crops more than once in a year, leading to higher cropping intensity. In case of Bhalia wheat, it can be grown only once. This is again determined by how the monsoon has been in that particular year. Inroads made by irrigation have already lured away traditional Bhalia growing villages from following traditional method of cultivation. This has boosted the income as it provides them better yield. Tukdi 49 (a local variety of wheat) is the popular choice as alternative to Bhalia. This variety fetches them a yield of 12-14 quintals as compared to Bhalia's 0.1-0.15 quintals. The price for tukadi is Rs.1500 per quintal, while Bhalia wheat gets them a price of Rs. 3500-4000 per quintal.

The other crops grown in the region other than Bhalia are Chana (gram), Suvadana (Dill Seeds) and Indigenous Cotton (characterised by short staple). Gram yields Rs. 6000 per quintal and Suvadna yields between Rs.3500 to 4500 respectively. It is important to mention that, these crops are cultivated in only those villages where condition suits them. The special condition required for cultivating these crops is determined by the monsoon, irrigation facility and soil type. As narrated by the farmers, if the soil is slightly less black and less clay like, they by default cultivate chana. If the soil of their land happens to be black and clay like, then every farmer sows cotton in such land (majority of bhal region is comprised of this) in the beginning of the monsoon. However, if the monsoon remains moderate then the cotton automatically grows and farmers continue with it. If the monsoon is good then the cotton saplings gets submerged in the water and decay as in the saline areas, the water takes a long time to dry up. With no alternative left, the farmers sows Bhalia variety.

Challenges in Production, Storage and Value Chain

Explaining the production method and process, the farmers narrated how the land preparation begins by building a bund of 45-60 cms. height around the field. The first few days of rain water is collected and drained after a couple of days to wash off the top layer salinity. After this the rain water is collected and allowed to remain in the field by blocking the outlets. This helps in storing the water to increase moisture retaining capacity and decrease salinity. After three months, the water is drained. Here it may be noted that there has to be a good social cohesion among the producers as cooperation is required among the farmers to let go the drained water to reach a village pond. If there is no cooperation the water cannot be drained and the land will not be suitable for sowing the seeds. After draining the water, the land is left to dry for about 10 days. After this, the farmers using their traditional knowledge check the moisture content and the sowing takes place. It is important to mention that, not all villages follow this kind of practice. In fact, in most of the villages, the monsoon water evaporates on its own, so there is no need to follow such exercise rigorously.

Nevertheless, sowing of Bhalia wheat takes place either in the last week of October or in the first week or second week of November. To be precise, November 15 is the date, majority of the farmers' sow the Bhalia seeds, some of the farmers find this date auspicious, while some see scientific reason and ancestor's wisdom in suggesting this date. But if we look at it from the climate point of view, winter sets in properly at this point of time and it is conducive for the wheat crop cultivation.

The seeds that are used for sowing have to be preserved/ conserved in a moisture free condition. Farmers are required to change the seeds once in four years. Some of the farmers follow this practice while some farmers do not heed to the advice of the university and go on repeating the same seeds which results in lower yield. While sowing, heavy seed-drill or automatic seed drill fixed to tractor is used. The sowing has to be done in even and at uniform depth i.e. 75 cms deep at a space gap of 30 cms between two. For healthy growth, manure in organic form is used. Intercropping is normally followed while cultivating Bhalia wheat. This is with safflower in 3:1 row proportion²³⁷. If requirement of seeds for sowing is calculated, the average requirement amounts to 25 kgs per acre. The variation in the spacing of between the seeds determines the actual volume. The farmers cultivating Bhalia by treating one time irrigation usually applies urea along with the water.

The most common pest that destroys Bhalia in its initial stage of growth is grass hopper. This pest is predominantly found around Dhandhuka taluka. Other disease that affects Bhalia crop is what locally known as '*sukharo*', meaning drying up. This affects the root of the crop and the plant does not bear the grain and this found to happen in different parts of the same field. According to the farmers, nearly 2 per cent of the crop is lost to this disease all the time. '*Tidla*' is another disease, this disease happens within 15 days of sowing, wherein, in this condition, the crop is destroyed and this requires re-ploughing in the affected area for sowing the seeds afresh. Bhalia crop needs minimum follow-up as it does not require fertilising the field often or the use of any pesticides. Bhalia fields does require to maintain watch on the crop that is growing in the field to not only shoo away the stray animals like cows, wild boars but also the *chakli* (sparrows). According to the farmers, these birds destroy good amount of harvest that is still on plant if ignored. These birds not only

²³⁷ However, mixed cultivation is not practiced in every village, this is common only in the Dhandhuka region.

eat away a bulk of grains, they destroy the budding crops too. Due to sentiment value, the farmers do not use any chemicals to kill them even if they number around 200 in one drove.

The average yield is normally 8-10 quintals per acre when it had rained adequately and the farmers have changed the seeds every four years, otherwise the yield is less as reported in Table 2. Further, around January if the climate is cloudy for number of days or more often, then grain formation is less²³⁸ affecting the yield. Finally, the grains are stored after thoroughly drying. Grains with only 10 percent moisture qualify for storing which are done in pits, bins and moisture proof godowns.

Harvesting and Storage

The harvesting time begins after four months (in February-March). The Bhalia growers have to be contended with only one crop in a season. The harvesting is done either manually or with harvesting machines. If done with harvester, the grain is expected to lose a bit of shine. However, many farmers prefer it due to shortage of labour. Those not preferring harvester do it in traditional way which is known as '*uppani*'.

Storage is vital in the case of Bhalia wheat, explaining about the importance of preserving the product, the farmers and traders alike pointed to the fact that the shelf life of the grains is very poor. According to them, the wheat gets spoiled within one month if not properly stored. The wheat grains cannot be preserved with castor oil application, the normal practice followed in the state for other food grains as the flour tastes bitter. The big mill owners procure wheat directly from the farmers from their fields, and then they sort at their mills using high technology machines purchased from Japan and Korea known for its accuracy. Thereafter, from there on the grains are moved to cold storages.

The farmers in Limdi region who are affected regularly by flooding of water during monsoon prefer to harvest manually for two reasons: First they use the crop residue known as '*bhusa*' (hay/ Straws) as fodder for their cattle, and secondly the crop residue is also used for storing the harvested crop in a unique way. The farmers choose the elevated area in their house and prepare a makeshift pit and fill it up with the hay to a minimum height of one feet, then the wheat laced with the *neem* leaves is securely sealed in plastic bags. Then these bags are placed in the pit and insulated again with the hay covering it entirely. This is a fool proof practice being followed by them to keep away the moisture and dampness affecting the wheat to preserve it from decaying.

Challenges of Markets: Price Determinants: Marketing Channels, Prices in the last couple of years

Price

According to a Secretary of Grain Merchant Association, Ahmedabad it is economics that determine the choice of farmers and consumers alike. It is so because, consumers get Tukdi wheat (common brand) for just Rs. 2000 per quintal. But, for Bhalia one has to shell out Rs. 4000 per quintal. Price of Bhalia wheat is higher than Tukdi, though in terms of yield, 'Tukdi' yields much higher than Bhalia wheat. Another big trader in the market thought that, Bhalia wheat trade constitutes only one per cent of entire wheat trading in Ahmedabad. The views expressed by various stakeholders' only points to the fact that, there are committed consumers of the product in and around the Bhal producing region and beyond. Yet the production appears to be coming down. It is evident that, the availability of irrigation has prompted the farmers to opt for other crops and at the same time the Bhalia wheat yield per acre of land is too less. According to officials of Directorate of Agriculture at all three levels of taluka, district and state, this is natural tendency of the farmers, as they will always be interested in increasing their yield. And to attain the objective, the irrigation is vital; hence all the farmers demand irrigation for their agriculture. The point, the officials try to make is that, if at all, the uniqueness of Bhalia variety is at stake, it makes little difference to them.

Market

The Bhalia wheat farmers have choice of selling their produce to the following: 1) directly to the consumers, 2) traders, 3) mill owners and 4) APMC. Except for the last category, all the buyers purchase the product from the door steps of the farmers. For the traders and mill owners, Bhalia wheat is a one month business material. In the opinion of all the stakeholders, the market for Bhalia wheat is very unpredictable. The prices in the market are determined by the market forces. So, if there is a lot of supply and the demand is low then the prices fall and if the demand rises up and supply is stable then the prices shot up. According to a leading mill owner, presently the prices (in 2018) could reach all time low from Rs. 45-47 kg to Rs. 22-27 kg.

The superior quality of Bhalia wheat attracts huge demand. Majority of traders purchase directly from the farmers known for cultivating the crop traditionally. In fact, there are a very few farmers producing such quality of Bhalia wheat. Major market for Bhalia wheat is found in Ahmedabad, Bhavnagar, Baroda, Surat, Anand and Nadiad and Mumbai. The traders from these cities buy directly from the farmers. Arrangement to sell the produce at doorsteps saves the farmers time and money. With telephone network making inroads, some of the farmers are able to make good use of the technology, firstly, they use phone facility to find out the price at different places or even at APMCs, most of the farmers have the regular purchasers who contact the farmers when they require the commodity or as and when demand arises. The farmers leave the sample of their product with them. Since the price is negotiated on phone, the farmers do not incur much loss. Some of the enterprising farmers in Moti Boru have tried their luck successfully by taking the stock in their mini vans and trucks all the way to Surat and were able to sale at retail price within a week's time. It was also reported in the newspapers that

²³⁸ Reported by farmers in Koth village.

farmers instead of selling at a lower auction price at APMC, farmers in the Khambhat area took the grains in mini trucks and carts and sold it directly to the consumers at their door steps²³⁹.

There is also an online market for Bhalia wheat. An Ahmedabad based online business firm started dealing in organic farming products in 2015. Bhalia wheat is one of their products. On receiving orders, the product is sent to the consumers. The packaging and transporting costs are borne by the customers. According to its proprietor, the people residing in faraway places like Bangalore, Delhi and Mumbai place order with them for Bhalia wheat. More often, the extra cost of transportation is almost equal to the value of the product they are purchasing. The current price of Bhalia wheat through this source is Rs. 60/- per kg. It was Rs. 50/- per Kg last year.

According to the experts of Agriculture University, Anand, Bhalia wheat has very good potential for be recognised as organic. They also highlight to the fact that, Bhalia fits in ideally for national market since the timing of its harvest is unique (between February and March) and does not exports because it requires minimum fertilizers and pesticides so it fulfils the essentials required to run parallel to other famous brands produced in Punjab, Haryana, Utter Pradesh or Madhya Pradesh (between May and June) when it comes out in market and can get a higher price. But the yield is relatively less than the Tukdi wheat.

When the scientists at Krishi Vigyan Kendra, Arnej were asked about the value chain or the scope for by-products of Bhalia wheat, they pointed out that, Bhalia wheat could be used in baking industry. Therefore the baking industry should be established in these regions benefiting both the consumers and farmers. Further, a big retail trader in Ahmedabad was of the opinion that Bhalia flour will not be commercially beneficial unless it is sold with its own brand, but given the poor awareness level (uniqueness characteristics of the wheat) of the consumers, this is not possible. He thought that, it is not commercially beneficial also because; Bhalia wheat flour absorbs 10 times more addends while making the dough. The addends could be ghee, water, oil, or any other bakery related ingredients.

Functioning of APMCs: Farmers Experience

Visiting APMCs which are 30 Kms in distance on an average from the Bhalia producing villages does not guarantee the farmers an assured and desired price for their product. According to farmers in Pachham, the trading associations and form an informal cartel to set the price for the product for a particular season. Hence, they are discouraged to visit APMCs. Only marginal and small farmers sell their product for the poor price because by March end they would be desperate to have hard cash in hand to fulfil their domestic obligations or to repay the loans. A farmer, who is also a trader, however does not approve about this allegation as he feels this is not practically possible because there are so many traders at the auction, and not all of them could be united to carry out such manipulation, this paves a way for some other traders quoting a higher price. But during the trading season in February- March 2018, the price range in the APMCs of Bhavla ranged from Rs.320 to 400. Nearly 90 per cent of the farmers got price in this range and the remaining got more than Rs. 400. While some farmers decided to offload their harvest at the price quoted by the traders, some of the farmers did not sell their product and took it back with them which is a huge cost for the farmers. However, other issues like lack of storage facility in the villages to bank on to wait until they get a good price determine the farmers to choose the traders wishing to collect their produce from their fields.

4. FUTURE OF BHALIA WHEAT

The scientists at Agriculture University, Anand agreed that the Narmada canal has changed the scenario of agriculture in Gujarat as 60 per cent of the land has been converted into irrigated land which earlier was rain fed. They observed that, volume of Bhalia wheat grown entirely on rain water in the region has decreased a lot. However, the farmers explained that irrigating the land consecutively for more than three years will decrease the quality of soil to such an extent that soil becomes useless for agriculture in the subsequent season, hence, they have to discontinue using irrigation after a couple of years. When asked how they know about this, the farmers explained that, they have observed the experience of their neighbouring villagers where Narmada water through canal has already reached, so they could come to conclusion that to preserve the quality of their farm land, they have to follow the traditional techniques.

On prospects of retaining traditional method of Bhalia wheat cultivation, the farmers sounded optimistic of doing well in future if government intervenes. They expect the government to come up with the incentives to the farmers in the form of extending better prices than other crops grown in the region. This is not only for maintaining the organic qualities of the land that are required for growing Bhalia but also for cultivating the crop the way it has to be. This would provide a much needed assurance to the farmers to stick to its cultivation even if their region starts receiving irrigation facility. This was reflected in vociferous contention that was common among all the stakeholders.

When asked about specific support, the government can provide to Bhalia farmers, a farmer in Gamph expects the government to intervene and set up a special board for Bhalia wheat. The objectives of the Board should be to include buying the stock directly from the farmers by paying a suitable price. If quality strictures are laid and price is assured, he sees no reason for the farmers to cheat on the method of production instead they would stick to the traditional variety and traditional form of cultivation. He suggested above measure in the wake of irrigation reaching them. Besides, a common demand coming from all the farmers involved in Bhalia wheat cultivation was construction of warehouses in each village or gram panchayat. According to the scientists at Krishi Vigyan Kendra, Arnej, promoting contract farming and establishing co-operatives will act as encouragement to the farmers to continue with Bhalia cultivation.

²³⁹ Reported in Sandesh on 7th April. 2018.

Minimum Support Price (MSP) is another important area that requires an urgent look-in from the government according to a mill owner based in Khambat. It is because; least respect is shown for following MSP during auction while buying not only Bhalia wheat but other agriculture products too. The traders offer prices below MSP on the pretext of lower quality of the grain. Hence, he recommends, the Food Corporation of India (FCI) to intervene and buy the entire stock when the prices go below MSP. In reality, one cannot find the representatives from the corporation when auctions are in the process. However, the official at District Agriculture Office in Ahmedabad was of the opinion that, MSP concept does not work for sustaining the endangered variety of crops like Bhalia wheat.

On insurance, none of the farmers spoken to were not highly impressed with the present mechanism as the insurance process and premium is decided by the banks, that too when loans are taken through them, hence, they want government to come up with sound policy. One farmer thought, the insurance on the lines of 'life insurance policy' would help farmers in improving their economic lives and provides much needed psychological security.

An interesting theory was presented by a taluka official of agriculture office on the future of Bhalia, his observation was that, the variety of Bhalia may not remain same over a period of time because there is strong chance of it getting pollinated because lot of other variety is grown around in the region, he doesn't see this problem affecting kesar mango because the area exclusively grows same variety in the region. Besides, in case of mango, the tree remains useful for 15-20 years.

Future of Agriculture

A farmer with good educational background in one of the FGDs opined that, if the government does not come up with special policy to address farmer's concerns like availing better prices for all the products, the agriculture sector could go down to an unprecedented low. He was not interested particularly with Bhalia wheat and it being registered as GI, he was concerned about the plight of farmers in general and feared that, very soon the members in the villages will move to the cities leaving agriculture activity altogether. He finds it difficult to carry on with farming given the poor market price, labour problem and interestingly society per se becoming indifferent towards looking at the farmers in terms of social status. Many examples are recorded during the FGD where farmers have given account of how their brethren's are abandoning agriculture for assured jobs that they get in the pharmaceutical companies that have come up nearby Ahmedabad. It is different issue that the salaries they get are meagre. Some of the bigger farmers especially belonging to Patel community are said to have selling good chunk of their land to buy flats in Ahmedabad to see their children educated in good schools and colleges so as to prepare them for better life than theirs as farmers.

Geographical Indication (GI)

When the farmers in the FGDs and the local agriculture officials in the villages visited for the study alike were enquired about GI, not a single respondent among them acknowledged to have heard about it before us introducing about it. It appeared that neither Agriculture University nor agriculture department have ever apprised about GI to the farmers in the Bhalia growing belt. The top most retailer in Ahmedabad too was found to be totally unaware of GI. On explaining its importance, he opined that, farmers go only by price factor and it determines their choice of crop they would cultivate. The owner of the online dealer in organic products had learnt about GI very recently when they exhibited Bhalia wheat along with other organic products they sell at a University in Ahmedabad.

However, more than half of the respondents were aware of organic farming and use of its logo. When the staffs working at Research Centre, Arnej were queried about GI, they agreed they have knowledge about it to the extent that, application process was underway, but it was surprising to learn from them that, they had no idea about its registry which had happened long back in 2009 itself. However, they opined that until the government comes up with wide publicity to create awareness among the masses, the benefits of GI will not reach the farmers and consumers alike. They pointed to lack of authority and institutional set-up devoted exclusively for its implementation. On asking, which department would be ideal to take GI implementation effectively, they thought Gujarat Agro Industries Corporation Limited (GAIC) as the nodal agency, should take initiatives for implementation of the GI. They are the agency at the state level which can take all the required responsibilities viz. organizing training programs, creating farmer's associations, overseeing code of practices and marketing. A senior scientist at the office of Directorate of Agriculture was hopeful of GI recognition helping the Bhalia farmers in the future if awareness is effectively created extensively including consumers. Spreading awareness will also increase the market and the continuous demand for the unique wheat will incentivise the farmers to continue cultivation. If adequate measures are not taken, the area will reduce drastically as only farmers who want this wheat for their self-consumption would cultivate it.

5. CONCLUSION

The results of the study illustrates that the production of Bhalia wheat is unique because it is grown exclusively on rain fed water. The 'bhal region' is only one of its kinds in the World, renowned for its uniqueness including its nutritional values. There are committed consumers of the product in and around the bhal producing region. However, the production of Bhalia wheat is gradually coming down since last decade for the reason that the famous bhal region is now receiving irrigation facility as canal water is slowly reaching the area. This is encouraging the traditional bhal wheat cultivators to move to other crops that fetch them lucrative prices. Besides, they get to grow those crops more than once in a year. In case of Bhalia wheat, it can be grown only once. This is again determined by how the monsoon has been in that particular year. Yet, the traditional Bhalia wheat cultivators are optimistic of doing well in future if government intervenes. They expect the government to come up with the incentives for the farmers in the form of extending better prices than other crops grown in the region. This is not only for maintaining the organic qualities of the land that are required for growing

Bhalia but also for cultivating the crop the way it has to be. This would provide a much needed assurance to the farmers to stick to its cultivation even if their region starts receiving irrigation facility. Besides, GI supporting institutions needs to be set-up strategically to help the farmers to promote a sense of regional pride and identity about the product and also to enhance a wide market for the product. It could be done by setting up a separate arena for Bhalia wheat at APMCs and facilitate them with all the required support to market their produce by using the GI logo and boost the marketability of Bhalia wheat. For this to happen on ground, the active and collective efforts of the farmers is equally important. Towards achieving this goal, they can form an organisation of their own which will give them the bargaining power to determine the price for their product. GAIC too can play its role in achieving common as a party for having GI registry in its name. All this exercise will ultimately boost the local economy by attracting the local populace to involve in the value chain of the product.

REFERENCES

- Bowen Sarah (2010), "Development from Within? The Potential for Geographical Indications in the Global South", *The Journal of World Intellectual Property*, Vol.13, No.2, pp 231-252.
- Cerkia Bramley, Estelle Bienabe and Johann Kirsten, (2011) *The Economics of Geographical Indications: Towards a Conceptual Framework for Geographical Indication research in Developing Countries*, in *The Economics of Intellectual Property*. http://www.wipo.int/export/sites/www/ip-development/en/economics/pdf/wo_1012_e.pdf#page=121, accessed April 20, 2014.
- Coombe, Rosemary J (2005) "Legal Claims to Culture in and Against the Market: Neoliberalism and the Global Proliferation of Meaningful Difference", *Law, Culture and the Humanities*, 1 (35): 35-52.
- Directorate of Agriculture, Gujarat State (2015) '*District-wise Area, Production and Yield of Important Food and Non-food Crops in Gujarat State - Year: 2010-11, 2011-12 and 2012-13*', Gandhinagar, website accessed on 30 April, 2018, <https://dag.gujarat.gov.in/images/directorofagriculture/pdf/10-11-12-13-reports.pdf>.
- Folkesson, Carina (2005) *Geographical Indications and Rural Development in EU*, Lund: University of Lund <http://lup.lub.lu.se/luur/download?func=downloadFile&recordId=1334511&fileId=1647280> accessed on July 7, 2014.
- Government of India (GoI) (2010) '*Geographical Indication Registry*', Intellectual Property office, Chennai, <http://www.ipindia.nic.in/registered-gis.htm>
- Government of Gujarat (GoG) 2015 "Report of Taskforce to Derive Suggestions to Increase Agricultural Development in Gujarat." Directorate of Agriculture and Cooperation, Gandhinagar, 32.
- Government of India (GoI) 2016 "State of Indian Agriculture 2015-16." Department of Agriculture, Cooperation and Farmers welfare, Ministry of Agriculture and Farmers Welfare, 280.
- Hayes J Dermot, Sergio H. Lence, and Andrea Stoppa (2003) *Farmer-Owned Brands?*, *Briefing Paper 02-BP 39*, March (Revised), Center for Agricultural and Rural Development, Iowa State University, Ames, Iowa 50011-1070, www.card.iastate.edu
- Lalitha, N (2014) *Socio-economic implications of protecting handicrafts through geographical indications - A Case Study of Selected Products from Southern States*, Report submitted to Indian Council of Social Science Research, New Delhi.
- Libery Brian and Moya Kneafsey (1998): *Product and Place: Promoting Quality Products and Services in the Lagging Rural Regions of the European Union*, *European Urban and Regional Studies*, 5:329.
- Reviron S, Thevenod-Mottet E and EL Benni N (2009) 'Geographical indications: creation and distribution of economic value in developing countries', NCCR Working Paper no 14.
- Rich Karl (2011): *Trajectories of Value Chain Governance and Geographical Indications: Issues for Upgrading Handicrafts Goods in India*, CUTS CITEE Working Paper No1/2011.
- Soam S K and Sastry, Kalpana (2008): *Socio-Economic Implications of GI Registration for Agricultural and Non-Agricultural Commodities/Products in India*, National Academy of Agricultural Research Management, Hyderabad.
- Swain, Mrutyunjay, S S Kalamkar, and Kalpana M Kapadia. 2015 "State of Gujarat Agriculture 2011-12, AERC Report 146." Agro Economic Research Centre, Sardar Patel University, Vallabh Vidyanagar, 50.
- Sylvander, Bertil (2004) 'Development of Origin Labelled Products: Humanity, Innovation and Sustainability', Dolphins, WP7 Report, January (Available at http://www.origin-food.org/pdf/wp7/dol_d8.pdf accessed on April 20, 2014).
- Vinayan, Soumya (2012) 'Intellectual Property Rights and Handloom Sector: Challenges in Implementation of Geographical Indications Act', *Journal of Intellectual Property Rights*, 17(1): 55-63.

1615 MEASURING THE CONNECTION BETWEEN CITIES' AND COMPANIES' COMPETITIVENESS - A HUNGARIAN CASE STUDY

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ABSTRACT

The main goal of the study is to examine the connection between corporate and territorial competitiveness. Despite the competitiveness of companies and competitiveness of cities are widely investigated topics, the common aspects of them are less researched area. The current study is a small part of a bigger research project and focuses only on economic competitiveness, the connection between location and financial performance and the concentration of companies by labour and revenue. In the literature review, we take the main research directions of companies' and cities competitiveness. Most of the studies distinguish competitiveness into territorial (country, region, city) and economic (industry, corporate) levels. The starting point for corporate competitiveness research can be several, as detailed in the relevant literature chapter: management, financial, export-import, industrial level and company level approach. Territorial competitiveness is strongly connected to the model of territorial capital (Camagni 2008). Territorial competitiveness studies usually do not dispute the role of individual companies in the region, complex indexes and studies often have a separate economic (or even enterprise) dimension. In our study, we distinguished many approaches to spatial aspects of companies' research. A possible grouping criterion is the starting-point, the distribution according to the subject of the test (orientation). These research can be started from companies or a given area unit. The first main group (the starting point for companies) examines the location of companies. Another main group of orientation researches starts from the unit of territory, examines companies in the given region, sector or size category. The empirical part of the study focuses on Hungarian regional centres (eight cities) and investigates how the companies performance effects on their territorial competitiveness. Examining the spatial aspects of companies' competitiveness and the companies' role in urban success is important not only for the Hungarian level but also for international researchers due to the methodology. Using city level and company level data in order to analyse the connection between company performance and spatial location is a new aspect of our empirical research. The paper investigates the financial performance of companies, how it affects the competitiveness of the city and examines if the profitability has spatial patterns. Indexes of financial position, liquidity, profitability and performance (for example ROA, ROE, financial ratios) were calculated from company-level data. City level data were stood for describing the education dimensions of the labour market, demography, infrastructural and natural environment and the economic system. The research investigated the concentration of significant companies in given cities by revenue and labour and findings are displayed by Lorenz-curves. We distinguished two groups of them: one dominant company, which provides most of the employment and revenue and 5-6 dominant companies. Overall, there is a large inequality in companies' revenue and employment in all cities, the differences in revenues are more significant. In two cities the revenue and employment concentrate to one-one large automotive company (Audi and Mercedes) which determines the economy of the region and city. Findings indicate the obvious connection between companies' and cities' competitiveness but is hard to measure. In addition, we have analysed the effect of multinational manufacturing companies on the regional centres' economy.

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1 THE CONNECTION BETWEEN CORPORATE AND URBAN COMPETITIVENESS

1.1 Territorial competitiveness and territorial capital

Territorial competitiveness researches (at regional or city level) and the concept of territorial capital have a lot in common. Both topics investigates economic, social and environmental dimensions with complex indexes. The theory of competitiveness and the model of territorial capital based on regional growth and regional resources, but the territorial capital integrates the elements into a theoretical concept which involves not only classical capital and resources (for example labour or capital) but also immaterial assets too. The following dimensions are most often used for investigating competitiveness and territorial capital:

- economic
- environmental
- infrastructural
- cultural
- connections
- innovation
- social
- demographic

Regional competitiveness depends on developing immaterial resources, in particular, knowledge transfer. (Camagni 2009) Giffinger and Hamedinger (2009) associated the concept of territorial capital with the competitiveness of large cities and described how could be this concept the key element of competitiveness of metropolitan areas and regional cohesion. They determined the urban competitiveness not only with economic indicators, they extended it with the quality of life and socio-cultural dimensions. They highlighted that the most important competitive advantage based on creating immaterial assets like cooperation between economic actors. (Giffinger – Hamedinger, 2009)

It is often hard to distinguish territorial competitiveness and territorial capital. The differences beyond definitions are initial, the territorial capital is the sum of potentials of the given regions, while competitiveness is the ability for utilizing those potentials. Furthermore, territorial capital emphasizes immaterial assets, primarily social capital and relations, cooperation and innovations. The territorial competitiveness researches focus often on economic dimensions.

1.2 Competitiveness of cities

By measuring urban competitiveness, it is necessary to take into consideration the hierarchy of cities and the city-network, because only cities at the same level could be compared and ranked, for example, global cities, large cities, regional centres, small towns. The economic success of given cities can contribute to national competitiveness too. (Begg 1999.) The literature is extensive in urban competitiveness, there are studies determining competitiveness of cities in general (Kresl 1995, Jensen-Butler 1997, Kresl - Singh 1999, Lever 1999), while other studies focuses on cities of given region, for example developing Chinese cities (Shen, 2004, So - Shen 2004, Yu et. al. 2005) or industrial American metropolises (Markusen – Schrock 2006).

Kres (1995) determined six key elements of urban competitiveness: highly qualified labour, high wages, sustainability in operations, manufacturing attractive goods, economic growth, specialization and enhancing the position of city hierarchy. Urban competitiveness divides into two main components: economic (manufacturing and infrastructure) and strategic (policies, institutions).

The competitiveness of cities based on their rank in the national or international hierarchy, the infrastructure (transport and utilities), efficiency of government, the volume of R&D, the education system and human resources. (Jensen – Butler 1997)

The definition of urban competitiveness is more than national competitiveness (because of the inequalities and differences within countries) or corporate competitiveness (because multinational companies locate their operations to most cost-efficient sites). The competitiveness of cities can be measured by following indicators (Kresl – Singh 1999):

- enhancing the volume of retail: the indicator of growing population and wages
- the growth of added value by companies: investments, increase of employment, developing infrastructure
- increasing number of financial service providers

According to Lever (1999) the goals of urban competitiveness are investments, economic growth, increasing population, get subsidizations or permission for organizing events.

1.3 Competitiveness of companies

The studies of companies competitiveness are divided into four main topics:

- management aspects (company strategy, marketing, market share, culture)
- financial aspects (corporate finances indexes, profitability rates)
- export-import aspects
- industrial studies

The current study focuses on financial aspects of companies competitiveness.

According to Ballantine et. al (1988) companies compete in order to enhance profitability. Neoclassical economics determines that companies want to maximize their profit in a competitive environment. The profit or loss means the performance in competition for companies. There is a relationship between company size and profitability. Ballantine et. al (1988) measured the profitability with Return on equity (Roe) and Return on Sales (ROS) indexes in two different approaches:

- between industries: profitability and sales revenue correlate with the industrial correlation (or dominance of a large company).
- within industries: company size correlate with profit or loss

Chowdhury and Chowdhury (2010) investigated the effect of capital structure on companies' value in Bangladesh between 1996 and 2003. Their data based on financial reports, the dependent variable was the rate of shares, independent variables were company size, profitability, owners' structure, efficiency, growth rate and liquidity.

Grabowska (2014) investigated the added value and competitive ranking by corporations using the sales revenue, added value and rate of capital. Jasiniak and Pastusiak (2014) measured the effect of owners' structure on profitability. Katits and Szalka (2014) investigated the Hungarian TOP 100 companies' profitability, growing paths and effectiveness using profitability rates, profit and cash analyses, liquidity and other financial ratios of statements.

1.4. The companies approach of territorial competitiveness

The two different topics, territorial competitiveness and companies' competitiveness have a common section. Territorial – corporate literature can be distinguished, in one hand there are studies based on companies and investigate the spatial patterns of them, in the other hand, other studies are based on spatial units (national, regional or city level) and describe the characteristics of them by companies' performance. (Poreisz 2017)

Holl (2014) investigated the connection between location, accessibility and performance of Spanish companies. The study used spatial data (population, population density, infrastructure) and company level data from financial reports. The research found a significant correlation between companies' performance and spatial characteristics (for example transport accessibility). The market performance was correlated stronger to companies' efficiency than population data.

Floros et.al (2014) investigated the differences in economic performance of companies in Greece using company level data (size, export) and regional and industry level data.

Ketelhöhn and Quintanilla (2012) investigated the country effect on company performance by Central-American countries. The basis of their research was the resource-based theory, that the company performance is defined by the variety of resource. They used ROA (Return on Assets) for measuring profitability and found significant differences in companies performance between countries.

Kottaridi and Lioukas (2011) researched the location of companies in the approach of financial and corporate strategic approach with the following four group of indicators:

- corporate strategy: technology, functions (operation, marketing), relational capital
- corporate finances: liquidity, the ratio of debts, growth, profitability, export
- regional characteristics: R&D, higher education, regional GDP
- control variables: company size, industry

They found a significant correlation between regional characteristics, corporate relations and location (metropolitan region or periphery). Furthermore, empirical data indicated that strategy, financial strategy and growth rate effects also on location.

Stavropoulos and Skuras (2015) investigated 15 EU countries' 410 company in order to describe the effect of the location, the region on the company performance. Data were based on profitability indexes and employment data in 2005. Profitability was measured by indexes of ROA, profit, EBIT (earnings before interest and taxes), liquidity and solvency indexes, total assets, current assets, and the age and size of a company. The study ascertained that regional differences do not explain significantly the companies' performance. They concluded that regional characteristics do not or partly explain the companies' performance, furthermore, the regional industrial specialization was found as low impact determinant.

With regard to the subject of the research, it can be distinguished two main group of territorial – corporate studies (Poreisz 2017):

- Investigating the effect of the location (Kipnis 1982, Taylor 1993, O'Farrell – Hitchens – Moffat 1993, Bagchi-sen, – Macpherson 1999, Carlin et. al. 2001, Geishecker – Görg – Taglioni 2009, Mion - Naticchioni 2013)
- Measuring industry concentration, productivity and competitiveness (Costa-Campi – Viladecans-Marsal 1999, Hernandez-Sancho et. al. 2012, Taegeun – Kabsung – Hyejin 2012, Drucker 2011, Ducker – Feser 2012)

The used methods can be divided into two main groups: Descriptive statistics and relationship analysis (mainly when examining the impact of the location) as well as multivariable statistical analysis methods such as factor analysis or regression model. The most commonly used indicators are (Poreisz 2017):

- corporate operating data: site, size of the company, the number of employees, industry
- corporate financial data: revenue, wage costs, export sales, tangible assets/wage /operating income
- corporate strategy data: innovation, international relations, market strategy, R&D, export
- regional data: R&D, GDP, employment, unemployment, population density, industry concentration.

2. DATABASE AND METHODOLOGY

The main research question of the study was that how the location effects on the company performance. We investigated eight Hungarian large cities (regional centres) between 2010 – 2013.

The database consists of regional level data and company level data based on financial reports. Company level data were provided by Opten Kft. In the current study, we investigated the characteristics by revenue, employment, industrial concentration and performance of companies with more than 50 employees in the 8 cities in 2013.

Concentration in employment and revenue were measured by Lorenz – curve. The method is traditionally used for measuring the distribution of income or wealth but it is adaptable for measuring inequalities and concentration in other areas. The methodology indicates the ranking of the values (employment, revenue) and producing the cumulative relative percentage of the investigated values. The graphical representation (a square) of the cumulative percentage of employment/revenue (vertical axis) by cumulative percentage of companies (horizontal axis) shows the inequalities.

The diagonal of the square represents the total equality, and the curves below the diagonal indicate the degree of concentration.

Table 1: The number of companies over 50 employees in database

	2010	2011	2012	2013
<i>Debrecen</i>	131	134	136	136
<i>Szeged</i>	89	98	92	85
<i>Miskolc</i>	73	78	86	76
<i>Pécs</i>	80	70	68	64
<i>Győr</i>	106	121	123	117
<i>Nyíregyháza</i>	71	72	73	70
<i>Kecskemét</i>	75	75	79	78
<i>Székesfehérvár</i>	77	82	85	86

Source: own calculation, data: Opten

The connection between corporate profitability and location was measured by Variance-analysis. We researched the differences between cities by corporate performance, profitability, efficiency and finances and calculated for the four years of investigated period 2010 – 2013. Independent variable was the location, dependent variables were the financial indexes. Variance-analysis is a multidimensional method for investigating the differences between the means of independent variables. The calculated financial indexes were the followings:

- Amount of total assets and capital
- The ratio of export revenue
- Debts/equity ratio, the growth of capital, provision of fix assets
- Liquidity rates, debts ratio
- Profitability rates: ROS, ROE, ROA
- Added value, wage efficiency, assets efficiency, capital efficiency

3. EMPIRICAL FINDINGS

3.1. Measuring of concentration

We illustrated the Lorenz – curves for the investigated eight cities and distinguished two groups of them:

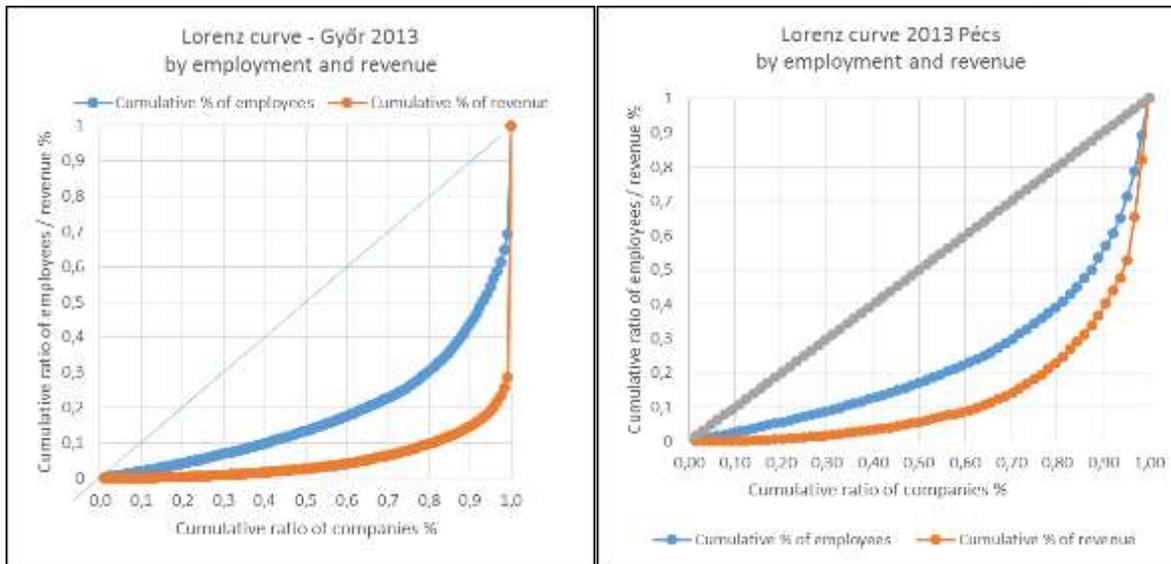
- cities with one dominant company, which provides most of the employment and revenue: Győr, Kecskemét (these cities have significant automotive industry)
- cities with 5-6 dominant companies.

Overall, there is a large inequality in companies' revenue and employment in all cities, the differences in revenues are more significant.

In Győr and Kecskemét the revenue and employment concentrate to one-one large automotive company (Audi and Mercedes) which determines the economy of the region and city. In Győr, Audi provides the 70% of total income and 30% of total employment. The half of the other, small companies give barely 5% of total revenue and 10% of employment. The 80% of companies give 10% of the total revenues and 30% of employment. This shows, how strongly concentrated the industry of Győr is. The structure of the companies in Kecskemét is similar to Győr, it is dominated by one automotive company, Mercedes, which gives the 60% of total revenue and 20% of employment. But in this city more than 80% of companies provide the 60% of employment, the dispersion of companies in the upper two deciles is favourable. Nyíregyháza has fewer inequalities by the upper 20% of companies, the half of the revenue is produced by the 5-6 company, but the 60% of total employment provides one large company.

The Lorenz – curves of the other cities with 5-6 dominant companies are similar to each other by revenue and employment too. The inequalities are higher by revenue in all cities. Only Szeged differs from the others, because concentration by employment is significantly lower, even so, it is extremely high by revenue. The industrial structure with smaller, mainly agricultural or food industry and energy industry companies explain the differences. (Figure 1)

Figure 1: Lorenz – curves of cities with one dominant company and 5-6 large companies



Source: own calculation, data: Opten Kft.

3.2. Variance – analysis

Data were most of the cases not applicable for Variance – analysis (the significance level of Levene statistics were lower than the expectable 0,05). By the cases, where the Levene statistics were acceptable, we found a significant connection with location and in 2010 for ROA and in 2012 for ROS. We can say that company location affected accidentally on companies' profitability on the investigated database.

4. CONCLUSION

The first part of the study reviewed the relevant literature of territorial competitiveness, the territorial capital, companies' competitiveness and the urban competitiveness. We focused on the common segment of them and described the most relevant studies on the topic of territorial and corporate competitiveness. Theoretically, it is proofed, that there is a connection between the companies' location and performance due to the territorial capital elements (immaterial assets like relations) and the vice-versa effect of companies and their region.

In the empirical part, we investigated the characteristics of Hungarian regional centres by economic competitiveness through the concentration of companies' employment and revenue. We distinguished two different groups of cities, one of them has a dominant company which rules the economic sphere of the city, the other group of cities have 5-6 large, significant companies. The cities with one dominant company are Győr and Kecskemét, the locations of two large multinational automotive company (Audi, Mercedes).

We investigated the correlation between company location and financial performance with Variance-analysis. We can say that the researched level of cities does not show significant differences by the financial performance of their companies. We can conclude that the Hungarian companies located in Hungarian regional centres are similar to each other by their profitability, liquidity and efficiency. Further researches are indicated, it is necessary to investigate, how the companies performance differ by automotive and non-automotive industry regions.

LITERATURE

- Bagchi-sen, S. – Macpherson, A. D. (1999): Competitive Characteristics of Small and Medium-sized Manufacturing Firms in the US and Canada. *Growth and Change*. Vol. 30. pp. 315-336.
- Ballantine, J. W. – Cleveland, F. W. – Koeller, C. T. (1988): Corporate Profitability and Competitive Circumstances. *Eastern Economic Journal*. Vol. 14. / 1. pp. 7-18.
- Begg, I. (1999): Cities and Competitiveness. *Urban Studies*. 36. 5-6. pp. 795 – 809.
- Camagni, R. (2008): Regional competitiveness: towards a concept of territorial capital. In Capello, R. – Camagni, R. – Chizzolini, B. – Fratesi U. (eds): *Modelling regional scenarios for the enlarged Europe*. Springer-Verlag, Berlin, pp. 33-47.
- Camagni, R. (2009): Territorial capital and regional development. Capello, R.–Nijkamp, P. (eds) *Handbook of regional growth and development theories*. Edward Elgar, Cheltenham. pp. 118-132. o.
- Carlin, W. – Fries, S. – Schaffer, M. – Seabright, P. (2001): *Competition and Enterprise Performance in Transition Economies: Evidence from a Cross-Country Survey*. European Bank for Reconstruction and Development,
- Chowdhury, A. – Chowdhury, S. P. (2010): Impact of capital structure on firms' value: Evidcence from Bangladesh. *Business and Economic Horizons*. 3 pp. 111-122.
- Costa-Campi, T. M. – Viladecans-Marsal, E. (1999): The District Effect and the Competitiveness of Manufacturing in Local Productive Systems. *Urban Studies*, Vol 36/12. pp. 2085-2098.
- Drucker, J. (2011): Regional Industrial Structure Concentration in the United States: Trends and Implications. *Economic Geography*. Vol 87./4. pp. 421-452.
- Drucker, J. – Feser, E. (2012): Regional Industrial Structure and Agglomeration Economies: An Analysis of Productivity in Three Manufacturing Industries. *Regional Science and Urban Economics*. Vol. 42. pp. 1-14.
- Floros, C. – Voulgaris, Z. – Lemonakis, C. (2014): Regional firm performance: the case of Greece. International Conference on Applied Economics (ICOAE) 2014. *Procedia Economics and Finance* 14 (2014). pp. 210-219.

- Giffinger, R. – Hamedinger, A. (2009): Metropolitan competitiveness reconsidered: the role of territorial capital and metropolitan governance. *Terra Spectra* XX. 2009/1. pp 3-12.
- Geishecker, I. – Görg, H. – Taglioni, D. (2009): Characterising Euro Area Multinationals. *The World Economy*. pp. 49-96.
- Grabowska, M. (2014): Economic value added and competitive position of enterprises: Case research. *Business and Economic Horizons*. 10/3. pp. 165-176.
- Hernandez-Sancho, F. – Soler-Marco, V. – Sala-Garrido, R. – Almenar-Llongo, V. (2012): Productive Efficiency and Territorial Externalities in Small and Medium-Sized Industrial Firms: A Dynamic Analysis of the District Effect. *Growth and Change*. Vol 43. / 2. pp. 179-197.
- Holl, A. (2014): Location, accessibility and firm-level productivity. In: Condeco-Melhorado A. – Guriérrez, J. – Reggiani, A. (eds): *Accessibility and Spatial Interaction*. Edward Elgar Nectar Series
- Jasiniak, M. – Pastusiak, R. (2014): The profitability of foreign and domestic enterprises in Poland. *Business and Economic Horizons*. 10/2. pp. 86-93.
- Jensen-Butler, C. (1997): Competition between cities, urban performance and the role of urban policy: a theoretical framework. In: Jensen-Butler, C. – Shachar, A. – Weesep, J. (szerk.): *European Cities in Competition*, pp. 3-42, Aldershot, Avebury
- Katits E. – Szalka É. (2014): A magyar top 100 növekedési újtai, avagy a „turnaround” értékvezérelt menedzseléssel. In: Tompos A. – Ablonczyné Mihályka L. (eds.): *„A tudomány és a gyakorlat találkozása” Kautz Gyula Emlékkonferencia 2014*. június 17. elektronikus formában megjelenő kötete. 20. tanulmány
- Ketelhöhn, N. W. – Quintanilla, C. (2012): Country effects on profitability: A multi-level approach using a sample of Central American firms. *Journal of Business Research*. 65. pp. 1767-1772.
- Kipnis, B. A. (1984): Plant Size and Urban Growth. *Urban Studies*. Vol. 21. pp. 53 – 61.
- Kottaridi, C. – Lioukas, S. (2011): Firm location: firm competences, financial structure and regional determinants. *Review of Urban & Regional Development Studies*. Vol 23. No. 1. pp. 1-20.
- Kresl, P. (1995): The determinants of urban competitiveness. In: Kresl, P. – Gappert, G. (szerk). *North American Cities and the Global Economy: Challenges and Opportunities*, pp. 45-68., London, Sage Publications
- Kresl, P. – Singh, Balwant (1999): Competitiveness and the Urban Economy: Twenty-four Large US Metropolitan Areas. *Urban Studies*, Vol. 36/5-6. pp. 1017-1027.
- Lever, W. F. (1999): Competitive Cities in Europe. *Urban Studies*. 36. 5-6. pp. 1029-1044.
- Markusen, A. – Schrock, G. (2006): The Distinctive City: Divergent Patterns in Growth, Hierarchy and Specialization. *Urban Studies*, Vol 43/8. pp. 1301-1323.
- Mion, G. – Naticchioni, P. (2013): The spatial sorting and matching of skills and firms. *Canadian Journal of Economics*. Vol 42 / 1. pp. 28-55.
- O'Farrell, P. N. – Hitchens, D. M – Moffat, L. A. R. (1993): The Competitiveness of Business Services and Regional Development: Evidence from Scotland and the South East of England. *Urban Studies*, Vol . 30. / 10. pp. 1629-1652.
- Poreisz V. (2017): Competitiveness of cities and performance of companies in case of Hungarian regional centers. *International Journal of Arts and Sciences*. 10/1. pp. 399-416.
- Shen, J. (2004): Urban competitiveness and urban governance in the globalizing word, *Asian Geographer*, 23. / 1-2. pp. 19-36.
- So, M. – Shen, J. (2004): Measuring urban competitiveness in China, *Asian Geographer*, 23./1-2. pp. 71-91.
- Taegun, B. – Kabsung, K. – Hyein, Ch. (2012): Comparative Analysis of the Total Factor Productivity of Manufacturing in Northeastern Asian Metropolitan Areas. *Growth and Change*. Vol. 43/1. pp. 167-177.
- Taylor, J. (1993): An Analysis of the Factors Determining the Geographical Distribution of Japanese Manufacturing Investment in the UK, 1984-91. *Urban Studies*. Vol. 30 / 7. pp. 1209-1224.
- Yu, T. – Gu, Ch. – Chen, X. (2005): External sources of urban competitiveness advantage in China. *Chinese Geographical Science*, Vol 15/2. pp. 95-102.

1735 FOREIGN DIRECT INVESTMENT AND INDUSTRIAL AGGLOMERATION: EVIDENCE FROM INDIA

ABSTRACT

Unevenness in the geographical distribution of economic activity is a persistent feature of all economies. The subject matter of economic geography since its inception tried to explain this unevenness. Differences in natural endowments and labour pool, scale economies are often cited by the previous studies to explain agglomeration of economic activity. More recently Foreign Direct Investment (FDI) is considered as a plausible factor to explain the concentration of industries (Ge, 2009; Gao, 2002; Zhang et al, 2014). It is evident from the empirical works that the unevenness persistent in the geographical distribution of economic activity is also observed in the distribution of Foreign Direct Investment (Guimaraes et al, 2000; Chung

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RS06.5. Location of Economic Activity

1550 FOREST ACCOUNTING REGIONAL SUSTAINABILITY

Parashram Jakappa Patil, Debasis Patnaik

ABSTRACT

Forest accounting is having direct input to ecological ecosystem sustainability in various way such as (1) reducing loss of biodiversity. (2) Mitigate inflated economic production figures. (3) Enable value chain and supply chain accounting starting with net forest produce. (4) Enable Gross National Happiness –GNH calculation that is dependent on forest living and environmental standards. (5) Enable balanced economic growth keeping future economic concerns. (6) Enable balance in regional economic diversity. (7) Safeguard biodiversity (both plant and animal). (8) Assess tradeoff between agriculture and environment preservation exercises (9) assess nature of food safety networks based on area specific nutrition availability and bring economic measures for balanced nutrition in regions. (10) Cause rational international economic and diplomacy dialogues based on hard data. (11) Measure economic sustainability. However, following are the specific objectives of present research work: The present study is explorative study on sustainability through developing forest accounting system. Essential data has been collected to find out present nexus.

Key Word: Forest Accounting, Forest Ecosystem Services, Bio- Economics.

INTRODUCTION

Global concern about forest degradation and depletion is related to two main problems i.e. destruction of the carbon sinks affecting the global climate and extinction of species affecting the biodiversity.

STATEMENT OF THE PROBLEM

Forest accounting has dimension having various ecological classification and its invisible services of an ecosystem which is not valued in economic terms. Hence it is very difficult to establish scientific forest accounting system. Segregation and understanding of each forest accounting component are inevitable. Making an analysis of forest accounting cycle would provide a better understanding of forest accounting. Forest accounting is having direct input to ecological ecosystem sustainability in various way such as (1) reducing loss of biodiversity. (2) Mitigate inflated economic production figures. (3) Enable value chain and supply chain accounting starting with net forest produce. (4) Enable Gross National Happiness –GNH calculation that is dependent on forest living and environmental standards. (5) Enable balanced economic growth keeping future economic concerns. (6) Enable balance in regional economic diversity. (7) Safeguard biodiversity (both plant and animal). (8) Assess tradeoff between agriculture and environment preservation exercises (9) assess nature of food safety networks based on area specific nutrition availability and bring economic measures for balanced nutrition in regions. (10) Cause rational international economic and diplomacy dialogues based on hard data. (11) Measure economic sustainability. It has potential of regional sustainability which need to be assess scientifically.

REVIEW OF LITERATURE

Jianguo, Liu (2013) in his study explain the telecoupling process in chine's forest and its implication on forest sustainability. **Knut H. Alfsen (1993)** in his study he has been analyzed structure of natural resources accounting of Norway. **Elsa Varela and Jose Miguel Barrios (2014)** they have studied framework of forest accounts, general structure of forest accounts and assets flow accounts. **William N. Mkanta (2002)** in his research he has made valuation of non-marketed forest products.

OBJECTIVES OF THE STUDY

The specific objectives of the study are as follows;

1. To explore relationship between forest accounting and sustainability.
2. To develop theoretical modeling of sustainability and
3. To study case study of forest asset and regional sustainability.

PREPOSITION

1. Forest resources has potential to make regional sustainability.

RESEARCH METHODOLOGY

The present study is a theoretical analysis of various components of forest accounting. It has been done an extensive review of literature for making an analysis of a forest accounting system. Also, it has been taken into consideration of various concepts related to forest economics. It has examined earlier studies on forest accounting in order to explore various aspects of it, supports to understand inter-linkages between various factors while making a theoretical analysis of forest accounting and regional sustainability. Present study is based on secondary sources of data it has collected from various sources. The present research is a case study of one of the forest rich districts in India i.e. Kolhapur district forest. This district is situated in Western Ghaat which is one of the mega biodiversity hubs in the world.

ECOLOGICAL ANALYSIS OF FOREST ACCOUNTING

The value of the forest depends on its ecological characteristics and therefore, while making forest accounting ecological classification is significant. The Ecological land classification is a cartographical delineation or regionalization of

distinct ecological areas, identified by their geology, topography, soils, vegetation, climate conditions, living species, habitats, water resources, and sometimes also anthropic factors. However Forest Ecology is the scientific study of the interrelated patterns, processes, flora. Fauna and ecosystems in forests. The management of forests is known as forestry, silviculture, and forest management. A forest ecosystem is a natural woodland unit consisting of all plants, animals and micro-organisms (Biotic components) in that area functioning together with all of the non-living physical (abiotic) factors of the environment. The forest ecosystem is very important. Following is the forest ecological classification of Kolhapur district.

Trees: It has been in existence for 370 million years. In botany, a tree is a perennial plant with an elongated stem, or trunk, supporting branches and leaves in most species. In some usages, the definition of a tree may be narrower, including only woody plants with secondary growth, plants that are used as lumber or plants above a specified height. Trees are not a taxonomic group, but include a variety of plant species that have independently evolved a woody trunk and branches as a way to tower above other plants to compete for sunlight. In looser senses, the tall palms, the tree ferns, bananas and bamboos are also trees. Trees tend to be long-lived, some reaching several thousand years old.

Table 1 Trees in Kolhapur district

Sr. No.	Local Name	Botanical Name
	Ain/Sadada	Terminalia tomentosa
	Alu	Vangueria spinosa
	Amba	Mangifera indica
	Ambada	Spondias mangifera
	Amberi	Nothopegia colebrookiana
	Ambat	Embelia basaal
	Anjani	edule
	Apta	Bauhinia racemosa
	Asana, Katak	Bridelia retusa
	Awala/Aonla	Emblica officinalis
	Arjun	Terminalia arjuna
	Akash neem	Millingtonia hortensis
	Bartondi	Morinda tinctoria
	Bakul	Mimusops elengi
	Bel	Aegle marmelos
	Bhendi	Thespesia populnea
	Bherli Mad	Caryota urens
	Bhokar	Cordia myxa
	Bhoma	Glochidion lanceolarium
	Bibla/Bija	Petrocarpus supium
	Biba/Bilva	Semecarpus anacardium
	Bibi/Ran/biba	Holigarna grahamii
	Bor	Zizyphus jujube
	Bulgi	Vitex altissima
	Babhul	Acacia Arabica

Source: Forest Department of Kolhapur District.

The table 1 shows that the Kolhapur district is reached by diversified trees at large number. There are various kinds of trees are available in forests in Kolhapur district. It increases prospects of forests. Therefore, it is important to protect them. Species of the tress are influenced forest monetary value that become basis for the forest accounting.

Shrubs: A shrub is an important component of forests. It is a small to medium-sized woody plant. It is distinguished from a tree by its multiple stems and short height. Plants of many species may grow either into shrubs or trees, depending on their growing conditions.

Table 2 Shrubs in Kolhapur district

Sr. No.	Local Name	Botanical Name
	Adulsa	Adhatoda vasica
	Ankul/Ankol	Strobilanthes heyneanus
	Bedki/Gudmari	Alangium salvifolium
	Bhamani	Gymnema sylvestre
	Bhandira	Colebrookea oppositifolia
	Bhandira	Clerodendrum infortunatum
	Bharati/Hekal	Gymnosporia Montana
	Bohkada /Charbati/Kirmira	Casearia graveolens
	Bugdi	Ardisia humilis
	Bukra	Strobilanthes sessilis
	Dinda/Motha Dinda	Leea sambucina
	Dhaiti/Dhayati	Leea macrophylla
	Hesur	Woodfordia fruticosa

Source: Forest Department of Kolhapur District

The Table 2 shows that there are various species of shrubs are available in the Kolhapur district forest. It is providing very valuable input to society. These all shrubs has its contribution in forest economy. There is need to take that monetary contribution in forest accounting of the district.

Climbers: The climbing plant is vital in forest ecology. The Climbing plants are plants which climb up trees and other tall objects. Many of them are vines whose stems twine round trees and branches. There are quite a number of other methods of climbing.

Table 3 Climbers in Kolhapur district

Sr. No.	Local Name	Botanical Name
	Alei	Dalbergia volubilis
	Amgul	Elaeagnus latifolia
	Bhui Kohola/Vidari Kand	Ipomaea digitata
	Cane	Calamus pseudotenuis
	Chambuli	Bauhinia vahlii
	Chickni	Bridelia stipularis
	Chillari	Caesalpinia mimosoides
	Garambi/Gardal	Entada scandens
	Ghotvel/Chopchini	Smilax zeylanica
	Gunj	Abrus precatorius
	Jungali miree	Piper hookeri
	Kajarvel	Strychnos colubrina
	Kanheri/Borati/Burgi	Zizyphus oenoplia
	Vilayati vakundi	Cryptolepis grandiflous
	Kali vel/Jungali Kajorne	Vitis auriculata
	Kavali	Cryptolepis buchanarous
	Khaj Kuhili	Mucuna pruriens

Source: Forest Department of Kolhapur District.

Table 3 shows that there are no of climbing plants available in Kolhapur district. Along with environmental there are commercial importance of such plants such as use in gardening and horticulture. It's a valuable addition in forest economics of the district.

Bamboos: The Bamboos are the significant crop of the agro forestry economy. It has notable economic and cultural significance in society being used for building material, as a food source, and as a versatile raw product. It has a higher specific compressive strength than wood, brick, or concrete and a specific tensile strength that rivals steel.

Table 4 Bamboos in Kolhapur district

Sr. No.	Local Name	Botanical Name
	Chiwa/Huda/Chiwan	Oxytenanthera monostigma/ Pseudoxytenanthera ritcheyi
	Kalak/Padai/Mandgay/Velu/Kanak	Bambusa bambos
	Konda/Managa/Chiwari/Mes	Oxytenanthera stocksii/ Pseudoxytenanthera stocksii
	Shi/Udha/Medar	Dendrocalamus strictus

Source: Forest Department of Kolhapur District.

Table 4 indicates that there are total 4 kinds of Bamboos species available in the forest of Kolhapur district. The Bamboos have important commercial uses, such as culinary, medicine, constructions, weapons, food, textiles, and musical instruments etc. The commercial value of such inputs enriches the forest accounting at large extent.

Grasses: It means a low, green plant that grows naturally over a lot of the earth's surface having groups of very thin leaves that grow close together in large numbers (Oxford dictionary). It is a very common plant consisting of a large number of thin, spiky, green leaves that cover the surface of the ground.

Table 5 Grasses in Kolhapur district

Sr. No.	Local Name	Botanical Name
	Anjan	Cenchrus ciliaris
	Bhalekusal	Andropogon triticicus
	Bhongrut	Themeda quadrivalvis
	Boru	Sorghum halepense
	Burghushi	Eragrostis tenella
	Chikra	Eragrostis tremula
	Chigan chara	Panicum prostratum
	Dongari gawat	Crysopogon Montana
	Gondal	Andropogon pumils
	Haryali/doob	Cynodon dactylon
	Kunda	Ischoemum pilosum
	Kusali	Heteropogon contortus
	Marvel	Dichanthium annulatum

	Natgras	Cyprus rotundus
	Nilgawat	Panicum antidotale
	Phuli/Kodmor	Apluda varia
	Phulera	Themeda ciliate
	Pandhari Kusal	Aristida paniculata
	Sheda	Sehima nervosum
	Pavana	Sehima sulcatum
	Rosha/Tokhadi	Cymbopogon martinl
	Shimpi	Panicum isachne
	Vala	Andropogon muricatus
	Wavashi	Saccharum procerum

Source: Forest Department of Kolhapur District.

Table 5 shows that there are total 24 different species of grass available in the district. It is very helpful to mankind, agriculturally, economically and ecologically. It is an important source of food for man and animals both. Thus its contribution needs to measure in monetary value and include in forest accounting.

Medical Plants: The medical plants have been identified and used through in human history. It's part of culture and tradition for centuries. Plants make many chemical compounds that are for biological functions including defense against insects, fungi and herbivorous mammals. The medical plants have huge commercial benefits, it generates business out of it. Kolhapur district has numerous medical plants in its forests as follows.

Abrus precatorius, Abutilon indicum, Acacia concinna, Achyranthes aspera var, aspera, Acorus calamus, Adansonia digitata, Aegle marmelos, Alangium salvifolium var, salvifolium, Alsaonia schloaris, Anacardium occidentale, Andrographis paniculata, Anogeissus latifolia, Artocarpus, heterophyllus, Asparagus racemosus var, javanica, Azadirachta indica, Bacopa monnieri, Balanites aegyptiaca, Baliospermum montanu, Biophytum sensitivum, Bixa Orellana, Boerhavia repens var diffusa, Bombax ceiba, Bombyx micranthus, Boswellia serrate, Bridelia retusa, Buchanania cochinchinensis, Butea monosperma, Caesalpinia bonduc, Calotropis gigantean, C. procera, Careya arborea, Cassia fistula, C. obtusifolia, C. tota, Catharanthus roseus, Celastrus paniculatus, Celosia argentea var, argentea, Centella asiatica, Colocasia esculenta, Convolvulus arvensis, Cordia dichotoma, C. gharaf, Costus speciosus, Crateva adansonii subsp, odora, Crossandra infudibuliformis, Cullen corylifolia, Cuminum cyminum, Curculigo orchioides, Cymbopogon citratus, Cynodon dactylon, Cyperus rotundus, subsp. Rotundus, Dendrophthoe falcate var, falcate, Dillenia indiaca, Dioscorea alata, D. bulbifera, Dodonea angustifolia, Dolichandrone falcate, Eclipata prostrate, Elaeagnus conferta, Embelia ribes, Emblica officinalis, Entada rheedei, Ficus amottiana, F. benghalensis, F. callosa, F. carica, F. racemosa, F. religiosa, Garcinia indiaca, Garuga pinnata, Gloriosa superba, Glossocardia bosvallea, Gmelina arborea, Gnidia glauca, Hedyotis herbacea, Helicteres isora, Heliotropium indicum, and others.

The identification and commercial valuation of medical plants provide the basis for forest accounting. The medical plants are a major component of forest economy. Its increase the monetary value of entire forest. In fact, there are certain forests are kept only for medical plants. Therefore collecting information of medical plants, analyzing it, interpreting it and recording it in monetary value is significant.

Mammals: The mammals include the largest animals on the planet, the great whales as well as some of the most intelligent such as elephants, primates and cetaceans.

Table 6 Mammals in Kolhapur district

Sr. No.	Local Name	Botanical Name
	Bonnet Macaque	Macaca radiate
	Common Langur	Preshbytis entelhus
	Tiger	Panthera tigris
	Panther	Panthera pardus
	Leopard cat	Felis bengalensis
	Jungal cat	Felis chaus
	Desert cat	Felis libyca
	Small Indian Civet	Viverricula indica
	Common Plam civet	Paradoxurus hermaphroditus
	Common mongoose	Herpestes edwardsi
	Striped Hyena	Hyaena hyaena
	Wolf	Canis lupus
	Jackal	Canis aureus
	Indian Fox	Vulpes bengalensis
	Indian Wild Dog	Cuon alpinus
	Sloth bear	Melursus ursinus
	Common Otter	Lutra lutra
	Moles	Talpa micrura
	Indian Tree Shrew	Anathana ellioti
	Slender Loris	Loris tardigradus
	Flying Fox	Pteropus giganteus
	Fulvous Fruit-Bat	Rousettus leschenaulti

	Short-Nosed Fruit Bat	Cynopterus sphinx
	Indian Pipistrelle	Pipistellus coromandra
	Painted Bat	Krivoula picta

Source: Forest Department of Kolhapur District.

Table 6 shows that there are various species of mammals are available in the district. It has direct contribution in human society and economy. For instance domestic mammals form a large part of the livestock raised for meat across the world. It is commonly used in agriculture and allied activities. Forests is crucial component for existence of such mammals. The economic contribution of such mammals has linkages with forests.

Avifauna: The birds or the kinds of birds of a region, period or environment. In simple word birds of a specific region or period. Birds are essential elements of ecology.

Table 7 Avifauna in Kolhapur district

Sr. No.	Local Name	Botanical Name
	Little Grebe	Podiceps ruficollis
	Little Cormorant	Phalacrocoras niger
	Dater	Anhinga rufa
	Grey Heron	Ardea cinerea
	Purple Heron	Ardea purpurea
	Pond Heron	Ardea gravii
	Cattle Egret	Babulcus ibis
	Large Egret	Ardea alba
	Smaller Egret	Egretta intermedia
	Little Egret	Egretta garzetta
	Night Heron	Nycticoras nycticorax
	Little Bittern	Ixobrychus minutus
	Yellow Bittern	Ixobrychus sinensis
	Painted Stock	Mycteria leucocphala
	Openbill Stork	Anastomus oscitans
	Whitenecked Stock	Ciconia episcopus
	Lesser Adjutant	Leptptilos javanicus

Source: Forest Department of Kolhapur District.

Table 7 indicates that there are bird species available in the forest of Kolhapur district. Birds are providing very essential benefits to human beings such as food, business, pollination, fertility, pest control, rodent control, communication, company, and games, etc. Therefore the economic contribution of birds is vital and existence of birds depends on forests.

Crocodile: The Crocodiles (subfamily Crocodylinae) or true crocodiles are large aquatic reptiles that live throughout the tropics in Africa, Asia, the Americas and Australia.

Table 8 Crocodile in Kolhapur district

Sr. No.	Local Name	Botanical Name
1	Mugger	Crocodylus palustris

Source: Forest Department of Kolhapur District.

Table 8 shows that the crocodile is also found in forests in Kolhapur district. The Crocodiles play very important role in the river ecosystem to ensure that river. These invisible ecosystem services, in monetary value needs to be taken into consideration.

Herpetofauna: The reptiles and amphibians of a particular region, habitat, or geological period. The table 9 talks about Herepetoaua of Kolhur district.

Table 9 Herpetofauna in Kolhapur district

Sr. no	Local Name	Botical Name
1	Barhminy Wrom Snake	Ramphotyphlops braminus
2	Beaked Wrom Snake	Gryptotyphlops acutus
3	Large Scaled Shieldtail	Uropelepis macrolepis macrolepis
4	Indian Rock Python	Python molurus molurus
5	Common Sand Boa	Gongylophis conicus
6	Red Sand Boa	Eryx johnii
7	Common Trinket Snake	Coelusognath Helena Helena
8	Montane Trinket Snake	Coelusognath Helena monticollaris
9	Indian Rat Snake	Ptyas mucosa
10	Banded Racer	Argyrogena fasciolata

Source: Forest Department of Kolhapur District.

Table 9 reveals that there are different species available in the forest in Kolhapur district. It is an essential component of ecology and the food chain. They provide numerous invisible services to protection of the ecology.

Turtle: The Turtles are classified as amniotes, along with other reptiles, birds, and mammals. Like other amniotes, turtles breathe air and do not lay eggs underwater, although many species live in or around water.

Table 10 Turtle in Kolhapur district

Sr.No.	Local Name	Botanical Name
1	Black Turtle	Melanochelys trijuga
2	Indian Mud Turtle	Lissemys punctata
3	Brahminy River Turtle	Lissemys punctate punctata
4	Indian Flap-shell Turtle	Lissemys punctate granosa
5	Peninsular Flap-Shell Turtle	
6	Indian Soft Shell Turtle	Aspideretes ganeticus

Source: Forest Department of Kolhapur District.

Table 10 shows that there are total 6 species of turtle available in the Kolhapur district forest. Turtles play an important role in the ecology and well-being of coastal and open ocean environments. It is essential for a healthy ecosystem. It has biological, cultural and economic significance.

Gecko: The Geckos are lizards belonging to the infraorder Gekkota, found in warm climates throughout the world. Geckos are unique among lizards in their vocalizations.

Table 11 Gecko in Kolhapur district

Sr. No.	Local Name	Botanical Name
1	Northern House Gecko	Hemidactylus flaviviridis
2	Brook's Gecko	Hemidactylus brookii
3	Termite Hill Gecko	Hemidactylus triedrus
4	Rock Gecko	Hemidactylus maculatus

Source: Forest Department of Kolhapur District.

Table 11 shows that there are 4 species of Gecko available in the Kolhapur district forest. Geckos are reptiles with unique and interesting features and play an important role in maintaining a balanced ecosystem.

Agamids: The Agamidae is a family of over 300 species of iguanian lizards indigenous to Africa, Asia, Australia, and a few in Southern Europe. Many species are commonly called dragons or dragon lizards.

Table 12 Agamids in Kolhapur district

Sr. No.	Local Name	Botanical Name
1	Common Garden Lizard	Calotes versicolor
2	Forest Calotes	Calotes rouxi
3	Southern Green Calotes	Calotes calotes
4	Fan-throated Lizard	Sitana ponticeriana

Source: Forest Department of Kolhapur District.

Table 12 reveals that there are total 4 Agamids species found in Kolhapur forest. Agamids are important for ecosystem balance and its diversity.

Chameleons: Chameleons or chamaeleons (family Chamaeleonidae) are a distinctive and a highly specialized clade of old world lizards with 202 species described as of June 2015. These species come in a range of colors, and many species have the ability to change colors.

Table 13 Chameleons in Kolhapur district

Sr. No.	Local Name	Botanical Name
1	Indian Chameleon	Chamaeleon zeylanicus

Source: Forest Department of Kolhapur District.

In Kolhapur forest chameleons are also found. Chameleons are able to vary their coloration and pattern through combinations of pink, blue, red, orange, green, black, brown, light blue, yellow, turquoise, and purple. It is important features of nature's diversity.

Skinks: Skinks are lizards belonging to the family Scincidae and the infraorder scincomorpha. With more than 1,500 described species, the Scincidae is one of the most diverse families of lizards.

Table 14 Skinks in Kolhapur district

Sr. No.	Local Name	Botanical Name
1	Brahminy Skink	Mabuaya carinata
2	Little Skink	Mabuaya macularia
3	Snake Skink	Lygosoma punctatus

Source: Forest Department of Kolhapur District.

Table 14 shows that there skinks species also available in Kolhapur forest. Various species occur in ecosystems ranging from deserts and mountains to grasslands.

Monitor Lizard: Monitor lizard is the common name of several large lizard species, comprising the genus Varanus.

Table 15 Monitor Lizard in Kolhapur district

Sr. No.	Local Name	Botanical Name
1	Common Indian Monitor	Varanus bengalensis

Source: Forest Department of Kolhapur District.

Monitor lizards is useful. It is used for a variety of medical purposes. The flesh is eaten for the relief of rheumatic pain, abdominal fat is used as a salve for skin infections, oil and fat are used to treat hemorrhoids or chronic pain, and the oil is used as an aphrodesiac lubricant.

Toads: It is a common name applied to certain frogs, especially of the family Bufonidae that are characterized by dry, leathery skin, short legs, and parotoid glands.

Table 16 Toads in Kolhapur district

Sr. No.	Local Name	Botanical Name
1	Common Indian Toad	Bufo melanostictus
2	Marbled Toad	Bufo stomaticus

Source: Forest Department of Kolhapur District.

Toads are important to the ecology and to humans. Toads provide important values for ecosystems and for human beings ecologically, they are important in food chains. Toads also serve as indicators of environmental health.

Frogs: A frog is any member of a diverse and largely carnivorous group of short-bodied, tailless amphibians composing the order Anura.

Table 17 Frogs in Kolhapur district

Sr. No.	Local Name	Botanical Name
1	Bush Frog	Philautus sp
2	Common Tree Frog	Polypedates maculatus
3	Skittering Frog	Rana cyanophlyctis
4	Indian Pond Frog	Rarisna hexadactylus
5	Indian Bull Frog	Rana tigerina
6	Indian Cricket Frog	Rana limnocharis
7	Fungoid Frog	Rana malabarica
8	Bicoloured Frog	Rana curtipes
9	Golden Frog	Rana aurantiaca
10	Indian Burroowing Frog	Rana breviceps

Source: Forest Department of Kolhapur District.

Table 17 shows that there are total 10 species of Frogs available in Kolhapur district. The frogs provide essential benefit to human being such as medical advances, food, filter drinking water etc.

Butterflies: The butterfly is one of the most emblematic totem animals symbolizing personal transformation. Table 17 talks about different butterfly species in Kolhapur forest.

Table 17 Butterflies in Kolhapur district

Sr. No.	Local Name	Botanical Name
1	Twany Coaster	Acraea violae
2	Blue Tiger	Tirumal limniace exoticus
3	Common Crow	Eploea core core
4	Dark Blue Tiger	Tirumala septentrionis dravidarum
5	Glassy Blue Tiger	Parantica aglea aglea
6	Malabar Tree Nymph	Idea malabarica
7	Plain Tiger	Danaus chrisispsu chrisispsu
8	Banded Angle	Danaus genutia genutia
9	Brown Awi	Odontoptilum angulata angulata
10	Common Banded Awl	Badamia exclamationis
11	Common Spotted Flat	Hasora chromus chromus
12	Dark Palm Dart	Celaenorrhinus leucocera
13	Golden Angle	Telicota ancila bambusae
14	Indian Palm Bob	Caprona ransoneetta potiphera
15	Indian Skipper	Suastus gremius gremius
16	Malabar Flat	Spialia galba galba
17	Banded Blue Pierrot	Celaenorrhinus ambarreesa
18	Bright Bauul Blue	Discolampa ethion vavasanus

Source: Forest Department of Kolhapur District.

Table 18 reveals that there are total 75 various species of butterflies available in Kolhapur forest. Butterflies are indicators of a healthy environment and healthy ecosystems. Butterflies are an important element of the food chain and are prey for birds, bats and other insectivorous animals.

Moths: Moths comprise a group of insects, related to butterflies, belonging to the order Lepidoptera. Most lepidopteron are moths; and there are thought to be approximately 160,000 species of moth, many of which are yet to be described. Most species of moth are nocturnal, but there are also crepuscular and diurnal species. Table 18 belongs to the Moths of Kolhapur forest.

Table 18 Moths in Kolhapur district

Sr. No.	Local Name	Botanical Name
1	Moon Moth	-----
2	Owlet Moth	-----
3	Bee Hawk Moth	-----
4	Monkey Moth	-----
5	Atlas Moth	-----
6	Tussar Silk Moth	-----

Source: Forest Department of Kolhapur District.

Table 18 shows that 19 Kolhapur forest has 6 various species of moths. It is a major part of our biodiversity and play vital roles in the ecosystem, affecting many other types of wildlife.

Insects: Insects are a class of invertebrates within the arthropod phylum that have a chitinous exoskeleton, a three-part body (head, thorax and abdomen), three pairs of jointed legs, compound eyes and one pair of antennae. Table 19 related to Insects in Kolhapur district.

Table 20 Insects in Kolhapur district

Sr. No.	Local Name	Botanical Name
1	Sick Insect	Vespa orientalis
2	Hornet Wasp	Teratodes monticollis
3	Hooded Grass Hopper	-----
4	Painted Grass Hopper	-----
5	Praying Mantis	-----
6	Leaf Insects	-----
7	Tortoise Shelled Beetle	-----
8	Dragon Fly	-----
9	Damsel Fly	-----
10	Leopard Beetle	-----
11	Bombardial Bettle	-----
12	Long Horned Beetle	-----
13	Spittle Bug	-----

Source: Forest Department of Kolhapur District.

Table 20 shows that 13 species of insects are available in Kolhapur forest. Insects are very important as primary or secondary decomposers. Without insects to help break down and dispose of wastes, dead animals and plants would accumulate in our environment and it would be messy indeed. Insects are underappreciated for their role in the food web. Insects are important in nature to help keep pest populations (insects or weeds) at a tolerable level.

Arachnids: Arachnids are a class (Arachnida) of joint legged invertebrate animals (arthropods), in the subphylum Chelicerata. All arachnids have eight legs, although the front pair of legs in some species has converted to a sensory function, while in other species, different appendages can grow large enough to take on the appearance of extra pairs of legs. Table 20 belongs to Arachnids in Kolhapur district.

Table 21 Arachnids in Kolhapur district

Sr. No.	Local Name	Botanical Name
1	Scorpion	-----
2	Harvestmen	-----
3	Ticks and Mites	-----
4	Whipscorpion	-----
5	Spiders	-----
6	Speckled Band Fourleg	-----
7	Banded Fourleg	-----
8	Giant Wood Spider	-----
9	Black Wood Spider	-----

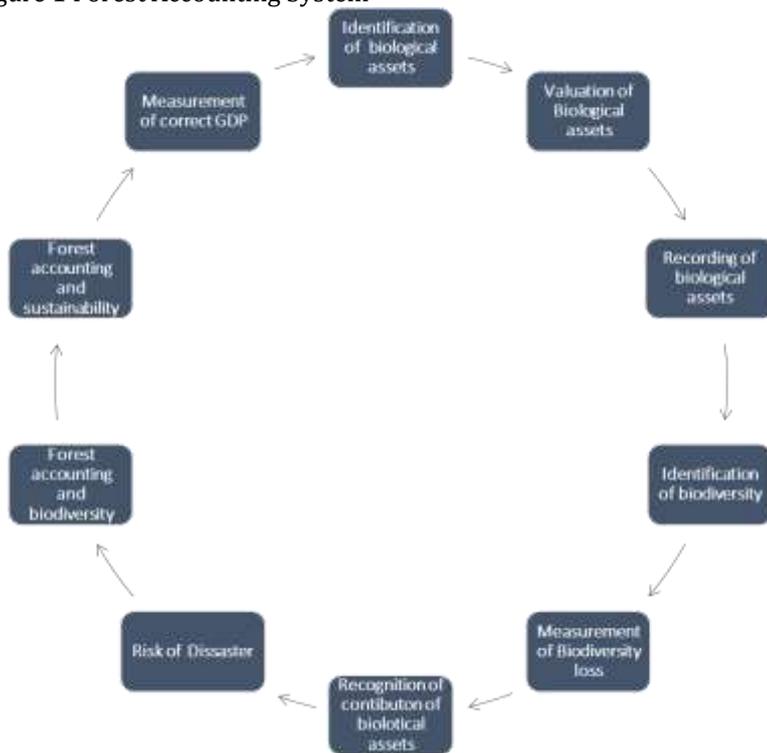
Source: Forest Department of Kolhapur District.

Table 22 reveals that there are totally 20 kind of species of Archinds are available in Kolhapur forest. The arachnids play an important role in limiting the size of other arthropod populations, especially insects. Some arachnids are pests, such as ticks and mites, but most are beneficial and should be protected.

FOREST ACCOUNTING SYSTEM

Forest Accounting provides a framework to capture the value of all economic contributions of forests and how they are linked to the economy (Making Waves, 2016). It does involve environmental accounting, physical accounting, monetary accounting and forest flow accounting of forest resources.

Figure 1 Forest Accounting System



Forest accounting cycle deal with forest capital (Forest capital refers to elements of forest that produce values directly and indirectly to people such as stock of trees, animals, goods and services etc). Forest accounting is given significant input in various ways, such as protecting biodiversity, sustainability, protection of ecosystems, livelihood, economic development, industry and trade, employment generation, reduction of biodiversity loss, a risk of disaster, the true measurement of economic development, and generating accurate data for policy makers etc.

Physical Resources Based Asset Accounts: Physical accounting refers to the natural resource and environmental accounting of stocks and changes in stocks in physical (non-monetary) units e.g. weight, area or number. Qualitative measures, expressed in terms of quality classes, types of uses or eco-system characteristics, may supplement quantitative measures (Statistic New Zealand, 2002). Forest resources based accounts accounted different forest resources individually. Forest has produce no of resources, it is significant to prepare accounting for it. In physical resources based forest accounting record all forest assets even if they are not currently expected to diliver benefits. And in monetary resources based asset accounting record economic value of such forest assets.

Forest Land Asset Accounts: Forest land asset account describe the area of forest land and changes in the area of forest land cover over an accounting period. Table presents a physical asset account for forest and other wooded land. It has given details of opening and closing stock by area, type and changes in forest stock. It has been accounted different additions and reductions in forest stock. Afforestation and natural expansion increases into forest stock. Deforestation or natural regression represents reduction in forest stock.

Table 22 Physical Asset Accounts for the area of Forest and other Wooded Land (Hectors)

Sr. No.	Particulars	Total
1	Opening stock of forest and other wooded land	13897100
2	Additions to stock: Afforestation Natural Expansions Total Addition to stock	5007
3	Reduction in stock Deforestation Natural regression Total reduction in stock	2276
4	Closing stock of forest and other wooded land	13899831

Source: Author calculations

Table 22 giving details about Physical Asset Accounts for the area of Forest and other Wooded Land of the Kolhapur district. There is total 13899831 hectare forest is available in district. Through afforestation (2495) and natural expansion (2512) there is addition in total forest. Similarly there is declined in stock (2276) due to deforestation. It

implies that there are constant efforts taken by forest department to keep forest intact. Deforestation is cover by continuous afforestation.

Timber Resources Asset Account: The timer resources accounts presents the volume of timber resources at both the beginning and end of an accounting period. It also records change in stock over the accounting period. The details of physical assets account of timber resources has been given in Table 22. Timber resources include volume of trees, living or dead, and include all trees regardless of diameter, tops of stems, large branches and dead trees lying on the ground that can be used fo timber or fuel. (SEEA Centrak Framework). The main additions to the stock of timber resources are annual growth and reclassifications. The main reductions in the stock due to removals, losses and reclassifications.

Table 22 Physical Asset Accounts for timber resources (No of Trees)

Sr. No.	Particulars	Total
1	Opening stock of Timber Resources	49952595
2	Addition in Stock Natural Growth Reclassification	91322 NA
3	Reduction in stock Removals Natural losses Catastrophic losses Reclassifications	NA 81521 NA NA
4	Closing stock of Timber Resources	49962396

Source: Author calculations

Table 22 giving details about Physical Asset Accounts for timber resources, entire forest cannot be treated as timber resources hence separate timber resources account is need to prepaid. There are total 49962396 tress are available as timber. Through natural growth (91322) there is addition in timber resources and there is declined in stock (81512) due to natural loss. Timber is the important resource of forest which is getting affected by various reasons such as natural growth, natural loss removals and catastrophic losses etc

Forest Products: Forest produces various non-wood product which has equally good demand in market. Non wood forest product has multiple uses hence they are constantly in demand. Non wood forest product market has good scope for further growth.

Table 23 Non Wood Forest Product

Sr. No.	Forest Product	1997-98		1998-99		1999-2000	
		M.T.	Revenue	M.T.	Revenue	M.T.	Revenue
1	Tamalpattra	456.65	37200	1226.59	61000	481.57	70435
2	Shikekai	55.35	36600	54.52	88433	19.03	100650
3	Hirda	322.73	135000	44.23	41930	1885.08	414901
4	Cashew	6.64	110885	2.20	15949	3.60	178335
5	Watsole	3.00	2400	1.98	3200	2.10	7100
6	Amsole	10.00	12000	11.00	12000	0.61	43100
7	Bibiphale	0.70	3900	2.10	550	0.05	610
8	Honey	1.01	15150	4.25	12600	0.22	20310
9	Karanji	3.05	6900	5.25	13300	5.20	8920
10	Gum	7.57	7700	16.55	8000	1.70	4250
11	Kadipatta	3.05	2300	9.30	4000	0.40	1025
12	Mediclinal Plants	97.31	8900	54.50	44250	58.17	12985
13	Madi	-----	-----	13200 lit	26000		

Continued.

Sr. No.	Forest Product	2000-01		2001-02		2002-03	
		M.T.	Revenue	M.T.	Revenue	M.T.	Revenue
1	Tamalpattra	390.45	688113	471.13	954000	580.07	1060000
2	Shikekai	23.45	130229	76.05	154750	324.08	155700
3	Hirda	1125.09	254375	0.46	71325	654.10	54100
4	Cashew	4.75	205082	2846.00	159402	2930.00	165460
5	Watsole	1.75	5000	2.52	5500	5.80	2500
6	Amsole	10.35	26150	30.05	27500	7.00	12000
7	Bibiphale	0.05	610	-----	----	0.07	950
8	Honey	0.21	10300	0.20	5650	0.15	7800
9	Karanji	4.84	7868	1.20	6100	11.08	7000
10	Gum	1.35	7760	3.25	6700	1.90	2000
11	Kadipatta	0.30	825	0.20	2100	0.50	1345
12	Mediclinal Plants	60.75	15025	39.02	6825	29.67	20060
13	Madi	14500 Lit	18500	16477	20000	18875 lit	20500

Continued.

Sr. No.	Forest Product	2003-04		2004-05		2005-06	
		M.T.	Revenue	M.T.	Revenue	M.T.	Revenue
1	Tamalpattra	411.76	1018000	357.9	600000	33.60	378000
2	Shikekai	90.32	90700	141.80	152500	42.00	40000
3	Hirda	2.75	34500	678.33	104500	5.60	16000
4	Cashew	0.11	172165	5.82	201500	-----	-----
5	Watsole	8.40	3000	5.84	2750	-----	-----
6	Amsole	0.30	1000	0.30	1000	-----	-----
7	Bibiphale	-----	-----	-----	-----	-----	-----
8	Honey	-----	-----	-----	-----	-----	-----
9	Karanji	11.75	86.51	13.50	7800	-----	-----
10	Gum	-----	-----	-----	-----	-----	-----
11	Kadipatta	-----	-----	-----	-----	-----	-----
12	Medicinal Plants	-----	-----	-----	-----	-----	-----
13	Madi	-----	-----	-----	-----	-----	-----

Source: Kolhapur Forest Department

Table 23 shows various non-wood product of forest in which Cashew, Tamalpartha, Hirda, Honey, Shikakai and Amsole are the important products available in forest. Each product has its own market. Its raw material to various forest based industry such forest honey industry, cashew industry, pharmaceuticals, and food processing industry etc.

Live Stock Account: Livestock growth is largely depends on availability of forest. And livestock is essential component of rural economy. Based on forest resources only livestock resources build. Larges section of rural sector depend upon livestock and get their livelihood. It almost 16% income of small farm households come from livestock. Along with that also creates employment generation. In nutshell livestock influence rural economy at large.

Table 24 Live Stock Account

Sr.No	Tahshil	Cows and Bulls	Bufflows	Sheep	Goats	Total
1	Karveer	13318	85187	27729	14458	140992
2	Panhala	11452	43714	7772	12260	75198
3	H. Kangale	10133	61658	39855	17708	129352
4	Shirol	6861	64681	18093	16205	105840
5	Kagal	9550	49798	27593	14172	101113
6	G. Hinglaj	4765	50300	16926	18294	90285
7	Chandgad	7574	42951	485	8880	59890
8	Ajara	3903	24745	264	10571	39483
9	Bhudargad	5308	26204	2067	11743	45322
10	R. Nagari	4974	37600	7574	13624	63772
11	G. Bawada	2758	4335	35	5061	12189
12	Shahuwadi	15114	34087	34087	29339	83318

Table 24 talks about livestock situation in Kolhapur district. Livestock only can be maintained if there is good forest in an around. Almost all Tahashils of Kolhapur district has very good livestock.

FOREST ASSETS AND REGIONAL SUSTAINABILITY

Case Study on Forest Honey Collection: This is the project where forest honey is collected scientifically. There are 100 traditional beekeepers from Malaiwada, Manoli and Barki in 3 villages of Shahuwadi taluka of Kolhapur district are involved. It is found that beekeeping is livelihood option offered to them is increasing social integration, responsibility and awareness about conservation of biodiversity. Important features of this project are as follows which has potential for regional sustainability.

- Organic honey collection in the Amba forests.
- Large potential for establishment and management of Honey clusters through state of art modern honey extraction and collection methods by training the traditional beekeepers.
- Protection and conservation of billions of bees, biology and diversity from becoming eminently endangered.
- It promotes regional sustainability.
- To improve the social status of these traditional beekeepers.

SUSTAINABLE MODEL: SCIENTIFIC METHOD OF HONEY COLLECTION

Smoking machines: Bees in the combs just fly away and do not die, thus not harming them. In the existing traditional method, fire is used wherein most of the bees die.

Sting protection suit: Beekeepers reach up to the comb wearing the suit with the help of ropes. In the traditional method there is a danger of bee stings and thus the beekeeper cannot reach up to the comb.

Tape Rope Ladder: The ladder is used to reach the branch of the tree or the stone in order to systematically slice the comb.

G.I.Cutter: The base of the comb is kept intact and the comb is cut above the base with the cutter and collected in a G.I.Bucket. About 20 % of honey is retained in the comb at the base for the growth of offspring's of bees and thereby sustaining of bee colony.

Rechargeable batteries: Honey is extracted in the evenings and early mornings in the dark.

Honey Extractor: The extractor uses centrifugal force to pour out honey in a pot and keeps the wax in the extractor itself and thus pure honey is extracted.

IMPACT OF THE PROJECT ON REGIONAL SUSTAINABILITY

- If honey is extracted without harming the bees, they revive the comb from the base of the comb in just one month.
- In this scientific method, honey can be extracted thrice a year.
- About 4 to 5 kg of honey can be extracted from a single honey comb through this method
- It helps to increase the population of bees as well as the honey production. This method is therefore useful to both beekeepers and eco-conservation.
- It curbs down deforestation as it is a source of income to the beekeepers.
- Beekeepers get the employment of about 50 to 60 days per year and improve the living standards.

THE TRADITIONAL DESTRUCTIVE METHODS OF HONEY COLLECTION OF FOREST BEEKEEPERS



THE MODERN AND SCIENTIFIC METHOD OF HONEY COLLECTION



CONCLUSION

In forest valuation ecological features of forest has significantly influenced forests monetary value. Hence it is inevitable that to make detailed ecological classification of particular forests. Kolhapur district forest has tremendous ecological inputs that increase value of forests. There are 20 ecological characteristics of Kolhapur forests such as Trees, Mammals, Arachnids, Insects, Moths, Butterflies, Frogs, Toads, Lizard, Skinks, Avifauna, Crocodile, Shrubs, Grasses, Bamboos,

Medical plants, Climber, Herepetauna, Agamids, Gecko, Turtle, Chameleons and its various species. These ecological elements enrich Kolhapur forest's value in greater extent. Ecological diversified forests have more monetary value because it provides diversification in output of forests. Therefore, in making of forest accounting analysis of ecological elements of forest is essential. Being a hilly region Kolhapur forests have scope for agro forestry practices such as cashew cultivation and mango cultivation. There is vast scope for Agro forestry practices in this region. Ecological classification does help in making scientific forest accounting system. Forest has tremendous potential for regional sustainability in which forest timber resources, livestock, forest non wood product and various forest assets are contributed. Forest regional sustainability brings biodiversity conservation, income generations, and improvement in food supply chain, and betterment in socio-economic status and sustainable economy.

REFERENCES

- Directorate of Economics and Statistics (DES), Planning Department, Govt. of Maharashtra, India.
- Elmqvist T., Tuvaldal M., Krishnaswamy J. and Hylander K. (2011), Managing of Trade off in Ecosystem Services, The United Nations Environment Programme, Printing: Publishing Services Section, UNON, Nairobi-Kenya.
- Eliasch Review on Climate Change Financing Global Forests, Earthscan Dunstan House 14a St Cross St London EC1N 8XA UK.
- Elsa Varela and Jose Miguel Barrios (2014), Global Workshop on Forest Accounting, Washington.
- Knut H.Alfsen (1994), Natural Resource Accounting and Analysis in Norway, Statistics Norway Research Department.
- India state of Forest Report -2011: Forest Survey of India (FSI)-2011, Ministry of Environment and Forests, Govt. of India (2011). pp. 4-5.
- Jianguo Liu (2013), Forest Sustainability in China and Implications for a Telecoupled World, Asia & the Pacific Policy Studies, Vol. 1. No1,pp 230-250.
- Kathuria Renu (2014) Natural Resource and Biodiversity Conservation, Shruti Publication, Jaipur - 302005.
- Srivastava S. C. and Smt. Srivastava Sangya (2006), Economics of Social Sector and Environment, Anmol Publications Pvt. Ltd., New Delhi, India - 110002.
- State of Forest Report -2013: Ministry of Environment and Forests, Govt. of India (2014).
- William N. Mkanta (2002) Towards Natural Resource Accounting In Tanzania: A Study On The Contribution of Natural Forests to National Income, CEEPA Discussion Paper Series, ISBN 0-9584508-1-1.

1756 CONTRIBUTION AND CHALLENGES OF MSMEs IN INDIA

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ABSTRACT

MSMEs have been playing dominant role in the growth of Indian economy since reforms period. As on today, they are contributing 33% of the total manufacturing output, 45% of exports and 6% of GDP²⁴⁰. Their contribution is valuable in terms of both manufacturing and services. They are complimentary to large enterprises and contribute significantly for the socio-economic development of the country. MSMEs not only play crucial role in providing large employment opportunities at comparatively lower capital cost than large industries but also help in industrialization of rural and backward areas, thereby, reducing regional imbalances, assuring more equitable distribution of national income and wealth. They are the centres for many unemployed and unskilled people; and giving birth to young entrepreneurs in starting their own enterprises. These young entrepreneurs with technological advancement are preferring MSMEs than to work for large corporate or multinational companies. Though MSMEs have progressed and evolved rapidly contributing significantly to the economy, are still facing several challenges.. They include - problems in getting adequate support from banks and other financial agencies., limited capital and knowledge, non-availability of suitable technology, ineffective marketing strategy, attrition of talented people with the tech-savvy background etc. Further, they are also facing challenges from overseas companies which are attracting the skilled manpower of MSMEs who were developed in these enterprises. In the light of this background, this conceptual paper aims at understanding the contribution of MSMEs to the Indian economy along with the role of government and the present challenges faced by them. For MSMEs in India challenges are not new. They are started with the inception of these enterprises and they are growing along with them. Some new challenges are emerging in place of the old as the time passes by. With the help of the secondary data, the authors try to analyse the contribution of MSMEs and their challenges to draw meaningful conclusions which show the way to eliminate some of the challenges which in turn help the MSMEs to contribute more to the economy.

Key words: MSMEs, Contribution, Challenges.

INTRODUCTION

All economies in the world, whether developed or developing, are directly depending on the contribution of MSMEs. Their contribution to employment, production, exports and GDP are considerable and in some economies, it is dominant. In India their contribution is significant. The growth of the economy cannot be imagined with out the contribution of MSMEs. They are complimentary to large enterprises and contribute significantly for the socio-economic development of the country. MSMEs not only play crucial role in providing large employment opportunities at comparatively lower capital cost than large industries but also help in industrialization of rural and backward areas, thereby, reducing regional imbalances, assuring more equitable distribution of national income and wealth. They are the centres for many unemployed and unskilled people; and giving birth to young entrepreneurs in starting their own enterprises. These young entrepreneurs with technological advancement are preferring MSMEs than to work for large corporate or multinational companies.

However, MSMEs have been facing some challenges. If the challenges are addressed, their support to the economy will increase drastically. Therefore, the importance of this paper lies in identifying the contribution and challenges of MSMEs in India and suggest suitable measures to overcome these challenges.

REVIEW OF LITERATURE

Urata and Jigyodan, (2000) in their policy recommendation for SME promotion of Jakarta found that MSMEs and potential entrepreneurs face supply and demand side challenges which can potentially impede their ability to establish, grow and ultimately survive. Overall, these challenges include both supply and demand side issues. Internally, challenges can be of financial nature (i.e. lack of access to financial markets and resources, business acumen), non-financial (i.e. lack of skills, lack of understanding of technology) and/or administrative (i.e. coordination, assessment and monitoring).

According to Ashok Kumar Panigrahi (2012), despite constituting more than 80% of the total number of industrial enterprises and supporting industrial development, many MSMEs in India have problems such as sub-optimal scale of operation, technological obsolescence, supply chain inefficiencies, increasing domestic and uncertain market scenario.

Lack of availability of adequate and timely credit from banks- Presently, high interest rates, high risk perception among the banks, unreasonable collateral demand, restrictive and conditional working capital limits and huge procedural transaction cost often creates problem for the MSMEs in availing easy credit from the banks as it does not have any alternative sources of finance (Pema lama, 2012 & 2013).

Uma, P (2013) observed that, lack of quality consciousness, lack of financial strength, and lack of industrial work culture are the major weaknesses of MSMEs in India.

Some major problems that approximately 80% MSME entrepreneurs face on a day-to-day basis while trying to obtain credit assistance for their business operations are as follows (Mishu Tripathi et al. 2016):

²⁴⁰ Annual Report of MSMEs 2016-17

Complex collaterals required to obtain term loans

1. High transaction costs in imports/exports
2. Private Equity Funding is difficult to obtain
3. Banks offer high rates for term loans
4. Private equity (PE) dilutes control in the company
5. Un-standardised project appraisal system for term loans
6. Cumbersome procedures and delay in fund disbursement

As found by Anshul Pachouri and Sankalp Sharma (2016), despite the numerous challenges, the SME sector in India has performed well. There are distinct barriers to innovation, the most important of which seems to be government policy. This leads to the adage that “entrepreneurs grow not due to the government in India, but despite the government.” However, a deeper analysis leads one to conclude that the government is trying to facilitate the growth of SMEs by promoting various schemes and programs to facilitate innovation in the sector through its distinct institutions. The Science, Technology and Innovation Policy 2013 has had an impact but the institutional functioning of the government, Council of Scientific and Industrial Research labs, and individual firms often does not match.

The OECD (2017) report enlightens that, in India, most concerns relating to general and business skills are a challenge primarily faced by potential entrepreneurs while growth companies primarily face challenges relating to a lack of individual financial literacy, financial exclusion and a lack of awareness/knowledge of financing options. Complexity of financing options was not considered to be a concern or priority to be addressed in India, though this may be due to a lack of data or less complex instruments.

Access to finance, market, people, infrastructure and technology are the major challenges of MSMEs in India (Sonu Garg, & Parul Agarwal, 2017).

Moloy Ghoshal (2017) identified that Indian MSMEs are lagging behind of China because of difference in outlook of government policies for development, more focus on public sector undertakings, late starting of reforms, and slow pace of infrastructure development.

The annual report of MSME (2016-17) reveals that the Indian economy thrives through the process of creation of enterprises. The MSMEs have been contributing to expansion of entrepreneurial culture through business innovations. The MSMEs are widely dispersed across sectors of the economy, producing diverse range of products and services to meet the demands of local as well as global markets. The contribution of MSMEs to GDP 6%, 33% in manufacturing sector and 45% in exports. It shows the valuable contribution that the MSME sector is making in the economy, both in terms of manufacturing and services.

Despite of the importance of the MSMEs in Indian economic growth, the sector is facing challenges and does not get the required support from the concerned Government Departments, Banks, Financial Institutions and Corporate which is proving to be a hurdle in the growth path of the MSMEs. The list of the problems that are faced by existing/new companies in SME sector are as under (Challenges to MSME, 2018):

1. Absence of adequate and timely banking finance
2. Limited capital and knowledge
3. Non-availability of suitable technology
4. Low production capacity
5. Ineffective marketing strategy
6. Constraints on modernisation & expansions
7. Non availability of skilled labour at affordable cost
8. Follow up with various government agencies to resolve problems due to lack of man power and knowledge etc.

METHODOLOGY

This conceptual paper is prepared based on secondary sources like, Annual Reports, Research Reports, Research Papers etc.

IMPORTANCE OF THE STUDY

All economies in the world are directly or indirectly depending on the contribution of MSMEs. India is not an exception. Though their contribution to the economy is significant, they have been facing challenges in different ways. Unless and until they are addressed, the expected contribution from them will remain a dream. In the light of this background, the present study focuses on the current contribution and challenges of MSMEs in India and probable solutions to address them.

LIMITATION

There many sources on MSMEs in India. While preparing this paper, the researchers consulted some of the prominent reports but not all. Some reports, which deserve to be looked into, might be missing. This might have some affect on the findings and conclusion.

OBJECTIVES

The following are the objectives of the study:

- to study the structure, growth and contribution of MSMEs in India; and
- to outline the challenges of MSMEs and suggest suitable measures for their improvement based on the findings of the study.

DEFINITION OF MSMEs IN INDIA

According to MSME Act, 2006, MSMEs in India are defined based on their investment in plant and machinery in manufacturing and equipment in service enterprises.

Category	Investment limit (in INR)
Micro - Manufacturing	< 25 ₹ lakh investment in plant and machinery
Micro -Services	< 10 ₹ lakh investment in equipment
Small - Manufacturing	< 5 ₹ crore investment in plant and machinery
Small - Services	< 2 ₹ crore investment in equipment
Medium - Manufacturing	< 10 ₹ crore investment in plant and machinery
Medium - Services	< 5 ₹ crore investment in equipment

GROWTH AND CONTRIBUTION

In India, MSMEs have been playing dominant role in the growth of Indian economy since reforms period (!991). As on today, they are contributing 33% of the total manufacturing output, 45% of exports and 6% of GDP(MSMEs Annual Report, 2016-17).

The Micro, Small and Medium Enterprises Development (MSMED) Act, 2006, provides for the filing of Memorandum for Enterprises. It empowers the Central Government to undertake programmes and issue guidelines and instructions to develop and enhance the competitiveness of MSMEs.

One of the critical indicators to access successful development of MSME sector in an economy is the data on opening of new MSMEs; it depicts the conducive environment for opening and growth of such units in an economy as well as show the high morale of entrepreneurs in the macro economics of the economy.

The data from the Entrepreneur Memorandum Part II(EM-II) filed at DICs (District Industries Centres) provides the information in the following paras about the growth and performance of MSMEs.

Number of EM-II filed during 2007-08 in the DICs across the country was 1.73 lakh. This has increased continuously during 2007-08 to 2014-15, the number of EM-II filings was 4.25 lakh.

The annual growth in the number of EM-II filings was 11 percent from 2007-08 to 2011-12. In 2014-15, the growth rate increased by 17 percent.

Since 2015, EM-II filings have been discontinued in favour of Udyog Aadhaar Memorandums - (UAMs). A total of 21,96,902 EM-II filings had taken place between 2007 and 2015. By contrast, 22,40,463 UAM filings have already taken place since 2015. An analysis of the EM-II filings is helpful in comparing overall trends within the sector. Since UAM filings have been introduced recently, their analysis is helpful in highlighting the current status of the sector.

An analysis of UAM filings also provides a break-up of manufacturing and services MSMEs. It must be noted that services MSMEs comprise a larger portion of UAM filings than those involved in manufacturing. It may therefore be noted that there is a progressive and healthy growth of the MSME sector that has resiliently withstood financial crisis and other shocks that have impacted the economy. The following table and figure followed by show the UAM-II filings during 2007-08 and 2014-15.

Table 1: UAM-II filings during 2007-08 and 2014-15

Year	No. of UAM-II filings (in lakhs)
2007-08	1.73
2008-09	1.93
2009-10	2.13
2010-11	2.38
2011-12	2.82
2012-13	3.23
2013-14	3.63
2014-15	4.25

Source: MSME Annual Report, 2016-17

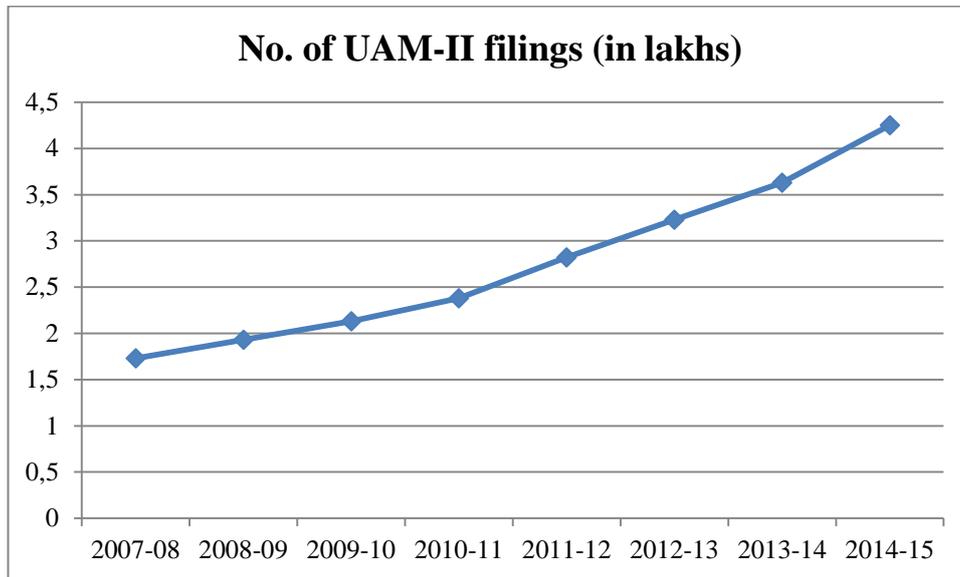


Fig 1: UAM-II filings

The growth rate of filings during this seven years period ranges from 10.45 to 17.18 per cent. The following table and figures display the facts.

Table 2: Rate of growth in UAM-II filings during 2007-08 and 2014-15

Year	Rate of growth in EM-II filings (in percentage)
2007-08 to 2008-09	11.77
2008-09 to 2009-10	10.45
2009-10 to 2010-11	11.83
2010-11 to 2011-12	18.45
2011-12 to 2012-13	14.3
2012-13 to 2013-14	12.44
2013-14 to 2014-15	17.18

Source: MSME Annual Report, 2016-17

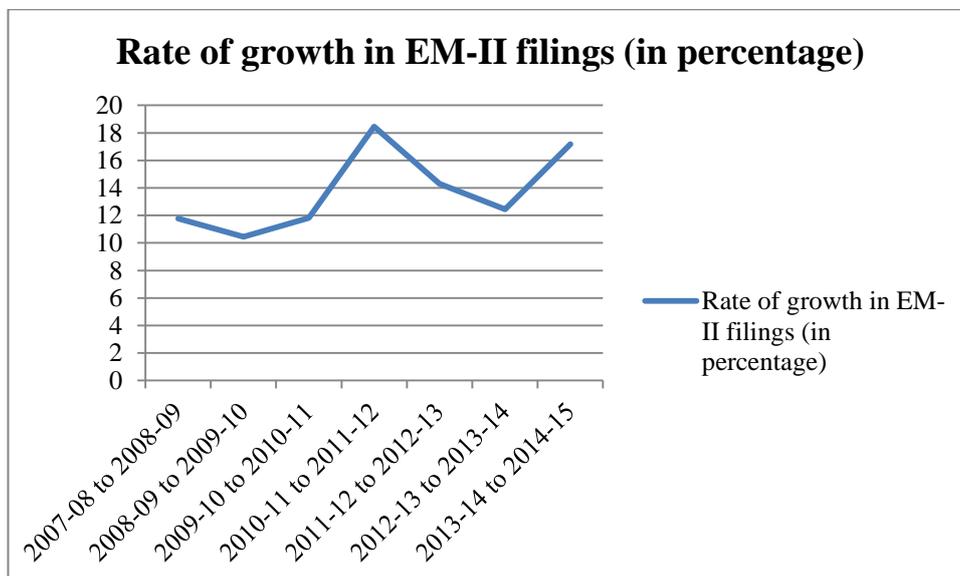


Fig 2: Rate of growth in EM-II filings

The Indian economy thrives through the process of creation of enterprises. The MSMEs have been contributing to expansion of entrepreneurial culture through business innovations. The MSMEs are widely dispersed across sectors of economy, producing diverse range of products and services to meet demands of local as well as global markets. The contribution of MSMEs in GDP is 6%, comprising of 33% in manufacturing sector, and 45% in exports. It shows the valuable contribution that the MSME sector is making in the economy, both in terms of manufacturing and services. The following table shows the share of MSME sector in GDP and total manufacturing output from 2011-12 to 2014-15.

Table 3: Share of MSME sector in GDP and total manufacturing output from 2011-12 to 2014-15

Share of MSME sector in GDP and total manufacturing output					
Manufacturing output at current price			Share of MSME GVA to GVA/GDP at constant price for the base year 2011-12(%)		
Year	MSME manufacturing	Share of MSME	MSME manufacturing sector	MSME services sector	Total

	output (₹ in crore)	output in the total Mfg. output (%)						
			In GVA	In GDP	In GVA	In GDP	In GVA	In GDP
2011-12	2167110	33.12	6.64	6.16	25.66	23.81	32.29	29.97
2012-13	2385248	33.22	6.77	6.27	26.05	24.13	32.89	30.40
2013-14	2653329	33.27	6.79	6.27	26.40	24.37	33.19	30.64
2014-15	2783343	33.40	6.63	6.11	26.72	24.63	33.34	30.74

Source: MSME Annual Report 2016-17.

The contribution of Gross Value Added (GVA)²⁴¹ of Manufacturing MSMEs to the economy at constant price with base year 2011-12 is 7 per cent (approx) of Gross Value Added (GVA) and 6 per cent (approx) of Gross Domestic Product (GDP)²⁴², amounting to more than 33 per cent of Manufacturing output²⁴³ at current price and also contributing to the tune of 45 per cent of exports of the country. This is as per the data available with Central Statistics Office (CSO). Ministry of Statistics & Programme implementation, Government of India, an approximation based on the results of Annual Survey of Industries (ASI) and survey on unorganised sector estimated contribution of the MSME sector to GVA, GDP and Manufacturing Output, during 2011-12 to 2014-15.

Source of data on MSMEs is taken from All India Census of MSMEs conducted by Ministry of Micro, Small and Medium Enterprises and Economic Census conducted by Central Statistics Office(CSO). Last All India Census of MSMEs was conducted for the year 2006 and results were published in 2011. Sixth Economic Census was conducted by CSO in 2013 and results were published in 2016. These Censuses being conducted with different methodology, criteria, definition and at different points of time give different results. The primary difference is that Economic Census collects data about all establishments including large, while Census of MSMEs collects data only for MSMEs. The percentage of large establishments in total is less than 1%. Therefore, the data on number of establishments in Economic Census could be used for total number of MSMEs. However, data on number of employees, production, etc cannot be used straight away for all MSMEs.

As per the Fourth All India Census of MSME covering both registered and unregistered sectors are shown in the table.

Table 4: Number of MSMEs as per Fourth All India Census

Sl. No.	Characteristics	Registered Sector	Unregistered Sector	Economic Census-2005	Total
1	No. of Enterprises (in lakh)	15.64	198.74	147.38	361.76
2	No. of rural Enterprises (in lakh)	7.07 (45.20%)	119.68 (60.22%)	73.43 (49.82%)	200.18 (55.34%)
3	No. of Enterprises owned by women (in lakh)	2.15 (13.72%)	18.06 (9.09%)	6.40 (4.34%)	26.61 (7.36%)
4	Employment (in lakh)	93.09	408.84	303.31	805.24
5	Per unit Employment	5.95	2.06	2.06	2.23

Source: MSME Annual Report 2016-17.

As per the estimates made using results of the sixth EC 2013 the results of which were published on the 31st March, 2016, the Fourth All India Census of MSME, 2006-07 and Fifth EC, 2005, the number of MSMEs and employment in MSME sector are 512.99 lakh and 1112.28 lakh respectively.

The volume of employment creation by the MSMEs is next only to that in agriculture. Thus the MSME sector has the potential of tapping individuals to associate with economic activities by way of self-employment. The All India Census of MSME was conducted with reference year 2006-07, wherein the data were collected till 2009 and results of the same were published in 2011-12. The results also made use of the Fifth Economic Census, 2005(EC,2005) conducted by CSO., for activities excluded from Fourth All India Census of MSMEs: 2006-07 for unregistered sector, namely wholesale/retail trade, legal, education & social services, hotel & restaurants, transports and storage& warehousing (except cold storage).

The primary difference between the Fourth All India Census of the MSME, 2006-07, and Sixth EC,2013, has enumerated all establishments engaged in various agricultural and non-agricultural activities excluding crop production, plantation, public administration, defence and compulsory social security, whereas the Fourth All India Census of the MSMEs, 2006-07, covered only MSME manufacturing and service sector establishments/enterprises which were defined as MSME under the MSME Act, 2006, thus, excluding large enterprises, retail and whole sale trading establishments amongst other.

As per the results of the Sixth Economic Census 2013, non-agricultural enterprises constitute 77.6 percent or more than three-fourths of all establishments (excluding crop production, plantation, public administration, compulsory social

²⁴¹ Gross Value Added (GVA): It may be noted that estimates of GVA had been prepared at factor cost in the earlier series (base year 2004-05), while these are being prepared at basic prices in the new series (2011-12). GVA estimated by production approach: (GVA= Output-Material Inputs) and GVA estimated by income approach: (GVA= Compensation of employees + operating surplus + CFC).

²⁴² Gross Domestic Product (GDP): GDP is derived by adding taxes on products, net of subsidies on products, to GVA at basic prices.

²⁴³ Manufacturing output: Manufacturing output is defined to include the ex-factory value, (i.e., exclusive of taxes, duties etc on sale and inclusive of subsidies etc., if any) of products and by-products manufactured during the accounting year, and the net value of semi-finished goods, work-in-progress, and also the receipts for industrial and non-industrial services rendered to others, value of semi-finished goods of last year sold in the current year, sale value of goods sold in the same condition as purchased and value of electricity generated and sold (Definitions above are from the CSO).

security) in the country. The non-agricultural sector that includes MSMEs and large establishments employed a total of 10,84,11,367 persons. This number is 82.6 percent of the total employment in agricultural and non-agricultural establishments (excluding crop production, plantation, public administration, and compulsory social security).

Most establishments were self-financed. A total of 35.48 million (78.2%) non-agricultural establishments were self-financed. In rural India 72.7% of the non-agricultural establishments were self-financed whereas this figure was 83.7% in urban India. This indicated the challenge of providing adequate financing to MSMEs in both rural and urban areas. It also highlights the challenge of providing other sources of financial credit and assistance for MSMEs, in order to enable greater capital investment within this sector. The following table shows the number of MSMEs, their employment generation and market value of fixed assets during 2006-07 and 2014-15.

Table 5: Total number of working MSMEs, Employment generation and Market Value of Fixed Assets during 2006-07 and 2014-15

	Total Working Enterprises (in Lakh)	Employment (in Lakh)	Market Value of Fixed Assets (in Crore)
2006-07	361.76	805.23	868543.79
2007-08	377.36	842	920459.84
2008-09	393.7	880.84	977114.72
2009-10	410.8	921.79	1038546.08
2010-11	428.73	965.15	1105934.09
2011-12	447.64	1011.69	1182757.64
2012-13	467.54	1061.4	1268763.67
2013-14	488.46	1114.29	1363700.54
2014-15	510.57	1171.32	1471912.94

Source: MSME Annual Report 2016-17

CHALLENGES

MSMEs in India, no doubt, are contributing to the economy a lot in the form of their number, employment, production and exports. It is also a fact that they are facing several challenges.

From the review of literature, it can easily be said that in India, MSMEs are struggling with many problems like finance, marketing, technology, human resources, infrastructure etc., despite of the efforts put in by the government through its policy measures, support and new initiatives. It is not exaggeration to say that if MSMEs are problem free, their contribution to the economy would be much better than what it is now.

The above challenges are the stumbling blocks for the growth of MSMEs in India. The growth of these enterprises has a direct effect on the GDP. Developed economies have always given specific policy thrusts for their development and yielded good results. For example, Taiwan, Italy, China, France, South Africa, Germany, UK, Singapore and US have contributed 85, 68, 60, 59, 57, 54, 50,50, and 48% respectively to their economies during 2013 (Maximilan ROBU, 2013). But in India the contribution of MSMEs to GDP is only 37.54%; where 7.28% is from manufacturing and the remaining from services in the same period. As on today, they are contributing still less i.e. 33% of the total manufacturing output, and 6% of GDP (MSMEs Annual Report, 2016-17). After economic reforms, when the Indian market was forced to open up, the real challenges began to MSMEs in India. Even after two and half decades since reforms, the Indian MSMEs could not face competition from countries like China because of the challenges they are facing..

FINDINGS

From the above secondary information, the following findings can be drawn:

1. The MSMEs are playing dominant role in the Indian economy contributing considerably for employment, production and exports.
2. The government of India has been supporting MSMEs through its policy measures and pronouncements.
3. Despite government support, MSMEs in India are still facing challenges like finance, marketing, technology, infrastructure etc.
4. Competition from countries like China makes Indian MSMEs more worried.

SUGGESTIONS

Based on the findings, the following suggestions can be made:

1. Government support for MSMEs should be continued, particularly for skill and infrastructural development; technological enhancement; marketing assistance; and timely finance.
2. MSME associations and the government should continuously find the ways for increase in the contribution of MSMEs to the economy without leaving any scope for weakening of these enterprises.

CONCLUSION

To survive and grow fast in the present competitive world, MSMEs in India should become strong in all fronts and face any challenge that comes from inside the country or outside. In addition to the government, the entrepreneurs should

also take active part in making these enterprises strong through finding other sources of finance, developing infrastructure, upgrading technologies and improving their marketing strategies.

REFERENCES

- Annual Report 2016-17. Government of India, Ministry of Micro, Small and Medium Enterprises
- Anshul Pachouri., & Sankalp Sharma. (2016). Barriers to Innovation in Indian SMEs. In SMEs in Developing Asia (New Approaches to Overcoming Market Failures), Asian Development Bank Institute, Tokyo.
- Ashok Kumar Panigrahi. (2012). Risk Management in Micro, Small and Medium Enterprises (MSMEs) in India: A Critical Appraisal. *Asia Pacific Journal of Marketing & Management Review*, Vol. 1(4), 59-72.
- Challenges to MSME.(2018). Chamber of Indian Micro Small & Medium Enterprises, https://www.indiansmechamber.com/challenges_to_msme.php
- Mishu Tripathi., Saurabh Tripathi., & Rikin Dedhia. (2016). Challenges faced by Micro, Small and Medium Enterprise (MSME) Sector in India. *4th International Conference on Recent Innovations in Science, Engineering and Management*, 20th March, 849 - 857.
- Moloy Ghoshal. (2017). Trade Performance of India and China in Micro, Small and Medium Enterprises Sector- A Case Study. *XVIII Annual International Conference Proceedings*.
- Maximilan ROBU. (2013). The dynamic and importance of SMEs in Economy. *The USV Annals of Economics and Public Administration*, Vol. 13, Issue 1(17), 19, 20 &25.
- OECD. (2017). Financial Education of Micro, Small and Medium-sized Enterprises in Asia.
- Pema lama. (2012 & 2013). Micro, Small and Medium Enterprises (MSMEs) in India - Problems and Prospects. *Business Studies*, Vol. XXXIII & XXXIV, 106-116.
- Sonu Garg., & Parul Agarwal. (2017). Micro, Small and Medium Enterprises in India: A Review of Growth and Challenges in the Present Scenario. *International Journal of Applied Business and Economic Research*, Vol 15, NO.4, 569-580.
- Uma, P. (2013). Role of SMEs in Economic Development of India. A Critical Appraisal. *Asia Pacific Journal of Marketing & Management Review*, Vol. 2(6), 120-128..
- Urata, S.J., & Jigyodan, K.K.R. (2000). Policy recommendation for SME promotion in the republic of Indonesia. Jakarta, JICA.

1687 MAPPING CHINA'S FOREIGN DIRECT INVESTMENT IN THE GLOBAL ENERGY SECTOR

ABSTRACT

As China's current account surplus has grown and the nation has liberalized its capital account, Chinese overseas foreign direct investment has increased significantly. In 2016, Chinese overseas foreign investment flows were more than \$1.3 trillion and outward investment from Hong Kong was \$1.5 trillion, combining to \$2.8 trillion in total—up a factor of 10 since 2005 and second only second to the United States in total outbound foreign direct investment. This paper examines the extent to which Chinese overseas foreign investment is significantly different from the United States and other OECD foreign investors in general, and with a specific focus on electricity energy sector. After creating a unique spatial database, merging disparate datasets, that allows us to analyze both greenfield and merger

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RS07.1. Methods in Regional Science and Urban Economics

1086 INDUSTRIAL STRUCTURAL CHANGES AND REGIONAL SPILLOVER EFFECTS: USING THE INTERREGIONAL INPUT-OUTPUT TABLE IN JAPAN

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ABSTRACT

The input-output analysis has been used for many years as a tool to measure the economic effect when economic shocks occurred. However, editing of data is very difficult. In this study, it is assumed that changes in the industrial structure are stochastically performed on data difficulties related to the input-output table. Then, we conduct an input-output analysis under the stochastically estimated input-output table. Specifically, the input coefficient required for the input-output analysis fluctuates stochastically, and the spillover effect is estimated under the fluctuating input coefficient.

As a case study, we use an interregional input-output table consisting of two regions, Fukuoka prefecture and other prefectures (the rest of Japan). Based on the input coefficient of the most recent 2011 table, we generate random numbers with the standard deviation of input coefficients of 1995, 2000, 2005 and 2011 tables as the variation range, and carry out the Monte Carlo experiment.

Since the standard deviation of the input coefficient used for the experiment depends on the past input-output table, the fluctuation becomes relatively small. However, there were still differences between industry sectors and simulation patterns.

JEL classification: C15, C67, D57, O53, R15

Keywords: Interregional Input-Output Model, Regional Spillover Effects, Fukuoka Prefecture, Monte Carlo Experiment

1. INTRODUCTION

The input-output analysis has been used for many years as a tool to measure the economic effect when economic shocks occurred (Miller and Blair, 2009). The input-output table as its basic information has advantages in that the transaction structure between industries is shown in detail, but it takes a huge amount of time to edit the table. Therefore, the input-output table will be published at a frequency of once every several years. However, this cannot analyze with relatively new data. Therefore, sometimes trying to solve this problem by adding some new data based on the original data and estimating a table of a relatively new year.

The input-output table is usually edited in one country or one region. However, the economy will never be completed in one country, one region. Transaction information outside the country and outside the region is necessary. For this purpose, an interregional input-output table is created. This will reveal transactions from one industry in one area to another industry in another area. However, it is very difficult to obtain transaction information.

In any case, in order to conduct the input-output analysis, it is necessary to have an input-output table which requires huge amount of statistics. For the data difficulty in the input-output table, in this study, it is assumed that the change of the industrial structure is stochastically performed. Then, we conduct an input-output analysis under the stochastically estimated input-output table. Specifically, the input coefficient required for the input-output analysis fluctuates stochastically, and the spillover effect is estimated under the fluctuating input coefficient. Stochastic fluctuations in the industrial structure are made by Monte Carlo experiments. We use an interregional input-output table consisting of two regions, Fukuoka prefecture and other prefectures (the rest of Japan) as a case study. Moreover, the spillover effect also fluctuates, so the magnitude of the fluctuation range becomes the focus of study.

2. THE MODEL

As known well, input-output analysis consists of two basic models, quantity and price. The quantity model is $X=(I-A)^{-1}F$, where A is a matrix of direct-input coefficient,²⁴⁴ X and F are vectors of output and final demand in monetary values. The price model is $P=(I-A')^{-1}V$, where A' is a transposing of A , P and V are vectors of price and value-added. It can also be said the quantity model is featured the demand side and the price model is the supply side.²⁴⁵ Various analyses are developed by making one of these two models (those many being the quantity models) decompose intricately. In this study, we analyze changes in industrial structure in each of the two models. The inverse matrix in the input-output analysis can be easily calculated by Excel and others. However, since the objective of this study is in the Monte Carlo experiment, another software is used to organize the measurement results more easily.²⁴⁶ Therefore, return each model to its form before being expanded to the inverse matrix.

²⁴⁴ $A=Zx-1$, where Z is a matrix of inter-industry sales in monetary values and x is a diagonal matrix with the elements of the vector X along the main diagonal.

²⁴⁵ This argument is based on Leontief model (Leontief, 1936, 1941, and 1986). As a model which treats a supply side quantitatively, Ghosh (1958) suggests other model using direct-output coefficient ($B=x-1Z$).

²⁴⁶ This model is carried by GAMS (General Algebraic Modeling System) program. We use a solver to solve the optimization problem (CONOPT), but the equation written in the text is not an optimization problem, so we set up a fictitious optimization problem on the program code.

$$X_{r,i} \cdot x_{r,i} = \sum_s \sum_j \alpha_{s,r,i,j}^A \cdot X_{s,j} \cdot x_{s,j} + \sum_s \sum_d \alpha_{s,r,i,d}^F \cdot f_{s,d} + \alpha_{r,i}^E \cdot e - \alpha_{r,i}^M \cdot X_{r,i} \cdot x_{r,i} + ex_{r,i} \quad (1)$$

This is a so-called quantity model. The production-goods demand ($X \cdot x$) consists of the intermediate-goods demand $A \cdot X \cdot x$ ($\alpha \cdot X \cdot x$), the final demand f , export e , and import (function of production goods). ex is an adjustment term that exists in the table. α is a parameter to each demand and it is calibrated from the database. Needless to say, α^A is an input coefficient, and this coefficient varies according to the Monte Carlo experiment. As a point to note, the left side is ($X \cdot x$). X is an index and becomes an endogenous variable, and x is an exogenous variable with a number obtained from the data. More specifically, x is a fixed production quantity, and as X varies, the amount of production after simulation is calculated in the form of $X \cdot x$. Therefore, in the initial equilibrium solution, X is 1. Subscript at the lower right of each variable r and s are represented region, i and j are represented industry, d is represented demand item, and v is represented value-added item, respectively.

$$P_{r,i} = \sum_s \sum_j \alpha_{r,s,j,i}^A \cdot P_{s,j} + \sum_v \alpha_{r,v,i}^V \quad (2)$$

This is a so-called price model, which is a mathematical expression before it is expanded into an inverse matrix. As you can see from the equations, these two equations are independent and have common exogenous input coefficients α^A . Therefore, each can be regarded as a problem of independence. However, in this study, two separate equations were calculated by one program in order to save computational complexity.

3. DATA AND SIMULATION

Fukuoka prefecture (Fukuoka-ken) is a prefecture of Japan located on Kyushu Island. It faces the sea on three sides, bordering on Saga, Oita, and Kumamoto prefectures and facing Yamaguchi Prefecture across the Kanmon Straits. It is also located near the Korean peninsula. There are 60 municipalities (28 cities, 30 towns and two villages) including two government-designated major cities: the Fukuoka city, the capital and central city in Fukuoka Prefecture, and the Kitakyushu city, a big city with a population of about one million. It also has the largest economic scale in Kyushu region.

We use a data of inter-regional input-output table of Fukuoka prefecture. This table is constructed two regions of Fukuoka prefecture (hereinafter sometimes uses “*fp*”) and other prefectures (hereinafter sometimes uses “*op*”) in Japan. Currently, the tables of 1995, 2000, 2005 and 2011 are available, but the number of industrial sectors in each table is different (37, 37, 39, 42 industrial sectors respectively). On the other hand, tables of 13 industrial sectors where more industrial sectors were consolidated are also published at the same time, so we will use these 13 sectors tables in this study (see, Table 1).

Next, the variation of the industrial structure will be explained. It is assumed that the fluctuation of the industrial structure is caused by a change in input coefficient of the input-output table. Since the input coefficient is a key part of the input-output analysis, it is expected that the solution of the quantity model and the price model (that is, the spillover effect) will change by changing this coefficient.

By the way, in the case of interregional input-output tables between two regions, input coefficients can be divided into four according to regions (*fp* to *fp*, *fp* to *op*, *op* to *fp*, and *op* to *op*). Therefore, in this study, five Monte Carlo experiment patterns are set, centering on input coefficient in Fukuoka prefecture. In the Monte Carlo experiment, random numbers are generated in the input coefficients to give variations. Random numbers follow a normal distribution with an average of 1. The standard deviation is not necessarily the same. Here, we use the calculated standard deviation of the input coefficients in the tables of 1995, 2000, 2005, 2011 (only four data points). We use the latest 2011 table as the reference input coefficient. In other words, experiment is carried out by multiplying a part (whole) of input coefficient of 2011 table by a normal random number. Furthermore, in order to set more complicated random numbers, experiments were conducted by generating the normal random number twice and multiplying them by the input coefficient. Therefore, a total of 10 experimental patterns were set together with five regional patterns (see, Table 2).

4. RESULTS

Tables 3 to 6 show standard deviations used for Monte Carlo experiments. The calculation method is the standard deviation of the input coefficient between the four data points as described above. It is rounded off to the fourth digit after the decimal point and even if a result of the standard deviation which is considerably small in computation comes out, it is treated as 0 (0.0000). Needless to say, when the standard deviation is 0, the input coefficient does not fluctuate. In some places, it is indicated as 0.0000, and for these input-output combinations, the input coefficient does not change. Also, the standard deviation itself is not too large. Therefore, it seems that the change in industrial structure during the period (1995-2011) was not so big. At the same time, it is expected that there will be no extreme fluctuation in output amount and price even as a result of Monte Carlo experiments to be shown from now.

Before describing the details of the results, introduce the results of the overall Monte Carlo experiment. Table 7 summarizes the changes in production in all Monte Carlo experiments by region. Random numbers were generated 500 times each. The table lists the maximum, minimum, average, and standard deviation of output (x) in each region. Needless to say, since the input coefficient multiplies the random number of 1 on average, the average value of production is quite close to 1.000000. Therefore, the difference between the maximum value, the minimum value and the standard deviation in each simulation and region is compared.

In simulation 1, the fluctuation range of the output in Fukuoka prefecture is a very small difference of 0.6% to -0.6%. In other prefectures, the fluctuation was not so large from 1.4% to -1.3%, but it was found to be larger than Fukuoka prefecture. In Japan as a whole, the fluctuation range is slightly smaller than other prefectures. The standard deviation is

0.2362% for Fukuoka prefecture, 0.4960% for other prefectures, 0.4853% for Japan. Likewise, the fluctuation range is never large, and it is considered that the fluctuation of the industrial structure is not so large. In each of simulations 2 to 5, the input coefficients in other prefectures do not fluctuate. In this case, the fluctuation in the output of other prefectures becomes extremely small (0.0027% to 0.0141% with standard deviation). Also, because of the difference in economic scale between Fukuoka prefecture and other prefectures (46 prefectures), fluctuations in the output are extremely small in Japan (0.0073% to 0.0154% with standard deviation). Furthermore, due to the absence of changes in other prefectures, fluctuations in Fukuoka prefecture are also smaller than in simulation 1 (0.1347% to 0.1378% with standard deviation). However, the standard deviation in other prefectures and Japan in simulations 3 and 5 is larger than simulations 2 and 4. In simulations 3 and 5, input coefficients from other prefectures to Fukuoka prefecture fluctuate. It is understood that the production in other prefectures is slightly affected by the import demand from other prefectures in Fukuoka prefecture.

Simulations 6 to 10 make the random number generation method more complicated for simulations 1 to 5. This shows that the fluctuation range of the output is larger. For example, the standard deviations of simulation 6 were 0.3354%, 0.6824% and 0.6679%, respectively. The same applies to other simulations. By making the random number generation more complicated, we succeeded in creating possibilities of more complicated results.

Tables 8 to 17 are experimental results of Monte Carlo experiments with respective simulation patterns. The table also lists the maximum, minimum, average, and standard deviation of output (x) and price (p) in each industry in each region.

In simulation 1, in the case of Fukuoka prefecture, the industrial sector with large standard deviation was mining (fp-i002, output is 1.7945%, price is 1.5454%). In manufacturing, price fluctuations are relatively large (fp-i003, output is 0.5780, price is 1.2177%). The more extreme is electricity, water and gas supply (fp-i005, output is 0.1910, price is 1.0987%). On the other hand, communication is somewhat large (fp-s010, output is 0.7300%, price is 0.7737%). In the case of other prefectures, mining has large fluctuations in output and price fluctuation is small (op-i002, output is 2.8089%, price is 0.4665%). On the contrary, electricity, water and gas supply has large fluctuations in price and fluctuation in output is small (op-s005, output is 0.4432%, price is 2.6202%). In manufacturing, both output and price are relatively large (op-i003, output is 1.2250%, price is 1.6638%), the next is agriculture (op-a001, output is 0.7483%, price is 0.7581%) and communication (op-s010, output is 0.6426%, price is 0.7072%). In addition, although activities not elsewhere classified (fp-s013 and op-s013) has relatively large fluctuation, it is not taken up here.

Simulations 2 to 5 are almost the same as the trends of the results in Table 7. Changes in other prefectures are rather small. The fluctuation in Fukuoka prefecture is high in mining, but the next highest is communication. Regarding price fluctuations, electricity, water and gas supply is also large. Meanwhile, in manufacturing, price fluctuations of simulations 3 and 5 become large. This tendency was the same in the simulations 6 to 10 which made the random number generation more complicated.

In this way, we found that the fluctuations vary among industries. However, in the case of Japan, mining is not flourishing because it is not a resource-rich country. Therefore, even if the fluctuation of mining is large, the impact on the Japanese economy is small. The manufacturing industry also has a 20% to 25% share of importance. The relatively large price fluctuation of electricity, water and gas supply may affect consumption life. Although there is not much fluctuation compared with these industrial sectors, communication will be an important industry in the future. It is said that the ICT revolution was thriving, and it is expected to grow greatly in the future.

5. CONCLUDING REMARKS

In this study, in order to compensate for the difficulty of data editing in the input-output table and the input-output analysis, the input coefficients were varied by Monte Carlo experiments, and fluctuations in output and price were analyzed. As a case study, we use an interregional input-output table consisting of two regions, Fukuoka prefecture and other prefectures (the rest of Japan). Since the standard deviation of the input coefficient used for the experiment depends on the past input-output table, the fluctuation becomes relatively small. However, there were still differences between industry sectors and simulation patterns. And it turned out that fluctuations in mining, manufacturing, electricity, water and gas supply and communication are relatively large. In particular, since communication is a promising industrial sector, it is necessary to pay attention to future trends.

REFERENCES

- Ghosh, Ambica, 1958. "Input-Output Approach to an Allocation System," *Economica*, 25, pp. 58-64.
 Leontief, Wassily, 1936. "Quantitative Input-Output Relations in the Economic System of the United States," *Review of Economics and Statistics*, 18, pp. 105-125.
 Leontief, Wassily, 1941. *The Structure of American Economy 1919-1939*, Oxford University Press.
 Leontief, Wassily, 1986. *Input-Output Economics 2nd edition*, Oxford University Press.
 Miller, Ronald E. and Peter D. Blair, 2009. *Input-Output Analysis: Foundations and Extensions 2nd edition*, Cambridge University Press.

Table 1 Industry Classification

	Industry
a001	Agriculture, forestry and fishing
i002	Mining
i003	Manufacturing
i004	Construction

s005	Electricity, water and gas supply
s006	Wholesale and retail trade
s007	Finance and insurance
s008	Real estate
s009	Transport
s010	Communications
s011	Public administration
s012	Other service
s013	Activities not elsewhere classified

(Source) Inter-regional IO table of Fukuoka prefecture

Table 2 Monte Carlo Experiments

	Experimental method	Input coefficients
Simulation 1	All input coefficients are uncertain	<i>fp to fp, fp to op, op to fp, op to op</i>
Simulation 2	Fukuoka prefecture's input coefficients are uncertain	<i>fp to fp</i>
Simulation 3	Fukuoka prefecture's input coefficients and export coefficients are uncertain	<i>fp to fp, fp to op</i>
Simulation 4	Fukuoka prefecture's input coefficients and import coefficients are uncertain	<i>fp to fp, op to fp</i>
Simulation 5	Fukuoka prefecture's input coefficients and export and import coefficients are uncertain	<i>fp to fp, fp to op, op to fp</i>
Simulation 6	All input coefficients are uncertain (generate random numbers twice and multiply)	<i>fp to fp, fp to op, op to fp, op to op</i>
Simulation 7	Fukuoka prefecture's input coefficients are uncertain (multiply)	<i>fp to fp</i>
Simulation 8	Fukuoka prefecture's input coefficients and export coefficients are uncertain (multiply)	<i>fp to fp, fp to op</i>
Simulation 9	Fukuoka prefecture's input coefficients and import coefficients are uncertain (multiply)	<i>fp to fp, op to fp</i>
Simulation 10	Fukuoka prefecture's input coefficients and export and import coefficients are uncertain (multiply)	<i>fp to fp, fp to op, op to fp</i>

(Note) Generate normal random numbers based on the average of 1 and standard deviation based on Table 3 to Table 6. From simulation 6 onwards, we tried experiments with more complex uncertainty by multiplying normal random numbers.

Table 3 Standard Deviation 1

	fp-a001	fp-i002	fp-i003	fp-i004	fp-s005	fp-s006	fp-s007
fp-a001	0.0028	0.0006	0.0009	0.0002	0.0000	0.0000	0.0000
fp-i002	0.0000	0.0006	0.0073	0.0014	0.0461	0.0000	0.0000
fp-i003	0.0082	0.0010	0.0204	0.0028	0.0027	0.0013	0.0007
fp-i004	0.0014	0.0005	0.0010	0.0005	0.0020	0.0002	0.0005
fp-s005	0.0014	0.0099	0.0027	0.0006	0.0123	0.0025	0.0005
fp-s006	0.0148	0.0107	0.0194	0.0209	0.0105	0.0062	0.0018
fp-s007	0.0095	0.0141	0.0029	0.0019	0.0043	0.0145	0.0142
fp-s008	0.0014	0.0017	0.0006	0.0010	0.0013	0.0039	0.0024
fp-s009	0.0041	0.0517	0.0029	0.0030	0.0012	0.0012	0.0047
fp-s010	0.0012	0.0015	0.0011	0.0021	0.0068	0.0064	0.0144
fp-s011	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
fp-s012	0.0037	0.0054	0.0081	0.0104	0.0050	0.0081	0.0123
fp-s013	0.0032	0.0042	0.0021	0.0050	0.0004	0.0008	0.0015
op-a001	0.0060	0.0004	0.0016	0.0002	0.0000	0.0000	0.0000
op-i002	0.0000	0.0005	0.0035	0.0007	0.0323	0.0000	0.0000
op-i003	0.0141	0.0085	0.0241	0.0129	0.0094	0.0016	0.0022
op-i004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
op-s005	0.0011	0.0020	0.0014	0.0004	0.0101	0.0020	0.0004
op-s006	0.0150	0.0065	0.0118	0.0179	0.0042	0.0051	0.0016
op-s007	0.0025	0.0034	0.0010	0.0007	0.0021	0.0047	0.0067
op-s008	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	0.0001
op-s009	0.0011	0.0106	0.0009	0.0010	0.0008	0.0015	0.0010
op-s010	0.0002	0.0005	0.0004	0.0006	0.0016	0.0021	0.0031
op-s011	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
op-s012	0.0012	0.0015	0.0019	0.0046	0.0036	0.0031	0.0038
op-s013	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000

Table 4 Standard Deviation 2

	fp-s008	fp-s009	fp-s010	fp-s011	fp-s012	fp-s013
fp-a001	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000
fp-i002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
fp-i003	0.0002	0.0036	0.0062	0.0028	0.0010	0.0091
fp-i004	0.0039	0.0013	0.0026	0.0022	0.0007	0.0000

fp-s005	0.0008	0.0020	0.0022	0.0103	0.0027	0.0053
fp-s006	0.0002	0.0117	0.0071	0.0049	0.0154	0.0084
fp-s007	0.0114	0.0118	0.0069	0.0152	0.0067	0.2126
fp-s008	0.0090	0.0032	0.0024	0.0004	0.0021	0.0062
fp-s009	0.0002	0.0103	0.0022	0.0024	0.0008	0.0085
fp-s010	0.0015	0.0015	0.0368	0.0060	0.0057	0.0094
fp-s011	0.0000	0.0000	0.0000	0.0000	0.0000	0.0814
fp-s012	0.0067	0.0068	0.0133	0.0133	0.0072	0.0227
fp-s013	0.0016	0.0013	0.0027	0.0291	0.0022	0.0000
op-a001	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000
op-i002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
op-i003	0.0003	0.0156	0.0080	0.0084	0.0087	0.0116
op-i004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
op-s005	0.0007	0.0007	0.0007	0.0007	0.0015	0.0006
op-s006	0.0005	0.0066	0.0030	0.0032	0.0104	0.0021
op-s007	0.0036	0.0043	0.0012	0.0018	0.0022	0.0121
op-s008	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001
op-s009	0.0001	0.0025	0.0004	0.0009	0.0005	0.0017
op-s010	0.0002	0.0008	0.0058	0.0020	0.0023	0.0015
op-s011	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
op-s012	0.0017	0.0044	0.0066	0.0030	0.0030	0.0013
op-s013	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000

Table 5 Standard Deviation 3

	op-a001	op-i002	op-i003	op-i004	op-s005	op-s006	op-s007
fp-a001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
fp-i002	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000
fp-i003	0.0004	0.0001	0.0011	0.0005	0.0003	0.0001	0.0001
fp-i004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
fp-s005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
fp-s006	0.0006	0.0003	0.0006	0.0008	0.0002	0.0003	0.0001
fp-s007	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
fp-s008	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
fp-s009	0.0001	0.0002	0.0000	0.0000	0.0001	0.0001	0.0001
fp-s010	0.0000	0.0000	0.0000	0.0001	0.0000	0.0001	0.0001
fp-s011	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
fp-s012	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
fp-s013	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
op-a001	0.0062	0.0002	0.0023	0.0003	0.0000	0.0000	0.0000
op-i002	0.0000	0.0004	0.0164	0.0012	0.0848	0.0000	0.0000
op-i003	0.0225	0.0114	0.0192	0.0070	0.0126	0.0019	0.0022
op-i004	0.0010	0.0007	0.0003	0.0005	0.0013	0.0005	0.0009
op-s005	0.0023	0.0052	0.0009	0.0007	0.0218	0.0046	0.0002
op-s006	0.0050	0.0040	0.0013	0.0025	0.0030	0.0033	0.0006
op-s007	0.0121	0.0125	0.0032	0.0017	0.0049	0.0161	0.0178
op-s008	0.0008	0.0008	0.0007	0.0008	0.0012	0.0042	0.0023
op-s009	0.0030	0.0122	0.0013	0.0044	0.0037	0.0031	0.0062
op-s010	0.0011	0.0028	0.0022	0.0026	0.0077	0.0093	0.0188
op-s011	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
op-s012	0.0056	0.0115	0.0044	0.0101	0.0111	0.0091	0.0095
op-s013	0.0031	0.0030	0.0018	0.0049	0.0009	0.0005	0.0015

Table 6 Standard Deviation 4

	op-s008	op-s009	op-s010	op-s011	op-s012	op-s013
fp-a001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
fp-i002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
fp-i003	0.0000	0.0009	0.0002	0.0002	0.0003	0.0001
fp-i004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
fp-s005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
fp-s006	0.0000	0.0003	0.0002	0.0001	0.0004	0.0002
fp-s007	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
fp-s008	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
fp-s009	0.0000	0.0001	0.0000	0.0000	0.0000	0.0003
fp-s010	0.0000	0.0000	0.0005	0.0001	0.0001	0.0001
fp-s011	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
fp-s012	0.0000	0.0001	0.0002	0.0001	0.0001	0.0001
fp-s013	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

op-a001	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000
op-i002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
op-i003	0.0002	0.0133	0.0161	0.0129	0.0052	0.0052
op-i004	0.0041	0.0020	0.0020	0.0022	0.0002	0.0000
op-s005	0.0011	0.0020	0.0021	0.0078	0.0017	0.0019
op-s006	0.0003	0.0034	0.0050	0.0021	0.0017	0.0021
op-s007	0.0102	0.0169	0.0064	0.0166	0.0078	0.2128
op-s008	0.0067	0.0026	0.0040	0.0004	0.0023	0.0138
op-s009	0.0001	0.0048	0.0020	0.0013	0.0010	0.0199
op-s010	0.0012	0.0022	0.0320	0.0085	0.0103	0.0149
op-s011	0.0000	0.0000	0.0000	0.0000	0.0000	0.0739
op-s012	0.0052	0.0041	0.0170	0.0154	0.0090	0.0116
op-s013	0.0017	0.0014	0.0021	0.0072	0.0011	0.0000

Table 7 Results of Monte Carlo Experiments (Simulation 1 to 10)

		max	min	average	std.dev
Simulation 1	fp	1.006340	0.994058	1.000085	0.002362
	op	1.013927	0.986967	1.000049	0.004960
	jp	1.013646	0.987218	1.000050	0.004853
Simulation 2	fp	1.003867	0.995891	0.999985	0.001367
	op	1.000083	0.999913	0.999999	0.000027
	jp	1.000217	0.999771	0.999998	0.000074
Simulation 3	fp	1.004355	0.996211	0.999957	0.001347
	op	1.000476	0.999557	0.999994	0.000141
	jp	1.000570	0.999548	0.999993	0.000154
Simulation 4	fp	1.004260	0.996092	0.999955	0.001351
	op	1.000084	0.999923	0.999999	0.000027
	jp	1.000232	0.999789	0.999997	0.000073
Simulation 5	fp	1.004364	0.996116	1.000009	0.001378
	op	1.000416	0.999555	0.999992	0.000137
	jp	1.000447	0.999542	0.999993	0.000150
Simulation 6	fp	1.011087	0.991947	1.000069	0.003354
	op	1.023376	0.980478	1.000083	0.006824
	jp	1.022846	0.980954	1.000082	0.006679
Simulation 7	fp	1.006776	0.995001	0.999935	0.001980
	op	1.000133	0.999886	0.999999	0.000040
	jp	1.000358	0.999713	0.999997	0.000107
Simulation 8	fp	1.006727	0.994857	0.999970	0.002044
	op	1.000627	0.999457	0.999995	0.000198
	jp	1.000636	0.999355	0.999995	0.000221
Simulation 9	fp	1.006708	0.994681	0.999969	0.002053
	op	1.000135	0.999879	0.999999	0.000041
	jp	1.000359	0.999695	0.999998	0.000111
Simulation 10	fp	1.006722	0.994516	1.000069	0.002074
	op	1.000670	0.999458	1.000009	0.000203
	jp	1.000640	0.999429	1.000011	0.000221

Table 8 Results of Monte Carlo Experiments (Simulation 1)

	x				p			
	max	min	average	std.dev	max	min	average	std.dev
fp-a001	1.014650	0.986637	1.000044	0.004682	1.014325	0.987946	1.000024	0.004555
fp-i002	1.068112	0.952206	1.001444	0.017945	1.051410	0.957741	1.000724	0.015454
fp-i003	1.016583	0.983750	1.000034	0.005780	1.036542	0.969222	0.999887	0.012177
fp-i004	1.000898	0.998990	1.000034	0.000350	1.015624	0.987880	1.000007	0.005058
fp-s005	1.006303	0.995151	1.000025	0.001910	1.031041	0.965937	1.001012	0.010987
fp-s006	1.006402	0.992981	1.000025	0.002317	1.004599	0.996682	1.000039	0.001308
fp-s007	1.007415	0.992969	1.000069	0.002768	1.005620	0.993307	0.999998	0.001886
fp-s008	1.001385	0.998590	1.000013	0.000525	1.002978	0.997365	1.000024	0.000996

fp-s009	1.005917	0.994915	1.000075	0.002125	1.012840	0.989683	1.000129	0.004006
fp-s010	1.021828	0.979906	1.000984	0.007300	1.023602	0.979730	1.000920	0.007737
fp-s011	1.004901	0.995799	1.000096	0.001638	1.011656	0.991247	1.000136	0.003256
fp-s012	1.003933	0.996344	1.000061	0.001291	1.007624	0.992543	1.000110	0.002594
fp-s013	1.034037	0.966716	0.999684	0.009950	1.021474	0.980850	1.000378	0.007622
op-a001	1.021678	0.976281	1.000057	0.007483	1.024154	0.976746	0.999996	0.007581
op-i002	1.073108	0.922344	0.999261	0.028089	1.014162	0.987670	1.000045	0.004665
op-i003	1.034878	0.963765	1.000011	0.012250	1.048246	0.955943	1.000055	0.016638
op-i004	1.001731	0.998242	1.000008	0.000622	1.018128	0.984995	1.000126	0.005718
op-s005	1.013447	0.986964	1.000043	0.004432	1.068000	0.916122	0.999330	0.026202
op-s006	1.006879	0.993627	1.000016	0.002437	1.004760	0.995785	1.000046	0.001746
op-s007	1.009360	0.991379	0.999931	0.002845	1.008951	0.992639	1.000037	0.002610
op-s008	1.001604	0.998686	1.000033	0.000485	1.003641	0.997100	1.000011	0.001055
op-s009	1.008668	0.992126	1.000006	0.002890	1.016186	0.988585	0.999987	0.004254
op-s010	1.022690	0.979883	1.000210	0.006426	1.016948	0.978340	1.000390	0.007072
op-s011	1.007016	0.993376	1.000056	0.002327	1.009694	0.992390	1.000143	0.002666
op-s012	1.006209	0.994865	1.000120	0.002056	1.010441	0.991869	1.000003	0.003160
op-s013	1.010704	0.990159	1.000047	0.003751	1.059746	0.943553	1.000529	0.019046

Table 9 Results of Monte Carlo Experiments (Simulation 2)

	x				p			
	max	min	average	std.dev	max	min	average	std.dev
fp-a001	1.004765	0.994995	0.999924	0.001430	1.002804	0.997006	1.000008	0.000846
fp-i002	1.047731	0.941273	1.000740	0.017069	1.043617	0.957000	1.000535	0.014886
fp-i003	1.011732	0.987837	0.999787	0.003669	1.014806	0.985690	0.999835	0.004353
fp-i004	1.000728	0.999297	1.000008	0.000255	1.004081	0.995855	1.000052	0.001315
fp-s005	1.004854	0.994627	0.999982	0.001514	1.029259	0.972658	1.000562	0.009566
fp-s006	1.002310	0.997326	0.999995	0.000817	1.002299	0.997545	1.000032	0.000721
fp-s007	1.008122	0.993309	0.999936	0.002708	1.004837	0.994072	0.999990	0.001781
fp-s008	1.001193	0.998797	1.000026	0.000442	1.002415	0.997174	0.999995	0.000869
fp-s009	1.002884	0.996658	0.999940	0.001112	1.004091	0.996323	0.999945	0.001303
fp-s010	1.016438	0.979824	1.000536	0.006799	1.017820	0.981024	1.000439	0.007233
fp-s011	1.005308	0.995192	1.000186	0.001668	1.006628	0.992962	1.000063	0.002496
fp-s012	1.003421	0.996010	1.000070	0.001157	1.002581	0.997832	1.000051	0.000839
fp-s013	1.025436	0.966890	0.999771	0.009018	1.020904	0.977218	1.000803	0.007599
op-a001	1.000237	0.999754	0.999996	0.000076	1.000164	0.999841	0.999998	0.000049
op-i002	1.000201	0.999790	0.999997	0.000065	1.000084	0.999911	0.999999	0.000027
op-i003	1.000179	0.999814	0.999997	0.000057	1.000313	0.999698	0.999997	0.000093
op-i004	1.000010	0.999989	1.000000	0.000003	1.000182	0.999823	0.999998	0.000055
op-s005	1.000097	0.999899	0.999999	0.000032	1.000104	0.999902	0.999999	0.000031
op-s006	1.000077	0.999918	0.999999	0.000026	1.000038	0.999961	1.000000	0.000012
op-s007	1.000024	0.999975	1.000000	0.000008	1.000039	0.999961	1.000000	0.000012
op-s008	1.000009	0.999991	1.000000	0.000003	1.000017	0.999983	1.000000	0.000005
op-s009	1.000061	0.999938	0.999999	0.000019	1.000099	0.999901	0.999999	0.000031
op-s010	1.000030	0.999968	1.000000	0.000011	1.000062	0.999940	1.000000	0.000020
op-s011	1.000002	0.999998	1.000000	0.000001	1.000057	0.999944	1.000000	0.000018
op-s012	1.000030	0.999968	1.000000	0.000010	1.000094	0.999909	0.999999	0.000029
op-s013	1.000068	0.999929	0.999999	0.000022	1.000086	0.999915	0.999999	0.000026

Table 10 Results of Monte Carlo Experiments (Simulation 3)

	x				p			
	max	min	average	std.dev	max	min	average	std.dev
fp-a001	1.004365	0.995826	0.999970	0.001434	1.007426	0.993684	1.000011	0.002674
fp-i002	1.071106	0.941268	1.001506	0.017818	1.055992	0.951227	1.001113	0.014302
fp-i003	1.011556	0.989102	0.999855	0.003691	1.034606	0.968775	0.999561	0.010077
fp-i004	1.000733	0.999270	0.999994	0.000266	1.010670	0.990648	1.000014	0.003022
fp-s005	1.004827	0.995683	0.999904	0.001484	1.034976	0.972213	1.001183	0.010364
fp-s006	1.002304	0.997306	0.999963	0.000840	1.002849	0.997357	1.000017	0.000800
fp-s007	1.007094	0.993303	0.999965	0.002581	1.004507	0.994097	0.999979	0.001726
fp-s008	1.001357	0.998667	1.000008	0.000445	1.002474	0.997415	0.999947	0.000894
fp-s009	1.003999	0.996595	0.999958	0.001151	1.007926	0.993749	1.000151	0.002580
fp-s010	1.022346	0.976826	1.000114	0.006962	1.025012	0.978751	0.999945	0.007463
fp-s011	1.004369	0.996175	1.000060	0.001582	1.009110	0.992264	0.999967	0.002676
fp-s012	1.003443	0.996283	1.000024	0.001157	1.003983	0.995143	1.000009	0.001380
fp-s013	1.032955	0.966893	0.999188	0.009750	1.020376	0.982634	1.000276	0.007212
op-a001	1.000767	0.999295	0.999990	0.000222	1.000398	0.999652	0.999996	0.000114
op-i002	1.001026	0.999226	0.999994	0.000295	1.000207	0.999822	0.999998	0.000062

op-i003	1.001150	0.998882	0.999984	0.000351	1.000748	0.999337	0.999991	0.000215
op-i004	1.000054	0.999951	0.999999	0.000016	1.000444	0.999612	0.999995	0.000127
op-s005	1.000372	0.999672	0.999995	0.000107	1.000240	0.999787	0.999998	0.000069
op-s006	1.000317	0.999732	1.000000	0.000085	1.000096	0.999920	0.999999	0.000027
op-s007	1.000112	0.999902	0.999999	0.000033	1.000096	0.999920	0.999999	0.000027
op-s008	1.000040	0.999967	1.000000	0.000011	1.000043	0.999963	1.000000	0.000012
op-s009	1.000281	0.999750	0.999997	0.000080	1.000243	0.999789	0.999997	0.000070
op-s010	1.000137	0.999883	0.999999	0.000038	1.000151	0.999875	0.999998	0.000041
op-s011	1.000010	0.999991	1.000000	0.000003	1.000140	0.999879	0.999998	0.000040
op-s012	1.000143	0.999871	0.999998	0.000042	1.000231	0.999800	0.999997	0.000065
op-s013	1.000355	0.999680	0.999996	0.000103	1.000209	0.999820	0.999998	0.000060

Table 11 Results of Monte Carlo Experiments (Simulation 4)

	x				p			
	max	min	average	std.dev	max	min	average	std.dev
fp-a001	1.004381	0.995806	0.999969	0.001435	1.002808	0.997005	1.000033	0.000840
fp-i002	1.071318	0.941256	1.001500	0.017827	1.056452	0.952493	1.001086	0.014115
fp-i003	1.011945	0.988725	0.999844	0.003699	1.014183	0.988649	0.999941	0.004397
fp-i004	1.000739	0.999263	0.999993	0.000266	1.004391	0.996196	1.000060	0.001312
fp-s005	1.004785	0.995655	0.999903	0.001485	1.030987	0.970969	1.000974	0.009859
fp-s006	1.002392	0.997320	0.999971	0.000834	1.002303	0.997516	1.000007	0.000757
fp-s007	1.007111	0.993296	0.999965	0.002581	1.004312	0.994072	0.999980	0.001698
fp-s008	1.001337	0.998668	1.000008	0.000444	1.002796	0.997174	0.999947	0.000882
fp-s009	1.004004	0.996574	0.999958	0.001151	1.004093	0.995902	0.999976	0.001371
fp-s010	1.022324	0.976859	1.000115	0.006962	1.024944	0.978691	0.999932	0.007455
fp-s011	1.004369	0.996175	1.000060	0.001582	1.008807	0.992962	0.999950	0.002598
fp-s012	1.003483	0.996299	1.000024	0.001158	1.002485	0.996833	1.000003	0.000880
fp-s013	1.032948	0.966899	0.999188	0.009750	1.020905	0.982410	1.000251	0.007170
op-a001	1.000245	0.999775	0.999997	0.000076	1.000159	0.999858	0.999999	0.000050
op-i002	1.000205	0.999815	0.999997	0.000065	1.000084	0.999922	0.999999	0.000027
op-i003	1.000183	0.999833	0.999998	0.000058	1.000323	0.999713	0.999998	0.000096
op-i004	1.000011	0.999990	1.000000	0.000003	1.000178	0.999844	0.999999	0.000056
op-s005	1.000100	0.999907	0.999999	0.000032	1.000099	0.999910	1.000000	0.000031
op-s006	1.000081	0.999927	0.999999	0.000026	1.000039	0.999963	1.000000	0.000012
op-s007	1.000025	0.999977	1.000000	0.000008	1.000040	0.999963	1.000000	0.000012
op-s008	1.000009	0.999992	1.000000	0.000003	1.000017	0.999984	1.000000	0.000005
op-s009	1.000061	0.999944	0.999999	0.000019	1.000098	0.999910	1.000000	0.000031
op-s010	1.000034	0.999972	1.000000	0.000010	1.000064	0.999941	1.000000	0.000020
op-s011	1.000002	0.999998	1.000000	0.000001	1.000056	0.999949	1.000000	0.000018
op-s012	1.000032	0.999972	1.000000	0.000010	1.000092	0.999916	1.000000	0.000029
op-s013	1.000069	0.999937	0.999999	0.000022	1.000083	0.999923	1.000000	0.000027

Table 12 Results of Monte Carlo Experiments (Simulation 5)

	x				p			
	max	min	average	std.dev	max	min	average	std.dev
fp-a001	1.004795	0.996229	0.999969	0.001453	1.007357	0.991311	0.999979	0.002605
fp-i002	1.071398	0.949608	1.000945	0.018515	1.055994	0.957931	1.000643	0.014896
fp-i003	1.011520	0.990464	0.999872	0.003707	1.028085	0.968767	0.999381	0.009911
fp-i004	1.000723	0.999270	1.000017	0.000257	1.007797	0.990646	1.000043	0.002883
fp-s005	1.003976	0.996209	1.000032	0.001550	1.034980	0.971051	1.000685	0.010688
fp-s006	1.002595	0.997491	1.000055	0.000852	1.002544	0.998051	1.000065	0.000789
fp-s007	1.007282	0.993592	1.000132	0.002605	1.006091	0.994174	1.000089	0.001737
fp-s008	1.001358	0.998507	1.000015	0.000477	1.002850	0.997415	1.000021	0.000876
fp-s009	1.003975	0.996695	1.000037	0.001158	1.009022	0.994133	1.000140	0.002511
fp-s010	1.023916	0.977083	1.000281	0.007334	1.025010	0.977632	1.000150	0.007684
fp-s011	1.004629	0.995081	1.000061	0.001668	1.009016	0.992057	0.999957	0.002805
fp-s012	1.003908	0.997137	1.000074	0.001165	1.004537	0.996237	1.000067	0.001362
fp-s013	1.032874	0.966880	0.999245	0.009781	1.019881	0.977462	1.000343	0.007468
op-a001	1.000675	0.999306	0.999987	0.000216	1.000326	0.999644	0.999994	0.000112
op-i002	1.000975	0.999239	0.999982	0.000283	1.000172	0.999819	0.999997	0.000060
op-i003	1.001043	0.998881	0.999980	0.000342	1.000622	0.999317	0.999988	0.000212
op-i004	1.000046	0.999951	0.999999	0.000015	1.000364	0.999606	0.999993	0.000124
op-s005	1.000314	0.999669	0.999994	0.000103	1.000199	0.999783	0.999997	0.000068
op-s006	1.000227	0.999782	0.999998	0.000083	1.000076	0.999918	0.999999	0.000026
op-s007	1.000095	0.999901	0.999998	0.000032	1.000076	0.999918	0.999999	0.000026
op-s008	1.000031	0.999967	0.999999	0.000011	1.000034	0.999963	0.999999	0.000012
op-s009	1.000236	0.999748	0.999996	0.000078	1.000197	0.999786	0.999997	0.000068

op-s010	1.000101	0.999882	0.999998	0.000037	1.000118	0.999872	0.999998	0.000040
op-s011	1.000009	0.999991	1.000000	0.000003	1.000114	0.999877	0.999998	0.000039
op-s012	1.000125	0.999870	0.999998	0.000040	1.000185	0.999795	0.999997	0.000064
op-s013	1.000301	0.999678	0.999994	0.000100	1.000170	0.999816	0.999997	0.000058

Table 13 Results of Monte Carlo Experiments (Simulation 6)

	x				p			
	max	min	average	std.dev	max	min	average	std.dev
fp-a001	1.021491	0.983086	1.000131	0.006418	1.020275	0.983333	0.999987	0.006287
fp-i002	1.077346	0.930214	1.002169	0.026522	1.059813	0.946433	0.999990	0.021134
fp-i003	1.026125	0.978713	1.000252	0.008114	1.051954	0.950310	1.000215	0.017673
fp-i004	1.001226	0.998698	0.999975	0.000485	1.020620	0.978032	0.999973	0.007042
fp-s005	1.008389	0.992608	1.000152	0.002681	1.055680	0.956055	1.000970	0.016427
fp-s006	1.010041	0.991299	1.000097	0.003273	1.006373	0.994536	0.999958	0.001956
fp-s007	1.013916	0.985188	0.999730	0.003821	1.010073	0.991795	1.000028	0.002710
fp-s008	1.002335	0.997899	1.000007	0.000737	1.004282	0.995830	0.999899	0.001339
fp-s009	1.010325	0.991058	1.000132	0.002969	1.016367	0.982852	0.999763	0.005721
fp-s010	1.040087	0.970197	1.000076	0.010738	1.040474	0.968746	0.999978	0.011139
fp-s011	1.007739	0.993763	1.000102	0.002346	1.011238	0.988235	1.000074	0.004302
fp-s012	1.005892	0.994479	0.999884	0.001850	1.011779	0.990149	0.999782	0.003722
fp-s013	1.039505	0.965186	1.000248	0.012554	1.034757	0.968566	1.000538	0.010665
op-a001	1.032293	0.972463	1.000123	0.010393	1.033355	0.972422	1.000378	0.010707
op-i002	1.121950	0.896009	0.996681	0.038970	1.026505	0.975980	0.999673	0.007134
op-i003	1.058610	0.952382	1.000280	0.016877	1.078915	0.937793	1.000299	0.023024
op-i004	1.002371	0.997236	1.000025	0.000858	1.026499	0.979265	1.000363	0.007758
op-s005	1.025655	0.979916	1.000274	0.006488	1.123890	0.905922	0.996483	0.037127
op-s006	1.010510	0.990893	1.000057	0.003343	1.008577	0.992653	1.000007	0.002501
op-s007	1.010632	0.989217	1.000124	0.004022	1.009701	0.990646	0.999893	0.003382
op-s008	1.002468	0.998241	1.000025	0.000706	1.004337	0.995510	0.999992	0.001501
op-s009	1.012503	0.989343	1.000115	0.003942	1.023307	0.984250	1.000051	0.005954
op-s010	1.028890	0.971595	0.999653	0.008843	1.028587	0.961446	0.999434	0.010384
op-s011	1.009580	0.991313	1.000103	0.003159	1.011441	0.990474	0.999797	0.003637
op-s012	1.008055	0.992078	0.999929	0.002767	1.014143	0.987041	0.999831	0.004396
op-s013	1.016187	0.986432	1.000031	0.005149	1.074718	0.930684	1.000895	0.026066

Table 14 Results of Monte Carlo Experiments (Simulation 7)

	x				p			
	max	min	average	std.dev	max	min	average	std.dev
fp-a001	1.007916	0.993970	0.999954	0.002128	1.003442	0.996701	0.999998	0.001201
fp-i002	1.080259	0.911115	0.998482	0.026013	1.062197	0.934403	0.999872	0.020873
fp-i003	1.018753	0.983992	0.999851	0.005462	1.021981	0.981654	0.999826	0.006439
fp-i004	1.001095	0.999080	0.999991	0.000379	1.004867	0.993110	0.999955	0.001788
fp-s005	1.006468	0.994381	0.999982	0.002080	1.042381	0.954960	0.999087	0.014508
fp-s006	1.004460	0.996606	1.000022	0.001239	1.003682	0.997259	1.000032	0.001040
fp-s007	1.013846	0.986590	0.999889	0.003657	1.007445	0.993984	0.999764	0.002274
fp-s008	1.002152	0.998181	1.000016	0.000651	1.003156	0.997018	0.999973	0.001187
fp-s009	1.004554	0.995763	1.000019	0.001694	1.005910	0.992647	0.999948	0.001867
fp-s010	1.038667	0.958733	1.000275	0.010890	1.037633	0.957357	1.000075	0.011351
fp-s011	1.007028	0.994396	0.999943	0.002379	1.013561	0.988581	0.999662	0.003555
fp-s012	1.004484	0.995348	0.999890	0.001562	1.003622	0.996908	0.999959	0.001233
fp-s013	1.041287	0.963341	0.999378	0.012931	1.033786	0.974187	0.999932	0.010807
op-a001	1.000382	0.999672	0.999997	0.000112	1.000250	0.999802	0.999998	0.000073
op-i002	1.000331	0.999718	0.999997	0.000096	1.000132	0.999902	0.999999	0.000040
op-i003	1.000287	0.999753	0.999997	0.000085	1.000470	0.999620	0.999996	0.000138
op-i004	1.000017	0.999986	1.000000	0.000005	1.000277	0.999780	0.999998	0.000081
op-s005	1.000157	0.999866	0.999998	0.000047	1.000149	0.999885	0.999999	0.000045
op-s006	1.000125	0.999892	0.999999	0.000038	1.000057	0.999956	1.000000	0.000018
op-s007	1.000040	0.999966	1.000000	0.000012	1.000057	0.999955	1.000000	0.000018
op-s008	1.000014	0.999988	1.000000	0.000004	1.000026	0.999980	1.000000	0.000008
op-s009	1.000096	0.999919	0.999999	0.000029	1.000152	0.999882	0.999999	0.000045
op-s010	1.000056	0.999965	1.000000	0.000015	1.000099	0.999928	0.999999	0.000029
op-s011	1.000003	0.999997	1.000000	0.000001	1.000086	0.999934	0.999999	0.000026
op-s012	1.000049	0.999961	1.000000	0.000015	1.000142	0.999890	0.999999	0.000042
op-s013	1.000109	0.999907	0.999999	0.000033	1.000128	0.999904	0.999999	0.000039

Table 15 Results of Monte Carlo Experiments (Simulation 8)

	x				p			
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	max	min	average	std.dev	max	min	average	std.dev
fp-a001	1.008000	0.993633	0.999970	0.002214	1.011620	0.989796	1.000095	0.003498
fp-i002	1.080369	0.930941	0.999910	0.025541	1.055603	0.945806	1.000251	0.020566
fp-i003	1.018836	0.983665	0.999938	0.005642	1.040858	0.955902	0.999769	0.014492
fp-i004	1.000993	0.998897	0.999979	0.000373	1.012663	0.987195	1.000149	0.004107
fp-s005	1.008178	0.994385	1.000130	0.002185	1.049577	0.958025	0.999794	0.015112
fp-s006	1.004414	0.996418	1.000022	0.001253	1.003507	0.995788	1.000011	0.001143
fp-s007	1.013819	0.989285	0.999824	0.003708	1.007498	0.993739	0.999875	0.002284
fp-s008	1.001940	0.998050	0.999975	0.000621	1.003524	0.996603	0.999937	0.001200
fp-s009	1.005207	0.995757	1.000049	0.001758	1.010105	0.989893	0.999844	0.003488
fp-s010	1.038682	0.973347	1.000466	0.010565	1.041937	0.970813	1.000144	0.011091
fp-s011	1.009197	0.993796	1.000035	0.002435	1.011336	0.988289	0.999871	0.003699
fp-s012	1.004117	0.994919	0.999856	0.001596	1.005599	0.995199	0.999826	0.001841
fp-s013	1.041259	0.965611	0.999995	0.013325	1.041484	0.971080	1.000162	0.010980
op-a001	1.000931	0.999058	0.999993	0.000314	1.000467	0.999516	0.999997	0.000163
op-i002	1.001281	0.998858	0.999988	0.000410	1.000256	0.999760	0.999998	0.000088
op-i003	1.001570	0.998654	0.999988	0.000492	1.000879	0.999078	0.999995	0.000309
op-i004	1.000069	0.999940	1.000000	0.000022	1.000518	0.999464	0.999997	0.000182
op-s005	1.000450	0.999586	0.999997	0.000153	1.000288	0.999720	0.999998	0.000100
op-s006	1.000346	0.999684	0.999999	0.000121	1.000107	0.999894	0.999999	0.000039
op-s007	1.000145	0.999878	0.999999	0.000047	1.000105	0.999897	0.999999	0.000038
op-s008	1.000048	0.999957	1.000000	0.000016	1.000048	0.999951	1.000000	0.000017
op-s009	1.000345	0.999700	0.999997	0.000113	1.000287	0.999714	0.999998	0.000100
op-s010	1.000149	0.999860	0.999999	0.000053	1.000161	0.999840	0.999999	0.000059
op-s011	1.000013	0.999988	1.000000	0.000004	1.000160	0.999838	0.999999	0.000057
op-s012	1.000181	0.999843	0.999999	0.000059	1.000263	0.999729	0.999998	0.000094
op-s013	1.000454	0.999604	0.999997	0.000144	1.000240	0.999760	0.999998	0.000086

Table 16 Results of Monte Carlo Experiments (Simulation 9)

	x				p			
	max	min	average	std.dev	max	min	average	std.dev
fp-a001	1.008019	0.993561	0.999970	0.002216	1.004420	0.996699	1.000031	0.001250
fp-i002	1.080507	0.930593	0.999907	0.025550	1.058319	0.945100	1.000296	0.020461
fp-i003	1.019022	0.982921	0.999932	0.005672	1.022923	0.981629	0.999966	0.006645
fp-i004	1.001003	0.998922	0.999979	0.000373	1.006022	0.994457	1.000032	0.001796
fp-s005	1.008293	0.994377	1.000129	0.002188	1.044124	0.961769	0.999889	0.014275
fp-s006	1.004415	0.996715	1.000028	0.001239	1.003501	0.996597	1.000028	0.001065
fp-s007	1.013797	0.989262	0.999824	0.003709	1.007445	0.994154	0.999898	0.002265
fp-s008	1.001942	0.998054	0.999975	0.000620	1.003315	0.996589	0.999938	0.001183
fp-s009	1.005229	0.995753	1.000050	0.001759	1.006229	0.992640	0.999938	0.001879
fp-s010	1.038743	0.973279	1.000465	0.010566	1.041257	0.971589	1.000165	0.011092
fp-s011	1.009198	0.993796	1.000035	0.002435	1.010984	0.988576	0.999866	0.003565
fp-s012	1.004120	0.994920	0.999856	0.001596	1.003620	0.996737	0.999936	0.001226
fp-s013	1.041242	0.965575	0.999995	0.013328	1.041527	0.971239	1.000130	0.010963
op-a001	1.000387	0.999650	0.999998	0.000117	1.000251	0.999783	1.000000	0.000076
op-i002	1.000335	0.999700	0.999999	0.000100	1.000134	0.999895	1.000000	0.000042
op-i003	1.000291	0.999737	0.999999	0.000088	1.000484	0.999560	0.999999	0.000146
op-i004	1.000017	0.999985	1.000000	0.000005	1.000274	0.999765	1.000000	0.000086
op-s005	1.000159	0.999857	0.999999	0.000049	1.000151	0.999873	1.000000	0.000048
op-s006	1.000127	0.999885	0.999999	0.000039	1.000058	0.999953	1.000000	0.000019
op-s007	1.000040	0.999964	1.000000	0.000012	1.000057	0.999952	1.000000	0.000019
op-s008	1.000014	0.999988	1.000000	0.000004	1.000026	0.999979	1.000000	0.000008
op-s009	1.000097	0.999914	1.000000	0.000030	1.000154	0.999872	1.000000	0.000047
op-s010	1.000055	0.999963	1.000000	0.000016	1.000096	0.999924	1.000000	0.000030
op-s011	1.000003	0.999997	1.000000	0.000001	1.000087	0.999928	1.000000	0.000027
op-s012	1.000049	0.999958	1.000000	0.000015	1.000144	0.999881	1.000000	0.000044
op-s013	1.000110	0.999901	0.999999	0.000034	1.000130	0.999895	1.000000	0.000040

Table 17 Results of Monte Carlo Experiments (Simulation 10)

	x				p			
	max	min	average	std.dev	max	min	average	std.dev
fp-a001	1.007294	0.993620	1.000126	0.002221	1.009216	0.990133	1.000060	0.003486
fp-i002	1.077613	0.910971	0.998856	0.025704	1.078393	0.941351	0.998840	0.021628
fp-i003	1.018717	0.983652	1.000288	0.005763	1.045756	0.961033	1.000783	0.014436
fp-i004	1.000998	0.998899	0.999997	0.000375	1.015474	0.988520	1.000345	0.004037
fp-s005	1.008390	0.993275	1.000153	0.002196	1.049581	0.952914	0.999249	0.015104
fp-s006	1.003218	0.996754	1.000093	0.001196	1.003371	0.996682	0.999956	0.001120

fp-s007	1.013791	0.986389	0.999684	0.003839	1.006061	0.993924	0.999892	0.002404
fp-s008	1.001731	0.998051	0.999960	0.000591	1.003067	0.996580	0.999869	0.001196
fp-s009	1.005215	0.995270	1.000038	0.001736	1.010047	0.988759	0.999947	0.003482
fp-s010	1.033082	0.958702	0.999908	0.010462	1.027395	0.957640	1.000031	0.010915
fp-s011	1.007741	0.993724	1.000119	0.002343	1.012993	0.991266	1.000341	0.003734
fp-s012	1.004082	0.995829	0.999888	0.001566	1.005248	0.995199	0.999915	0.001883
fp-s013	1.041230	0.964671	1.001204	0.013405	1.034944	0.971438	1.000561	0.010751
op-a001	1.000948	0.999215	1.000016	0.000318	1.000501	0.999557	1.000008	0.000162
op-i002	1.001436	0.998985	1.000019	0.000421	1.000273	0.999763	1.000004	0.000087
op-i003	1.001651	0.998655	1.000021	0.000505	1.000922	0.999167	1.000015	0.000309
op-i004	1.000075	0.999940	1.000001	0.000023	1.000554	0.999511	1.000009	0.000181
op-s005	1.000478	0.999606	1.000008	0.000155	1.000313	0.999731	1.000004	0.000099
op-s006	1.000420	0.999684	1.000009	0.000128	1.000120	0.999897	1.000002	0.000039
op-s007	1.000151	0.999878	1.000003	0.000048	1.000118	0.999901	1.000002	0.000038
op-s008	1.000055	0.999957	1.000001	0.000016	1.000053	0.999954	1.000001	0.000017
op-s009	1.000377	0.999701	1.000006	0.000116	1.000311	0.999728	1.000005	0.000100
op-s010	1.000183	0.999860	1.000003	0.000054	1.000181	0.999850	1.000003	0.000059
op-s011	1.000014	0.999988	1.000000	0.000004	1.000175	0.999848	1.000003	0.000057
op-s012	1.000195	0.999843	1.000003	0.000060	1.000283	0.999748	1.000004	0.000093
op-s013	1.000492	0.999605	1.000007	0.000148	1.000263	0.999772	1.000004	0.000085

Appendix Figure 1 Fukuoka Prefecture in Japan



Appendix Figure 2 Fukuoka Prefecture and Surrounding Areas



1196 SATELLITE AND WIRELESS INTERNET SERVICE IN LIEU OF WIRED RURAL INTERNET SERVICE

ABSTRACT

It has always been expensive to deliver telecommunication services to rural and isolated households, but as new broadband Internet technologies have been introduced that are both cheaper and more effective, the economic dynamics have changed. More rural areas have received the advanced broadband technologies, but many rural areas are still perceived as offering the least in economic returns for private investment and have not. Given the apparent benefits of the Internet, there are meaningful consequences for rural households remaining without, or with lesser, broadband service. Wireless Internet has improved a great deal over the last decade, but is it a solution to lack of universal rural service? Our research will be somewhat broad ranging at this point and constitute four questions: (1) the technical state of satellite and fixed and mobile wireless and how it fits into the rural broadband market, (2) how dependent are rural areas on the (various aspects of the) Internet? Or what is the relationship between rural economies and the Internet? (3) Are wireless broadband systems substitutes or complements to hardwired systems? What does substitute versus complement mean for rural households?

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1767 A STUDY ON INTEGRATED WATERSHED MANAGEMENT BASED ON THE EXPANDED I-O ANALYSIS; A CASE OF PUBLIC WATER BODY IN KANTO REGION, JAPAN

ABSTRACT

In this study, we propose an optimal regional environmental policy to improve the environmental quality in and around the public water body, considering both - the total ecological system and periodical changes over a certain period of time. We specify three sub-models (water pollutants flow balance model, air pollutants flow balance model and socio-economic model) and one objective function based on expanded I-O analysis in order to analyze the policy to improve the water and air quality including reduction of GHG emission. The water pollutants flow balance model describes the amount of water pollutants generated in the municipalities of each sub-basin and the amount of water pollutants transported into the . The air pollutants flow balance model describes the amount of air pollutants and greenhouse effect gases generated and emitted into the air in each municipality. The socio- economic model describes the socio-economic activities in the sub-basins and the amount of air and water pollutants emitted by the activities. Also, the socio-economic model describes how the relation between the socio- economic activities and the emission of pollutants change dependent on the adopted watershed management policies in the region.

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RS07.2. Methods in Regional Science and Urban Economics

1243 INTRODUCTION TO THE E3-INDIA MODEL. E3

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ABSTRACT

E3-India is a new state-level model of India, developed from the global E3ME macro-econometric model, linking the economic, energy and environmental emissions systems. The model is designed to assess policy through a highly empirical structure, whereby historical data is used to feed in to econometric estimations of model interactions, forming a consistent modelling framework. As a general model of the economy, E3-India can be used to assess a wide range of fiscal and general macroeconomic policies. However, it has been designed to have a particular focus on the energy sector. Policies can be introduced into this framework at a state level, allowing energy system and socio-economic impacts to be assessed both within that state and (through trade) spillovers into other states.

The model is macro-econometric in nature, based on a post-Keynesian framework within which optimisation is not assumed (i.e. it is not a general equilibrium model). Through accounting identities, demand must equal supply, but demand can be less than or equal to total potential supply; the implication of this framework is that, under the right conditions, it is possible for regulation to increase output and employment. E3-India combines the features of an annual short- and medium-term sectoral model estimated by formal econometric methods with the detail and some of the methods of CGE models, providing analysis of the movement of the long-term outcomes for key E3 indicators in response to policy changes. It is essentially a dynamic simulation model that is estimated by econometric methods. The data used represent the best available data sources relevant to India; the data used was largely sourced from official national and state sources, including the Reserve Bank of India and the Ministry of Statistics and Programme Implementation.

A key advantage of the E3-India model is its structure. The model disaggregates the economy by sector, which allows the representation of fairly complex scenarios at state level, especially those that are differentiated by sector. Similarly, the impact of any policy measure can be represented in a detailed way, for example showing the winners and losers from a particular policy. The full integration of separate energy, environment, & economy modules is an undoubted advantage over models that may either ignore these interactions completely or only assume a one-way causation.

E3-India also includes explicit treatment of technology, using the Future Technology Transformations (FTT) modelling framework for the power sector. This approach is qualitatively different from the optimisation tools that are used in other analyses and draws on theories from post-Keynesian and evolutionary economics. Instead of trying to find least-cost pathways, the model simulates the responses to policy inputs (including both regulation and market-based instruments) and is parameterized on real-world time-series data.

INTRODUCTION

E3-India model is a new macro-econometric E3 (energy-environment-economy) model of India that can be used to assess policy at the level of the 32 states and territories. It is built on the existing structure offered by the global E3ME model but accounts for more detailed data and issues that are specific to India. As the model operates at state level, policies in individual states can be addressed and the distribution of impacts across India can be considered for national policy.

- The E3-India model has the following dimensions:
- 32 Indian states and territories
- 20 economic sectors
- 8 users of 5 different energy carriers
- CO2 emissions from 8 sources
- annual projections out to 2035

E3-India is based on a series of econometric equations that are similar in design to those in the E3ME model (see www.e3me.com). Unlike the more common computable general equilibrium (CGE) approach to economic modelling, E3-India does not assume full employment or perfectly competitive markets; instead it estimates behaviour based on available historical data.

The E3-India model was constructed with the following aims:

- The model represents best practice for sectoral policy simulations.
- Its development is transparent. Designed through a collaborative process it aims to capture local knowledge and expertise in India.
- The data used represent the best available data sources relevant to India.
- The parameters in the model reflect the behavioural characteristics of the states of India.
- The outputs of model simulations can be readily identified and explained.
- Use of the model is accessible and affordable to a broad base of prospective users over time.

As a general model of the economy, E3-India can be used to assess a wide range of fiscal and general macroeconomic policies. However, it has been designed to have a particular focus on the energy sector. Policies that the model can assess include:

- changes in the power sector energy mix, including the share of renewables in the mix
- policies to promote renewable uptake, such as Feed-in-Tariffs or direct subsidies
- direct regulation on energy efficiency
- energy and carbon pricing instruments.

E3-India produces a wide range of socio-economic outputs at state and national level, for example:

- employment and unemployment
- GDP and sectoral output
- investment
- international trade and trade between states
- household income (by income group) and consumption
- public balances
- prices and inflation.

The model results also include a full set of energy balances (and prices), detailed power sector results by technologies, and energy-related emissions.

METHOD

The theoretical background

Economic activity undertaken by persons, households, firms and other groups in society has effects on other groups after a time lag, and the effects persist into future generations, although many of the effects soon become so small as to be negligible. But there are many actors and the effects, both beneficial and damaging, accumulate in economic and physical stocks. The effects are transmitted through the environment (for example through greenhouse gas emissions contributing to global warming), through the economy and the price and money system (via the markets for labour and commodities), and through transport and information networks. The markets transmit effects in three main ways: through the level of activity creating demand for inputs of materials, fuels and labour; through wages and prices affecting incomes; and through incomes leading in turn to further demands for goods and services. These interdependencies suggest that an E3 model should be comprehensive (i.e. covering the whole economy), and include a full set of linkages between different parts of the economic and energy systems.

The economic and energy systems have the following characteristics: economies and diseconomies of scale in both production and consumption; markets with different degrees of competition; the prevalence of institutional behaviour whose aim may be maximisation, but may also be the satisfaction of more restricted objectives; and rapid and uneven changes in technology and consumer preferences, certainly within the time scale of greenhouse gas mitigation policy. Labour markets in particular may be characterised by long-term unemployment. An E3 model capable of representing these features must therefore be flexible, capable of embodying a variety of behaviours and of simulating a dynamic system. This approach can be contrasted with that adopted by general equilibrium models: they typically assume constant returns to scale; perfect competition in all markets; maximisation of social welfare measured by total discounted private consumption; no involuntary unemployment; and exogenous technical progress following a constant time trend.

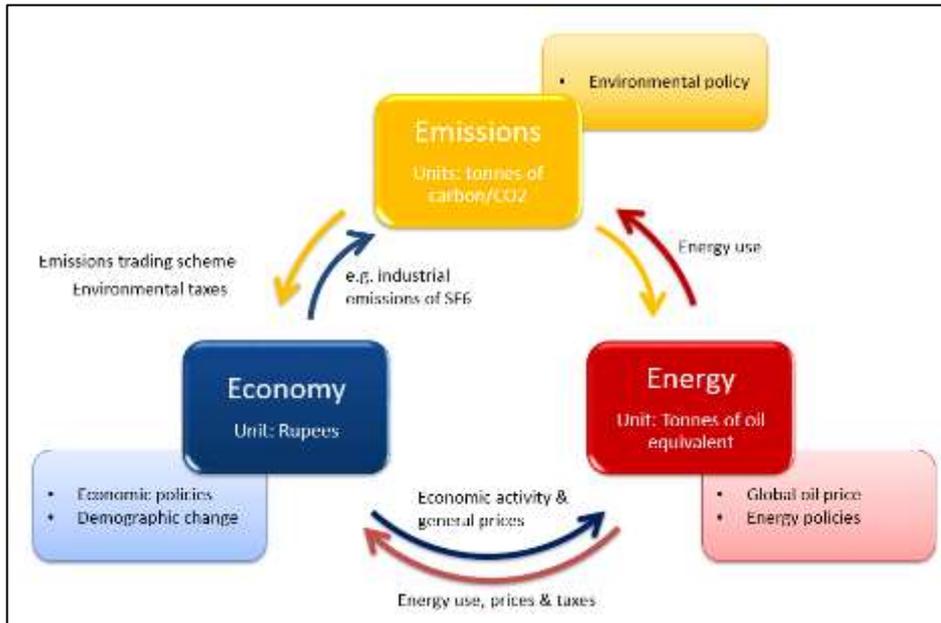
Model structure

The E3-India model comprises:

- the accounting framework of the economy, coupled with balances for energy demands and environmental emission flows
- detailed historical data sets, with time series covering the period since 1993, and sectoral disaggregation
- an econometric specification of behavioural relationships in which short-term deviations move towards long-term trends
- the software to hold together these other component parts

Figure 1 shows how the three components (modules) of the model (energy, environment and economy) fit together.

Figure 50 India-E3 as an E3 model



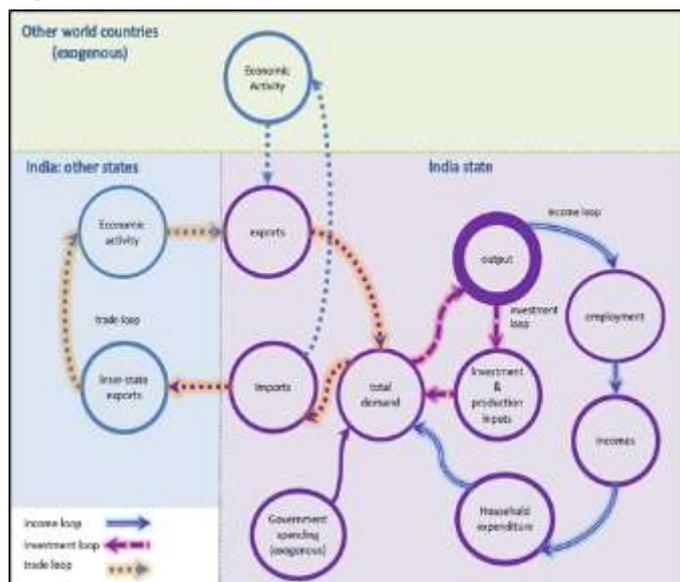
Each component is shown in its own box with its own units of account and sources of data. Each data set has been constructed by statistical offices to conform to accounting conventions. Exogenous factors coming from outside the modelling framework are shown on the outside edge of the chart as inputs into each component. For the economic module, these include demographic factors and economic policy (including tax rates, growth in government expenditures, interest rates and exchange rates). For the energy system, the outside factors are the world oil prices and energy policy (including regulation of energy industries). For the environment component, exogenous factors include policies such as carbon taxes. The linkages between the components of the model are shown explicitly by the arrows that indicate which values are transmitted between components.

The economy module provides measures of economic activity and general price levels to the energy module; the energy module then determines levels and prices of energy consumption, which is passed to the emissions module and is also fed back to the economic module.

E3-India's economic module

Figure 51 shows how E3-India's economic module is solved for each state. Most of the economic variables shown in the chart are solved at the sectoral level. The whole system is solved simultaneously for all industries and all states, although single-state solutions are also possible.

Figure 51 E3-India's basic economic structure



As the figure suggests, output and employment are determined by levels of demand, unless there are constraints on available supply. The figure shows three loops or circuits of economic interdependence, which are described below. In addition, there is an interdependency between the sectors that is not shown in the figure. The full set of loops comprises:

- Interdependency between sectors: If one sector increases output it will buy more inputs from its suppliers who will in turn purchase from their own suppliers. This is similar to a Type I multiplier.

- The income loop: If a sector increases output it may also increase employment, leading to higher incomes and additional consumer spending. This in turn feeds back into the economy, as given by a Type II multiplier.
- The investment loop: When firms increase output (and expect higher levels of future output) they will also increase production capacity by investing. This creates demand for the production of the sectors that produce investment goods (e.g. construction, engineering) and their supply chains.
- The trade loop: Some of the increase in demand described above will be met by imported goods and services (within India and outside India). This leads to higher demand and production levels in other states. Hence there is also a loop between states. Economic activities outside India are treated as exogenous in E3-India.

The components of demand

We now turn to how the model calculates results for each of the main components in the figure above. There is a mixture of accounting and behavioural relationships involved.

Intermediate demand (the sum of demand from other production sectors) is determined by the input-output relationships in the model. When one sector increases its production, it requires more inputs to do so. The sectors in its supply chain thus see an increase in demand for their products.

Estimating household consumption is a two-stage process. Total consumer spending by region is derived from functions estimated from time-series data. These equations relate consumption to regional personal disposable income, unemployment rates, inflation and interest rates. Share equations for each of the 16 consumption categories are then estimated. In the model solution, disaggregate consumption is always scaled to be consistent with the total.

Government consumption is given by assumption, split into the main different components of spending. It is therefore exogenous in the simulations and will not change unless explicitly requested by the modeller.

Gross Fixed Capital Formation is determined through econometric equations estimated on time-series data. Expectations of future output are a key determinant of investment, but investment is also affected by relative prices and interest rates.

Due to data limitations investment is not disaggregated by asset in E3-India. Stock building is treated as exogenous in the model.

In a sub-national model, trade represents a major issue in assessing regional economic impacts. Demand in each state can be met either by production within that state, production in another state in India, or production in another country. With no available data on trade between the states, it is necessary to impose assumptions on the rates of production in the states with relation to developments in neighbouring states.

The approach can be summarised as:

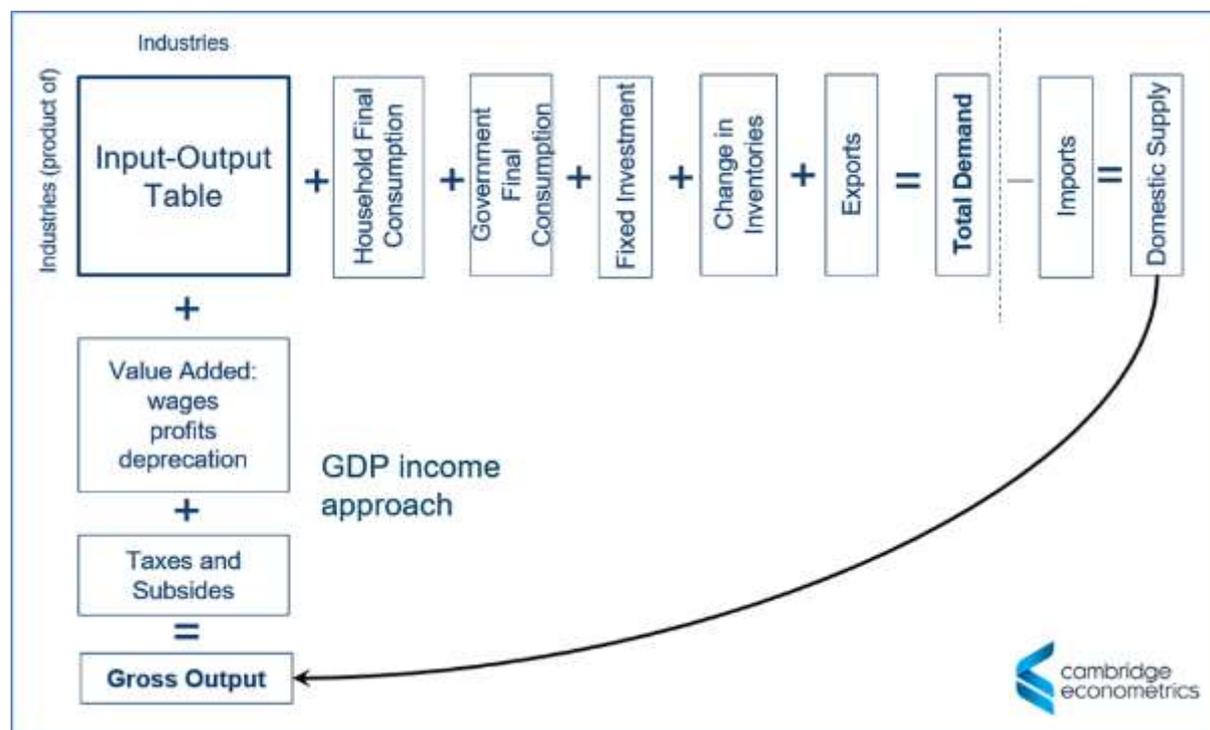
- International exports are estimated at state level, based on the production prices within each state.
- International imports are estimated at national level and applied to the states, based on estimates of current and baseline future state-level imports.
- Trade between states is estimated using production shares (export) and domestic demand shares (import).

Output and determination of supply

Total product output, in gross terms, is determined by summing intermediate demand and the components of final demand described above. This gives a measure of total demand for domestic production.

It is assumed that, subject to certain constraints, domestic supply increases to match demand (see Figure 3 for how this is implemented within the National Accounts structure). The most obvious constraint is the labour market; if there is not enough available labour then production levels cannot increase. However, full employment is an unusual position for the labour market to be in and thus the supply constraint is therefore unlikely to be an issue.

Figure 3 Determination of supply and demand



The labour market and incomes

Treatment of the labour market is another area that distinguishes E3-India from other macroeconomic models. E3-India includes econometric equation sets for employment (as a headcount), wage rates and participation rates. Employment and wage rates are disaggregated by economic sector while participation rates are disaggregated by gender.

The labour force is determined by multiplying labour market participation rates by population. Unemployment (including both voluntary and involuntary unemployment) is determined by taking the difference between the labour force and employment.

There are important interactions between the labour market equations. They are summarised below:

Employment = F (Economic output, Wage rates, ...)

Wage rates = F (Labour productivity, Unemployment, ...)

Participation rates = F (Economic output, Wage rates, Unemployment, ...)

Labour supply = Participation rate * Population

Unemployment = Labour supply – Employment

The full specification for the econometric equations is given in Chapter 5.

E3-India does not include measures of skills demand and supply explicitly, but the model results for sectoral employment and labour supply may be used to derive both of these. Nevertheless, it is important to be aware of the limitation in skills treatment within the main model structure. If a modelled scenario shows an increase in employment it is implicitly assumed that workers with the necessary skills are available. For studying large changes in employment, a supplementary bottom-up analysis is required to test feasibility of the model results.

Due to limitations in available time-series data, E3-India adopts a representative household for each region. Household income is determined as:

Income = Wages – Taxes + Benefits + Other income

The taxes currently distinguished are standard income taxes and employees' social security payments (employers' social security payments are not included in wages). A single benefit rate is used for each region.

'Other income' includes factors such as dividend payments, property rent and remittances. At present, it is not possible to derive data for these financial flows and so they are held constant in relation to wages.

Household income, once converted to real terms, is an important component in the model's consumption equations, with a one-to-one relationship assumed in the long run.

Due to data constraints, E3-India only includes a limited treatment of income distribution across different household groups.

Price formation

For each real variable there is an associated price, which influences quantities consumed. For example, each category of household expenditure has a price variable attached to it, which influences consumption patterns within the model.

Aside from wages, there are three econometric price equations in the model:

- domestic production prices
- import prices
- export prices

These are influenced by unit costs (derived by summing wage costs, material costs and taxes), competing prices and technology. Each one is estimated at the sectoral level.

One of the key price variables in the model is the price of domestic consumption. It is also determined by sector, by taking a weighted average of domestic and import prices, subtracting off the export component. This price is then used to determine the prices for final consumption goods; for example, if the car industry increases prices, this will be reflected in the price consumers pay for cars.

Aggregate deflators, including the Consumer Price Index, are derived by taking the average of prices across all products and sectors.

Social indicators

In quantitative modelling, the assessment of social impacts is often largely ignored. This is partly due to a lack of quantitative indicators but also that it often does not fit well into the basic structure of most macroeconomic models.

Like other models, E3-India can provide less coverage of social factors than economic factors and environmental impacts but social factors are not ignored completely. The main social indicators in the model are:

- sectoral employment and working hours
- sectoral wage rates
- unemployment
- an estimate of (real) income distribution when looking at issue of electricity price subsidies

The labour market indicators are discussed above, so the remainder of this section focuses on the estimates of distributional impacts.

There is no explicit modelling of the distribution of income in E3-India, except when looking at the issue of electricity price subsidies.

The model has an option to adjust electricity price subsidies by household group (five income quintiles and a rural/urban split), which enables users to adjust the subsidy rates and then assess the distributional impacts of electricity price policies (although without feedback to the rest of the model). The distributional impacts among households are calculated from state-level data on different electricity tariffs, average electricity consumption and income distribution by household group.

Demographic variables

Population projections are treated as exogenous in E3-India, apart from migration between Indian states. Aside from the endogenous treatment of migration, state population projections follow the overall population trends for India published by the UN (World Population Prospects).

Inter-state migration is modelled using a simplified concept of spatial transactions. The decision to migrate between states is determined by economic distance, i.e. pair-wise differences in GDP growth rates, weighted by physical distance between the states.

Energy-emissions modelling in E3-India

The energy module in E3-India is constructed, estimated and solved for each energy user, each energy carrier (termed fuels for convenience below) and each state.

Aggregate energy demand is determined by a set of econometric equations, with the main explanatory variables being:

- economic activity in each of the energy users
- average energy prices for each energy user in real terms
- technological variables, represented by investment and R&D expenditure

Price elasticities

Typically changes in energy prices in the historical data have been due to fluctuations in commodity prices and have been temporary in nature. However, the changes in energy prices that are modelled using E3-India tend to be based on permanent changes in policy and are therefore more likely to lead to behavioural change. Estimating elasticities based on the time-series data could thus lead to a downward bias.

Instead the long-run price elasticities used are taken from a combination of cross-section estimation and reviewed literature. For most sectors the values range from -0.2 to -0.3, meaning that a 1% increase in price leads to a 0.2-0.3% reduction in consumption. For road transport, a higher value of -0.7 is used, taken from Franzen and Sterner (1995) and Johansson and Schipper (1997, p.289) and confirmed by our own analysis. Short-run elasticities are based on the time-series data and are usually close to zero.

Fuel substitution

Fuel use equations are estimated for four energy carriers (coal, oils, gas and electricity) with four sets of equations estimated for the fuel users in each region. These equations are intended to allow substitution between the four energy carriers by users on the basis of relative prices, although overall fuel use and the technological variables can affect the choice.

Due to limitations in biomass prices, biomass consumption in E3-India is treated as a residual fuel demand and is modelled as a fixed ratio to aggregate energy use (final use only). Biomass used in power generation comes from FTT results.

One point to note is that the current version of E3-India includes only existing fuel types for road transport. The econometric equations are not able to consider electrification of the transport system as there is no historical precedent for this. These developments must therefore be entered by assumption by the model user.

Feedbacks to the economy

The economic feedbacks are based on the fact that the same transactions appear in the energy data and in the economic data, albeit in different units. For example, the iron and steel sector's purchases of coal appear as:

- coal consumption in the energy balances (as time series), measured in toe
- an input-output flow in the National Accounts (for the base year), measured in m rupees

The feedbacks from the energy module assume a one-to-one relationship between these two measures, once price changes are considered.

This places quite a strong reliance on consistency between the two data sets. Theoretically the energy balances multiplied by the fuel costs (excluding taxes) should match against the flows in the input-output table, once distribution costs are taken into account. However, this is often not the case (for example due to differences in definition and a lack of state-level input-output data) and the mismatch in data can lead to apparently non-important uses of fuel having large economic consequences.

The team at Cambridge Econometrics therefore works to ensure consistency in the data sets where reasonably possible. Adjustments are made to the base-year input-output tables to ensure accuracy in the modelling.

There are also feedbacks from the energy module to household final demand. In the same way that an input-output flow provides an economic representation of industry purchases of energy, consumer expenditure on energy in the national accounts is equivalent to the energy balances for household purchases. In E3-India, the approach is to set the economic variables so that they maintain consistency with physical energy flows. The same issues about consistency of data described above apply here.

Emissions

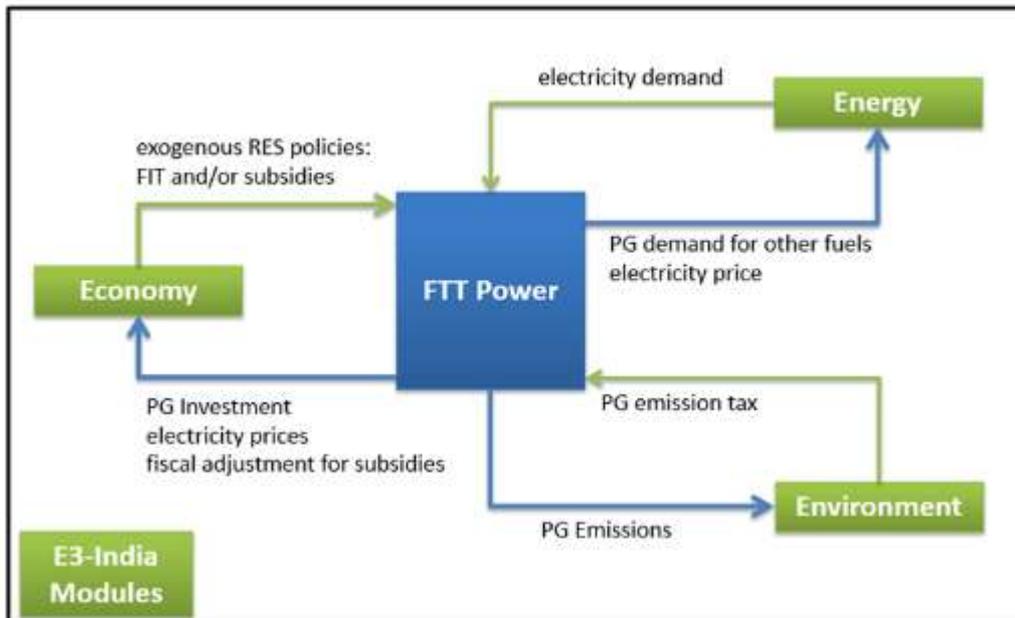
The emissions module calculates carbon dioxide emissions generated from end-use of different fuels and from primary use of fuels in the energy industries themselves, particularly electricity generation. The current E3-India version does not cover other non-CO₂ atmospheric emissions due to data limitations at state-level.

Emissions data for CO₂ from energy consumption are available for each of the energy users in the model. Coefficients (tonnes of carbon in CO₂ emitted per toe) are implicitly derived using historical data (and sometimes also baseline projections). This forms the relationship between energy consumption and emissions.

The power sector model

The power sector in E3-India is represented using a novel framework for the dynamic selection and diffusion of innovations, initially developed by J.-F. Mercure (Mercure, 2012), called FTT:Power (Future Technology Transformations for the Power sector). This is the first member of the FTT family of technology diffusion models. It uses a decision-making core for investors wanting to build new electrical capacity, facing several options. The resulting diffusion of competing technologies is constrained by a global database of renewable and non-renewable resources (Mercure & Salas, 2012, 2013; adapted for the states of India). The decision-making core takes place by pairwise levelised cost (LCOE) comparisons, conceptually equivalent to a binary logit model, parameterised by measured technology cost distributions. Costs include reductions originating from learning curves, as well as increasing marginal costs of renewable natural resources (for renewable technologies) using cost-supply curves. The diffusion of technology follows a set of coupled non-linear differential equations, sometimes called 'Lotka-Volterra' or 'replicator dynamics', which represent the better ability of larger or well established industries to capture the market, and the life expectancy of technologies. Due to learning-by-doing and increasing returns to adoption, it results in path-dependent technology scenarios that arise from electricity sector policies.

Figure 4 FTT basic structure



FTT:Power determines a technology mix by each state given a scenario of detailed electricity policy: carbon prices, subsidies, feed-in tariffs and regulations by technology. Changes in the power technology mix result in changes of production costs, reflected in the price of electricity. The model takes electricity demand from E3-India and feeds back a price, fuel use and investment for replacements and new generators.

Natural resource constraints

The representation of FTT:Power in the global E3ME model includes constraints on the supply of both renewable and non-renewable resources (Mercure & Salas, 2012, 2013, e.g. barrels of oil, or suitable sites for wind farms).

Non-renewable resources are treated as exogenous in E3-India since the rest of the world is not included. Due to data restrictions, it is only possible to introduced state-level constraints for some renewable technologies:

- for wind and solar, using information from MapRE , we introduce cost-curves to include diminishing capacity factors
- for hydro, state level maximum potentials are added using information from Energy Alternative India (EAI)
- landlocked states have zero potentials for wave, tidal and off-shore wind

Innovation and endogenous technological progress

In the past, technological progress has often been represented as exogenous in macroeconomic models (e.g. via a time trend) or as a residual in a neoclassical production function. Both methods have their drawbacks. The neoclassical approach is somewhat circular in its logic, i.e. to know a firm's production possibilities one needs to model technological progress, but in modelling technological progress one is already making an assumption about the production process. The time trend approach is also unappealing given its theoretical background.

Data availability for state-level investment is poor and there are no data for R&D. For this reason, R&D is set to zero in the technological progress indicator equation. In the future, R&D could be incorporated when data become available. Overall, the indicator is constructed using investment data of variable quality and users should exercise caution when using the indicator.

The measures of technological progress include both product and process innovation and this is represented in the various feedbacks to other parts of the model: a higher quality product could lead to higher levels of demand or command a higher price, so the technology indices feature in the model's trade and price equations. Additionally, the term is included in the model's energy demand equations to represent efficiencies.

The financial sector

E3-India features a specific treatment of financial balances in the economy. Equation specifications are included for each of the main institutional groups included in the model. Figure 5 presents a summary of the bilateral financial flows between groups. The crucial assumption in E3-India's financial block is that reserves provided by the central bank are not fixed: the money supply is endogenous. Pollitt & Mercure (2018) provides an analysis of the treatment of the financial sector in CGE and macro-econometric models, which are used to assess climate and energy policy.

Figure 52 Financial block basic structure

Sector Receiving

		Government	Households	Industry	Banking system	Other states	Other countries
Sector Paying	Government	x	Benefit payments	Government expenditure	Government saving and interest payments		
	Households	Taxes on income and expenditure	x	Household consumption net of tax	Household saving and interest payments	Expenditure in other states	Expenditure outside India
	Industry	Taxes on production	Wage payments, dividends	Inter-sectoral purchases	Retained profits, interest payments	Imports from other states	Imports
	Banking system	Government borrowing	Household borrowing	Industry borrowing	x		
	Other states			Exports, FDI (incl tourist expenditure)		x	
	Other countries			Exports, FDI (incl tourist expenditure)			x

COMPARING E3-INDIA TO ECONOMETRIC FORECASTING MODELS

E3-India could also be compared to short-term econometric forecasting models. These models, which are typically operational in government, describe short and medium-term economic consequences of policies but with a limited treatment of longer-term effects. This limits their ability to analyse long-term policies and they often lack a detailed sectoral disaggregation.

These models are usually used for short-term forecasting exercises, often with a quarterly or even monthly resolution.

E3-India combines the features of an annual short- and medium-term sectoral model estimated by formal econometric methods with the detail and some of the methods of CGE models, providing analysis of the movement of the long-term outcomes for key E3 indicators in response to policy changes. It is essentially a dynamic simulation model that is estimated by econometric methods.

E3-India has a complete specification of the long-term solution in the form of an estimated equation which has long-term restrictions imposed on its parameters. Economic theory informs the specification of the long-term equations and hence properties of the model; dynamic equations which embody these long-term properties are estimated by econometric methods to allow the model to provide forecasts. The method utilises developments in time-series econometrics, with the specification of dynamic relationships in terms of error correction models (ECM) which allow dynamic convergence to a long-term.

E3-India is therefore the result of an ambitious modelling project which expands the methodology of long-term modelling to incorporate developments both in economic theory and in applied econometrics, all applied at the state level in India.

Comparative advantages of E3-India

Compared to the other macroeconomic models in operation currently across the world (both CGE and otherwise), E3-India has advantages in the following four important areas:

- Geographical coverage
The current version of E3-India provides state-level coverage, with explicit representation of each state and territory in India.
- Sectoral disaggregation
The sectoral disaggregation of the model allows the representation of fairly complex scenarios at state level, especially those that are differentiated by sector. Similarly, the impact of any policy measure can be represented in a detailed way, for example showing the winners and losers from a particular policy.
- Econometric pedigree
The econometric and empirical grounding of the model makes it better able to represent performance in the short to medium terms, as well as providing long-term assessment. It also means that the model is not reliant on the rigid assumptions common to other modelling approaches.

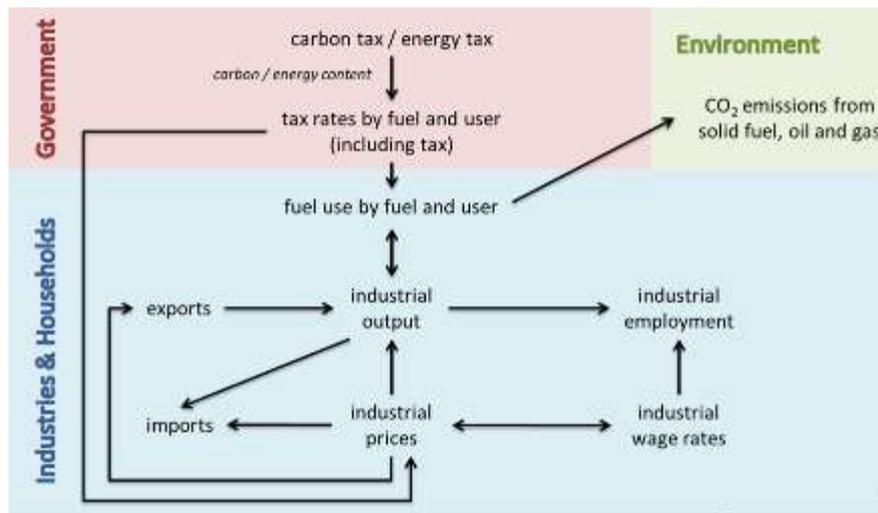
E3-India is a hybrid model. A non-linear interaction (two-way feedback) between the economy, energy demand/supply and environmental emissions is an undoubted advantage over models that may either ignore the interaction completely or only assume a one-way causation.

ILLUSTRATIVE EXAMPLE OF POLICY ANALYSIS USING E3-INDIA: CARBON TAX

Carbon pricing is a central pillar to the climate policy discussion globally. E3-India’s focus on energy and climate policy allow a detailed analysis of such a policy. Disaggregation by fuel types and fuel users enables users to assess targeted policy, such as future pathways of the Indian clean energy cess, introduced in 2010. Figure 6 details the key model interactions of introducing a carbon or energy tax. It illustrates the socioeconomic, energy, and environmental implications of policy which can be assessed.

The financial specification in E3-India allows users to develop the fiscal side of a carbon tax. Users can decide if carbon revenues are used to reduce government deficit or to reduce other taxes. Alternatively, the user can develop a more comprehensive climate and energy policy, such as directing carbon tax revenues to subsidising renewable technologies in power generation.

Figure 53 Modelling a carbon tax: E3-India interactions



REFERENCES

Franzén, M and T Sterner (1995), 'Long-run Demand Elasticities for Gasoline', in Barker, T., N. Johnstone and P. Ekins (eds.), *Global Warming and Energy Elasticities*, Routledge.

Johansson, O and L Schipper (1997), 'Measuring the long-run fuel demand of cars', *Journal of Transport Economics and Policy*, Vol XXXI, No 3, pp 277-292.

Mercure, J-F (2012), 'FTT:Power A global model of the power sector with induced technological change and natural resource depletion', *Energy Policy*, 48, 799–811.

Mercure, J-F and P Salas (2012), 'An assessment of global energy resource economic potentials', *Energy*, 46(1), 322–336.

Mercure, J-F, and P Salas (2013), 'On the global economic potentials and marginal costs of non-renewable resources and the price of energy commodities', *Energy Policy*, (63), 469–483.

Pollitt et al (2014), 'E3ME Technical Manual, Version 6.0', Cambridge Econometrics.

Pollitt, H, and J-F Mercure (2018), 'The role of money and the financial sector in energy-economy models used for assessing climate and energy policy', *Climate Policy* (18:2), 184-197.

1625 ENERGY, EMISSIONS AND ECONOMY WIDE IMPACTS OF COUPLED ENERGY EFFICIENCY AND RENEWABLE ENERGY MEASURES

ABSTRACT

This paper is being proposed as part of "E3-India Special Session". As India moves towards meeting its Intended Nationally Determined Contributions (INDCs) to emissions, policy makers have to choose among alternative policy options. The investment in renewable energy continues to be the primary choice. Energy efficiency is relegated to the second place as savings are not visible and its economy wide impacts are difficult to estimate. The debate on the choice between energy efficiency and renewable energy is far from settled and decisions continue to be made void of empirical evidence. In this paper, we estimate the (a) reduction in energy consumption and emissions, (b) economy wide impacts on GDP, employment and income over time due to promotion of efficient household appliances in the India. We find that this leads to reduction in electricity demand and avoided investments in construction of new power plants. In the next step, we allocate the money saved in construction of new power plants to promotion of renewable energy. We then re-estimate on emissions and economy as a result of two pronged approach. This method helps to quantify the complete monetary and environmental benefits of efficiency improvement programs dovetailed with renewable energy policy. The impacts of these scenarios are estimated based on their economy wide impacts using a coupled input-output econometric framework of the newly developed E3-India model. The model captures the relationship between Economy, Energy and Emissions, covering 20 economic sectors and five income quintiles for India's 27 states.

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1769 THE IMPACT CREDIT, PUBLIC SUPPORT AND EXPORTS ON REGIONAL GROWTH. THE CASE OF THE AZORES

ABSTRACT

According to the Base Model, regional growth depends on the growth of the basic activities. Nevertheless, these basic activities involves not only exports but also all the inflows of money associated with public and private transferences and credit. The aim of this paper is to analyze the factors of growth in the economy of the Azores. To achieve that we estimate an econometric model with data from 2000 until 2016 that relates total employment with the main exports, credit and external support for the Azores Economy. We conclude that in a period of crises the dynamic of credit plays a crucial role in the economy and that the change in policies related to the exports activity do have a major impact on the economic system.

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RS07.3. Methods in Regional Science and Urban Economics

1022 THE ROOTS OF A DUAL EQUILIBRIUM: GDP, PRODUCTIVITY AND STRUCTURAL CHANGE IN THE ITALIAN REGIONS IN THE LONG-RUN (1871-2011)

ABSTRACT

The article presents and discusses up-to-date estimates of GDP per capita, GDP per worker (productivity) and employment for Italy's regions, spanning 140 years in ten-year benchmarks (1871-2011), at the NUTS II level and at current borders, for the whole economy and its three branches - agriculture, industry, services. Sigma and beta convergence are tested for GDP per capita, productivity (GDP/employment) and workers per capita (employment/population). Four phases in the history of regional inequality in post-unification Italy are identified, roughly coinciding with the different political eras of the country: mild divergence (the liberal age), strong divergence (the two world wars and Fascism), general convergence (the golden age) and the "two-Italies" tale (1971-2011). Over the long-run, we document an increasing North-South polarization, with differences in employment becoming more important than those in productivity. This result is in line with a socio-institutional interpretation of the North-South divide.

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1036 A STUDY ON ENVIRONMENTAL VIOLATIONS FOR BRAZILIAN MUNICIPALITIES: A LIMITED INFORMATION MAXIMUM LIKELIHOOD APPROACH TO SPATIAL DYNAMIC PANEL

ABSTRACT

This paper presents novel evidence for environmental offenses in Brazil. IBAMA's strategy to deter violations is based on large operations and on decapitalizing offenders to signal it's will to monitor and enforce the law. We want to answer the following questions: Do the sanctions applied by IBAMA, especially sanction charges, deter actual and potential offenders? Are there any spatial or temporal patterns affecting violations? We use data on offenses against flora and applied fines for Brazilian municipalities between 1998 and 2015. We contribute to the existing research by providing evidence for Brazil and by incorporating spatial controls in a dynamic panel approach to explain infractions against the environment. We develop and apply a Spatial LIML estimator that accounts for the endogeneity of sanction charges to estimate our panel models. Results show that there is a pedagogic deterrent effect associated with applied fine values. Sanction charges are important to discourage new offenses.

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1048 CAREER PATHS AND WAGES IN DIFFERENT CITY SIZES

ABSTRACT

We assess how career paths are influenced by the size of the cities. We follow a group of 2 million Brazilian workers for 14 years and assess their wage history, as well their mobility in terms of occupations, firms and cities. We estimate the wage premium for staying in the same job or changing jobs in the same city or in another city. We are able to determine the role of city size on career success.

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RS08.1. Migration and Labor Markets

1186 HETEROGENEOUS BENEFITS OF DENSE LABOUR MARKETS - EVIDENCE FROM TRANSITIONS TO EMPLOYMENT IN GERMANY

ABSTRACT

We investigate whether the size of the local labour market impacts on the wage of new employment relationships and whether the benefits of large urban labor markets significantly differ across distinct types of transitions to employment. The analysis is based on a large data set providing detailed micro-level information on transitions to employment in Germany. Our results suggest rather small static urbanisation benefits. Doubling employment density increases the productivity of new employment relationships by 0.9% up to 2.2%. Moreover, the findings indicate that the benefits accrue only to persons experiencing job-to-job transitions and short-term unemployed. We detect no important impact of urbanisation on transitions from long-term non-employed. We suppose that these differences point to matching advantages in large urban labour markets from which only some job seekers benefit.

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1253 EMERGING KOLKATA WITH ITS MIGRATING POPULATION MAKING CHANGE IN LABOR MARKET

ABSTRACT

Migration means movement of people from one place to another place. It plays an important role on labor market. Migration is affected by pull and push factors, which transfers labor from areas of surplus to areas of deficit. It helps to raise productivity of the labor force and minimizing imperfections in the labor market. This paper is an attempt to discuss the relationships between migration and labor market. The main objective of this paper to analyze the impact of migration on labor market. For this purpose Kolkata Metropolitan area has been chosen as study area. Kolkata is located in 22.5726°N to 88.3639°E. It is the capital of the Indian state West Bengal, situated on the east bank of river Hooghly. Kolkata is the third most populous metropolitan area in India after Delhi and Mumbai but now days, Kolkata is suffering from high migrated population. Migration is one of the common trends in these days. In rural Bengal, people are facing so many problems which pull them to Kolkata. In search of employment people are migrating from rural areas as daily workers. They are migrating from mainly South 24 Pargana, North 24 Pargana and Howrah. This continuous influx of migrated labor is creating pressure on labor market which results the stagnation of employment. The study is based on primary and secondary data. Primary data are collected through random, stratified and purposive sampling process. The secondary data are collected from different data sources such as Census Report 2011, professional magazines, reference book, newspapers, journals etc. various quantitative techniques are applied to establish the relation between migration and labor market. Gravity Model, based on Newton's law of gravitation has been used here to analyze the relationship between distance and migration. Relative Deprivation theory of migration by Oded Stark, applied here to create link between social mobility and migration. Lastly, the main pull factors of the rural to urban migration are identified with the help of Dual Labor Market theory. Perception study of laborers is also done here. The study reveals that migration has both positive and negative impacts on labor market. It creates labor availability but also reduces wage rate of the labors. Due to excessive labor, skilled labors are getting more priority than unskilled labors and a huge wage difference has been created between skilled and unskilled labors which results inequality in society. There is a need for balanced development across all regions of West Bengal. More focus is needed on the employment opportunities of rural areas and better schemes should be designed to overcome this condition. Key words: Migration, labor market, pull and push factors, impact of migration, gravity model, dual labor market theory, relative deprivation theory.

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1482 INTERNATIONAL COMMUTING BETWEEN NEIGHBOURING EU-COUNTRIES

ABSTRACT

This paper will investigate annual international commuting between neighbouring EU-countries during the period 2011-2014. International commuting from one EU-country to a neighbouring EU-country will be explained by differences between the two countries in (i) hourly (net) wage costs; (ii) kilometres of expressways; (iii) unemployment rates. See also Mathä and Wintr (2009). A common language between neighbouring countries will also be taken into account when explaining international commuting. Apart from overall commuting, we also distinguish between commuting by different types, like gender, education level, working time, contract type, age- group, firm size of the working firm and nationality of the commuter. These different types may lead to different levels of commuting and thus may have different effects of our explanatory variables. These different estimation results will be presented and discussed. Finally, we will also make recommendations based on our analysis that will help to stimulate cross-border commuting in the EU.

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1518 DETERMINANTS OF RURAL TO URBAN MIGRATION IN LARGE AGGLOMERATIONS IN INDIA: AN EMPIRICAL ANALYSIS

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ABSTRACT

The paper investigates the relevant determinants of rural to urban migration in large agglomerations in India. The OLS regression results based on data from 51 cities, show that city-wise employment and unemployment situation (measured by male self employed, not in labour force male, male casual labourer) have a negative impact on city level rural to urban migration. The level of poverty (measured by poverty head count ratio) and inequality level of a city also has a negative impact. However, infrastructure condition (availability of total number of electricity connection) of a city has a positive impact on city-wise rural to urban migration. Economic conditions also matters higher level of rural to urban migration. Finally, it suggests that cities need to equip themselves with better infrastructural facilities along with higher job opportunities to encourage urbanization through rural-urban migration for higher and sustainable economic growth in India.

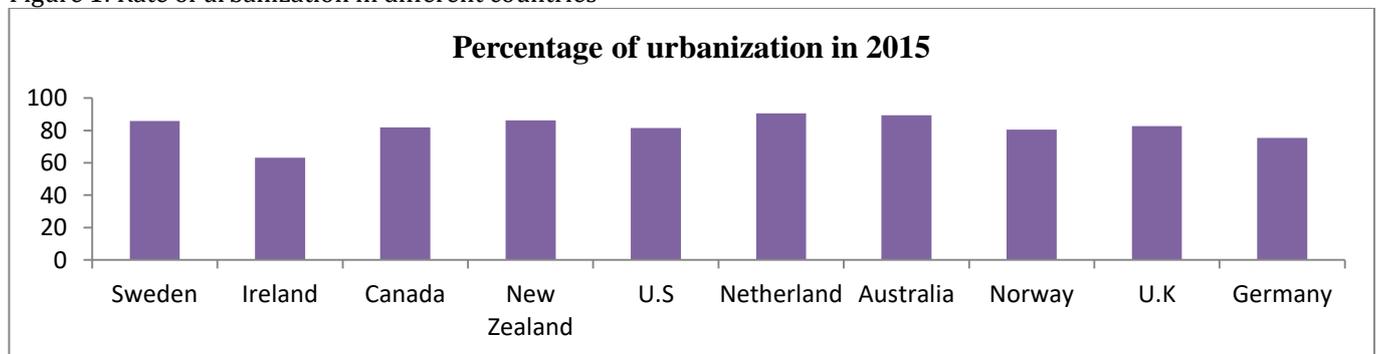
Key Words: Urbanization, rural to urban migration, urban economic growth, India.

JEL Classification: R12, O10, O15

1. INTRODUCTION

In the wake of the rapid urbanization in recent years, Indian economy is witnessing a transformation from an agro-based rural economy to an urbanized modern economy. After independence, urbanization rate has increased continuously; in urban population in India was 28.53 percent in 2001 which increased to 31.16 per cent in 2011. The growth of urbanization has led to higher economic growth (Tripathi, 2013; Tripathi and Mahey, forthcoming) i.e., urbanization is the engine of economic growth in India. Currently 31.16% urban population is contributing about 63% of India’s GDP (GOI, 2011). However, the percentage of population residing in urban areas in developed countries is far greater than in India. As shown in Figure 1, per the data given by World Urbanization Prospects (WUP) (UN, 2014) 85.8 % (or 75.3 % or 63% or 81% or 90.5 % or 89.4 % or 80.5 % or 82.6 %) urban population live in Sweden (or Germany or Ireland or Canada or New Zealand or U.S.A. or Netherlands or Australia or Norway or U.K.) as of 2015. This clearly indicates that India's urbanization rate is lower than in the developed countries.²⁴⁷ It is also predicted that India’s future development process ought to be lead by high urbanization rate.

Figure 1: Rate of urbanization in different countries

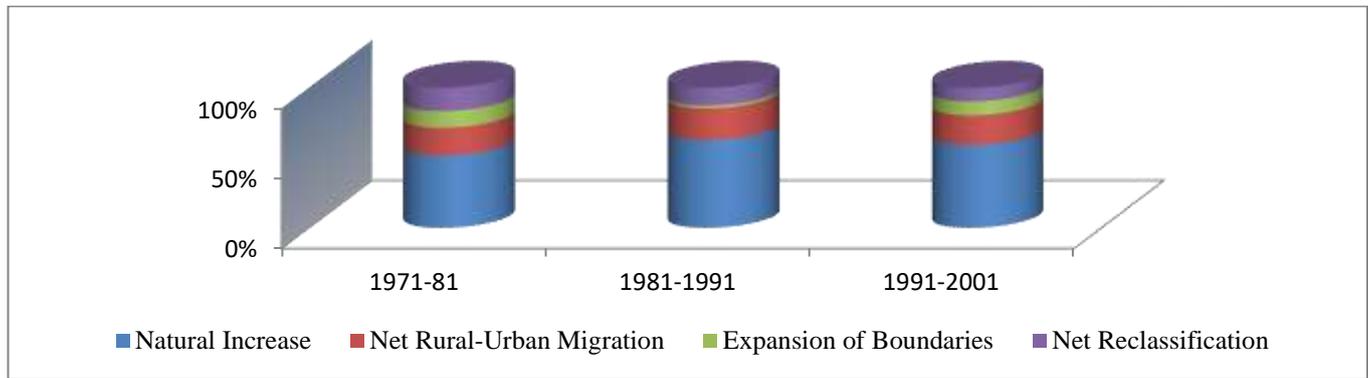


Source: WUP (2014)

The urban growth occurs due to the natural growth of population, expansion of city boundaries, net rural to urban migration, and reclassification of rural areas into urban. Figure 2 shows that net migration from rural to urban areas contributed to about 21 per cent to the increase in urban population in the 1990s, a little smaller than its contribution of 22.6 per cent in the 1980s. Natural increase has been by far the largest source of increase in urban population (62.7 per cent in the 1980s and 59.2 per cent in the 1990s).

Figure 2: Sources of Increase in Urban Population

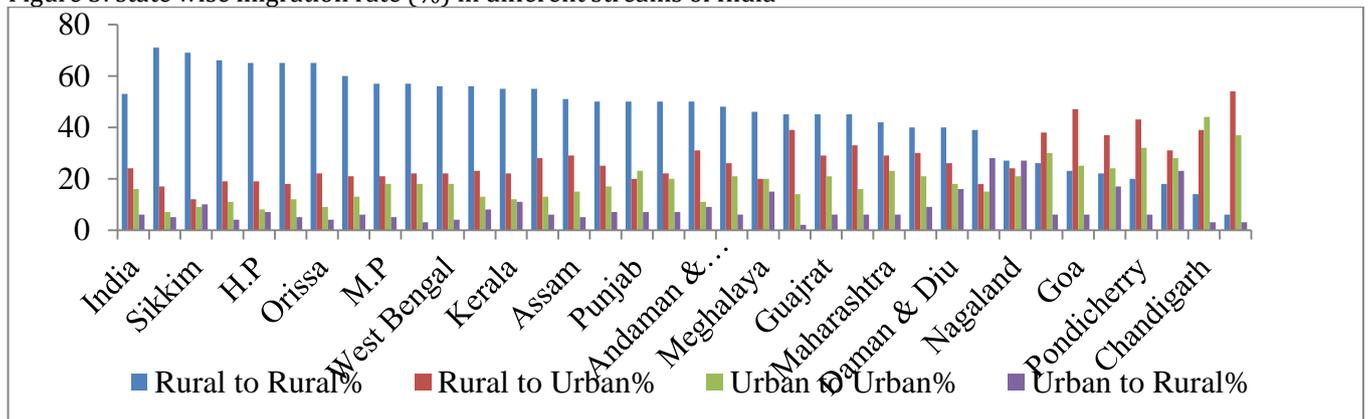
²⁴⁷ Though different countries follow different definitions to measure urbanization still we can say India’s urbanization rate is much lower than other developed countries.



Source: GOI (2011)

Migration is the transfer of population from one area to another. Labour migration from agricultural sector to non-agriculture sector in 2007-08 was 66% in which 63% of migrants were men in India. The migration of male population is greater than female. Migration leads to higher growth in urban population, but the migration rate has been very low in India. To increase the growth rate of urbanization, it is essential to promote rural to urban migration. Migration depends upon many factors like job opportunities in urban areas, urban poverty, and higher urban wage rate. Thus, migration positively impacts, the growth of economy, albeit indirectly. Rural to urban migration leads to the growth of economy through the growth of urbanization. Migration could be voluntary or coercive. Voluntary migration occurs due to the promise of job opportunities, education, better medical care, securing family links, industrial job, higher income etc. in the host city. On the other hand, forced migration occurs due to drought, political war, poor medical care, loss of wealth, forced labour, etc.

Figure 3: state wise migration rate (%) in different streams of India

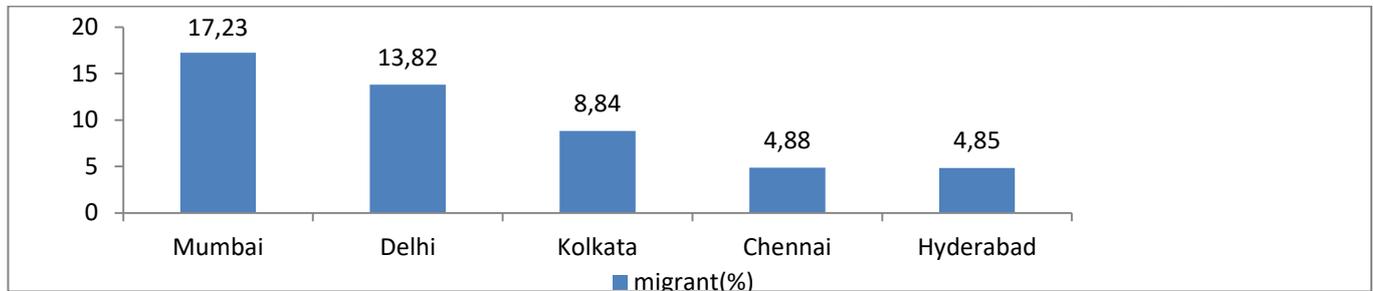


Source of data: NSSO 64th round National Sample Survey of India

The 64th round of Indian National Sample Survey Office (NSSO) on “Employment & Unemployment and Migration Particulars” during July 7 to June 8 2007-08, covered a sample of 1,25,578 households and 5,72,254 persons. The survey, taking into account the entire mobility including within - and between states, estimates the mobility of the Indian population as about 30 percent. However, within this 30% the share of migrants within the state was 85% and across state, 15%. In other words, migration was by and large rural to rural. Figure 3 provides figure of state- wise migration between rural to rural, rural to urban, urban to urban, and urban to rural. As can be seen from the table, in internal migration, the maximum percentage of migration was rural to rural. Rural to urban migration was the highest in Delhi at 54%. In the rural to urban migration stream, Sikkim had the lowest percentage value of 12%. The percentage of urban to urban migration was quite in Chandigarh at 44%. The percentage value of urban to urban migration was quite for Manipur also. The figure shows that the percentage of rural to urban migration is less than that of rural to rural migration in India. On the other hand, developed or economically advanced Indian states have a higher level of rural to urban migration rate than the less developed states. It becomes clear from the above analysis that in order to have higher development, rural-urban migration needs to be promoted.

Given the present focus on smart cities/million plus cities, it is necessary to consider India-specific data on migration, particularly rural-urban migration arrive at any meaningful conclusion. The diagram below (Figure 4) shows the trends of migration in top five million plus cities on the basis of census of India in 2001 on a time-scale of ten years and more than 10 years. Mumbai reported 17.32% its population as migrants, which is quite higher than in other million plus cities. The second-ranking city, Delhi, reported 13.82% as its migration of population.

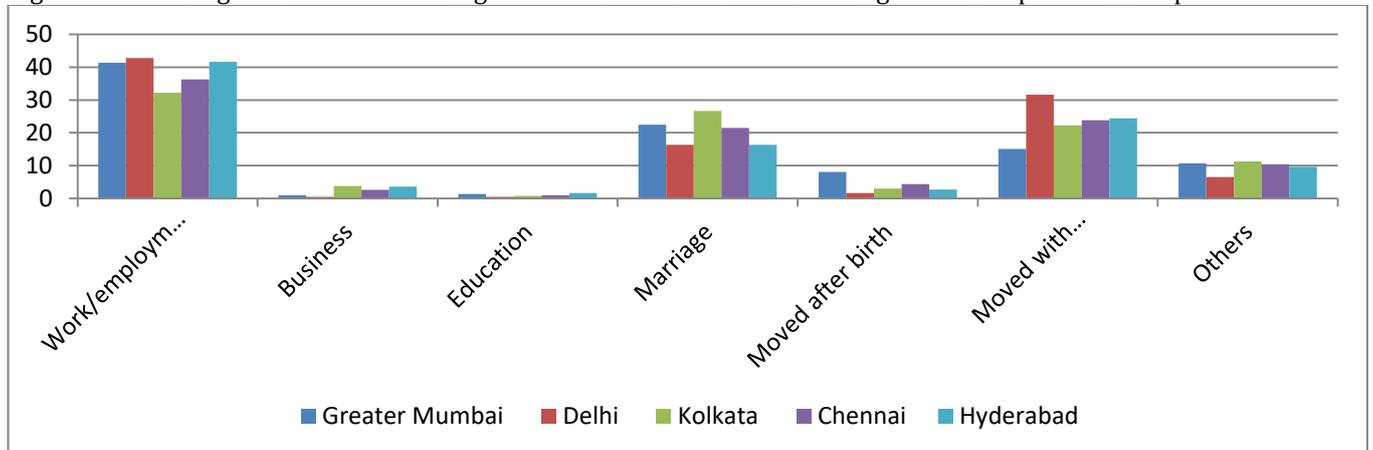
Figure 4: Percentage of rural to urban migration in top five (as per population size) million plus cities



Source: Census of India 2001

The Census data also provides enough clues about the reasons for rural to urban migration in these cities. Figure 5 shows the percentage of rural to urban migrants on the basis of reasons of migration in top five million plus cities with the time duration of ten years and more than ten years. The figure indicates that the main reasons behind the migration of population are work and employment. A large part of migrants move from backward to modern areas due to lure of job opportunities. It is observed that the largest rural-urban migration was to Mumbai (28,47,510 persons), of which 41% people cited work and employment as reasons for migration; 22% people migrated due to marriage in which the percentage of women was higher than that of men. Migration to Delhi, Chennai and Hyderabad also show the same pattern; higher rural to urban migration was dominated by work and employment reasons in these cities. Marriage and consequent re location of households is also cited as causes for rural to urban migration.

Figure 5: Percentage of rural to urban migrants on the basis of reasons of migration in top five million plus cities



Source: Census of India (2001)

Recently, government of India has launched several policies and programmes to promote urbanisation-led development in India as urban areas have traditionally contributed higher level of GDP than rural areas. Among the various policies, 100 Smart Cities Programme, AMRUT (Atal Mission for Rejuvenation and Urban Transformation), JNNURM (Jawaharlal Nehru National Urban Renewal Mission), UIDSSMT (Urban Infrastructure Development Scheme for Small and Medium Towns), NERUDP (North Eastern Region Urban Development Programme), NUIS (National Urban Information System), Capacity Building for Urban Local Bodies, Lump Sum Provision Scheme for the benefit of North East Region (NER) including Sikkim, Brihan Mumbai Storm Water Drainage (BRIMSTOWAD) project at Mumbai, PPP (Public Private Partnership), Clean India Mission are the major programme and policies introduced by governments in recent years to promote urbanization in India.

The above discussion clearly indicates that India is experiencing a higher level of urbanization and its contribution to national income is also high. This in turn indicates that Indian economy is going through a transformation from an agricultural based rural economy to an industry and service lead urban economy. In fact, recent years government has initiated and implemented various urban related policies and programs to promote urbanization in India. However, the country needs still better policies in the days to come to promote planned urbanization in India and to absorb the maximum economic potential that urban areas can provide for sustainable economic growth in India. Given the importance of knowing the factors which contribute to rural to urban migration in India, it is imperative to systematically study the determinants of rural to urban migration in India. It is only fair to that rural to urban migration will lead to future rapid urbanization in India which in turn will lead to higher and sustainable economic growth. It is hoped that the findings of this paper will help policy makers to formulate effective policies in India to promote urbanization through rural to urban migration. It is also surmised from a review of existing studies on this topic is that this is first study in India which considers city specific factors to identify the reasons behind city level rural to urban migration.

In this study, urban agglomeration is defined as a geographic concentration of urban population and related economic activities. This implies that urban agglomeration includes, but is not equal to, urbanization. Here, cities with 750,000 or more inhabitants as of 2015 are defined as large urban agglomerations. There are several reasons behind the selection of such large agglomerations as the units of analysis. First, World Urbanization Prospects provide updated data for the

cities with 750,000 or more inhabitants for the years 1950 to 2025 with five year intervals, whereas Indian census data only provides data up to the 2001 census (as latest 2011 census data is yet to be published) with a 10 year interval. Second, because of the unavailability of city specific data for a large number of variables used in this study (e.g. city income data), city district (where the sample city is located) is used as a proxy of a city. Larger cities are a good proxy for a city district as they cover a larger portion of a district than the smaller cities. Third, as India's urbanization (i.e. share of urban population) is mainly centred around Class I cities, these cities by definition belong to Class I cities. On the other hand, urban economic growth is defined by growth rate of city domestic income (i.e. non - primary district domestic product [DDP])

2. BRIEF REVIEW OF LITERATURES

To understand the movement of people occurring within the country, it is important to study the migration pattern initially. Arzaghi and Rupasingha (2013) argued that the migration of rural to urban occurs due to diversification. The migrants get opportunities to migrate due to correlation of income between origin and destination as measure of diversification, as in the case of United States. Iversen (2006) argues that the rural to urban migration is a dynamic migration model. The reasons of migration are social network, multipliers, spillovers, and caste affinities and the job opportunities in urban areas. According to McCatty (2004) who examined the need of rural to urban migration in developing countries, migration takes place in these countries due to both the push-pull migration forces these forces are of two types -- voluntary forces and involuntary forces. Voluntary forces are job opportunities; education, medical facilities, high per capita income, transport facilities, high living standard etc., and the involuntary forces are political disputes, strike, fighting with neighbors, lack of transport facility, illiteracy, natural disaster, bullying etc.

In the context of India, Mitra and Murayama (2009) found that intra state migration is much higher in magnitude than inter-state migration rate in India. Male and female migration rates are closely inter connected irrespective of whether they migrate from rural areas within the states and outside the states. The social and cultural diversity in India stands as a major hindrance to population mobility. Bhagat (2014) argued that migrants with low education and skills, given with the seasonal and temporary nature of their employment, are more vulnerable and subject to various kinds of exclusions in urban areas. Migration is treated more as an issue of governance rather than one of development in developing countries like India. Akram (2015) analyzed the push factors of rural to urban labour migration in India. His empirical analysis shows that increase in per capita Net State Domestic Product tends to decrease the number of out-migrants from the rural areas of that state whereas increase in the proportion of population living below poverty line, higher proportion of Scheduled Castes in the population and illiteracy rate in the rural area of the state, etc. tend to decrease rural to urban labour migration from that state to other states. Agasty and Patra (2013) who examined the determinants of rural to urban migration in the Indian states of Orissa states that there are two types of variables that influence the migration rural to urban: micro variables and macro variables. These are the two variables that influence people to move from one place to another. Micro variables are individual variables and macro variables refer to the factors that influence the whole population of a particular place or area to move.

However, there only a few studies that have tried to investigate the economic factors that contributes to rural to urban migration in India. Therefore, it is hoped that the present study will be useful not only to measure the effect of migration on urbanization but also its effect on economic growth and development.

3. EMPIRICAL FRAMEWORK AND RESULTS OF THE ESTIMATION OF DETERMINANTS

To empirically investigate the determinants of rural to urban migration in large agglomeration in India, the following OLS regression model is used for estimation.

$$\text{Migrant} = \alpha_0 + \sum_{i=1}^9 \alpha_i X_i + \epsilon \tag{1}$$

Here, the dependent variable 'Migrant' in equation 1 has two different forms; first it is measured by percentage of rural to urban migration in large agglomeration in India and secondly, it is measured in terms of the total number of rural to urban migrants. The X_is are independent variables i.e. city wise total self employed male, city-wise self employed female, level of inequality, railway station- distance from the city, total number of electricity connections, not in male labour force, city-wise total number of universities, casual worker male, city output, city-wise poverty headcount ratio, city-wise poverty gap ratio, city-wise total no. of medical facilities, city wise average rain fall, city-wise total receipts and city-wise total number of colleges.

Appendix table AI lists out the all the cities which are considered for the study. Summarized in Appendix table AII are the descriptions, measurements, and data sources of all of the variables used in estimation of OLS regression of Equation 1. Table 1 explains the means, standard deviations, minimum, maximum, and coefficient of variation (CV) values for the variables used for the regression analysis. Most importantly, the CV aims to describe the dispersion of the variables in a way that does not depend on the variable's measurement unit. The higher values of CV for railway station distance from the city in and total number of electricity connections indicate a greater dispersion in these variables. On the other hand, city output, city wise average rain fall and city wise total number of self employed male show a lower dispersion in these variables. On the other hand, Table 2 presents the row correlation coefficients.

Table 1: Description of data used in the regression equation

Variables	Mean	Std. Dev.	Min.	Max.	C.V.
Percentage of rural to urban migration in 2001 (prum)	18.6	12.2	2.7	47.4	65.7

Total number of rural to urban migrants (trum) (in thousands)	383.1	794.9	25.7	4651.5	0.21
City wise total Self employed male in 2004-05 (selfm)	328.4	94.6	188.8	615.8	28.8
City-wise self employed female in 2004-05 (self)	91.0	71.8	7.4	348.2	79.0
Level of inequality in 2004-05 (Gini)	0.3	0.1	0.1	0.6	28.7
Railway Station distance from the city in 2001 (rail dist)	0.4	1.4	0.0	8.0	383.6
Total no. of electricity connection in 2001 (elect) (in thousands)	461.4	1222.2	0.0	8560.3	0.26
Not in male labour force in 2004-05 (nlfm)	215.1	64.2	72.3	439.2	29.8
City-wise total number of universities in 2001 (univ)	1.1	1.2	0.0	5.0	105.0
Casual worker male in 2004-05 (casualm)	104.3	60.4	9.3	300.9	57.9
City output in 2001 (ddp)	16597.8	7614.6	797.2	38412.6	45.9
City-wise poverty headcount ration in 2004-05 (fgt0)	12.2	12.5	0.2	57.8	102.4
City-wise poverty headcount ration in 2004-05 (fgt1)	2.3	3.1	0.0	16.1	132.7
City-wise total no. of medical facilities in 2001 (medi)	187.4	213.8	2.0	781.0	114.1
City wise average rain fall in 2001 (rain)	1075.3	570.2	266.0	3053.0	53.0
City-wise total receipt through taxes and revenue derived from municipal properties (trmp) (in lakh) in 2001	14.9	53.2	0.0	380	0.004
City-wise total no. of colleges (ctc) in 2001	41.5	49.0	1.0	195.0	118.2

Source: Calculated by authors' by using 51 observations

Table 2: Correlation Coefficient of Determinants of rural to urban migration in large cities in India

	prum	trum	selfm	selff	gini	raildist	elect	nlfm	univ	casualm	ddp	fgt0	fgt1	medi	rain	trmp	ctc
prum	1																
trum	0.39	1															
selfm	-0.16	0.09	1														
selff	0.33	0.16	0.54	1													
gini	-0.23	0.08	-0.20	-0.09	1												
raildist	0.03	0.03	-0.04	-0.22	-0.04	1											
elect	0.15	0.05	-0.16	-0.21	-0.16	-0.07	1										
nlfm	-0.03	0.02	-0.46	-0.34	0.16	0.37	0.24	1									
univ	-0.14	0.15	-0.05	-0.04	-0.06	-0.23	0.11	-0.11	1								
casualm	0.09	0.20	-0.26	0.03	-0.14	-0.19	0.22	-0.17	0.24	1							
ddp	0.04	0.03	-0.28	-0.22	0.01	-0.01	-0.07	-0.17	-0.12	-0.03	1						
fgt0	-0.11	0.08	-0.10	-0.08	0.17	-0.06	-0.07	0.12	-0.13	0.28	-0.18	1					
fgt1	-0.05	0.08	-0.18	-0.09	0.15	0.06	-0.05	0.20	-0.15	0.30	-0.12	0.93	1				
medi	0.06	0.03	-0.17	-0.23	-0.11	0.29	0.10	0.04	0.02	0.04	0.22	-0.08	0.01	1			
rain	0.03	0.19	-0.09	-0.19	0.10	0.06	-0.03	0.03	-0.03	-0.21	-0.03	-0.15	0.14	0.03	1		
trmp	0.08	0.03	0.08	-0.08	-0.16	-0.07	0.27	-0.19	0.13	0.06	-0.01	-0.06	0.08	0.32	0.26	1	
ctc	-0.03	0.08	-0.11	-0.19	-0.13	-0.11	0.61	0.06	0.17	0.19	0.11	0.02	0.04	0.48	0.04	0.50	1

Note: See Table 1 for variable definitions. The correlation coefficients are based on 51 observations. Source: Authors'.

Table 3: Determinants of rural to urban migration in large cities in India

Independent variables	Dependent variable:				Total Migrants from Rural to Urban
	Percentage of Rural to Urban Migration				
	(1)	(2)	(3)	(4)	
City wise total no. of self employed male	-0.081** (0.031)	-0.092*** (0.027)	-0.094*** (0.027)		-0.006*** (0.002)
City-wise self employed female	0.117** (0.048)	0.123*** (0.045)	0.123*** (0.044)		0.006* (0.004)
City-wise level of inequality	-23.74 (19.69)	-31.714* (16.61)	-30.98** (14.39)		-0.447 (1.59)
Road distance to nearest railway station from a city	0.817 (0.847)	1.761* (1.02)	2.091** (0.782)		0.192 (0.109)
City-wise total no. of electricity connection	6.48*** (2.23)	0.276*** (0.081)	0.279*** (0.087)	6.01*** (1.48)	0.005 (0.007)
City-wise total no. of persons not in labour force	-0.005 (0.032)	-0.051* (0.028)	-0.054* (0.029)		-0.003 (0.003)
City-wise total number of universities	-0.855 (1.42)	-1.387 (1.162)		-1.93 (1.621)	
City-wise total no. of casual male worker	-0.033 (0.035)	-0.036 (0.030)	-0.048* (0.028)		
City wise per capita income	-6.284* (3.61)	-0.189 (1.908)			-0.054 (0.283)
City-wise poverty headcount ration	-0.024	0.032	0.051	-0.549**	0.026

	(0.265)	(0.134)	(0.122)	(0.263)	(0.046)
City-wise squared poverty headcount ratio	0.216 (1.35)			2.12 (1.35)	-0.077 (0.194)
City-wise total no. of medical facilities	0.006 (0.008)	0.001 (0.008)			
City wise average rain fall	0.0004 (0.003)	0.002 (0.002)			
City-wise total receipt through taxes and revenue derived from municipal properties	0.056 (0.018)			0.028*** (0.009)	
City-wise total number of colleges	-0.069* (0.039)			-0.122*** (0.037)	
Intercept	56.39 (52.67)	61.405** (27.289)	62.96*** (14.38)	45.83*** (16.45)	14.59** (3.64)
No. of observations	51	51	51	51	51
R square	0.51	0.46	0.44	0.19	0.18
Adjusted R ²	0.28	0.29	0.33	0.08	0.003
F Statistics	4.59***	7.42***	9.65***	7.79***	1.74
Mean VIF	3.62	1.57	1.59	4.07	3.47

Note: Figures in parentheses represent robust standard errors. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. Source: Estimated using equation 1.

Table 3 presents the estimated regression results from Equation (1). Regression 1 reports the full model where all the independent variables for OLS estimation are considered. On the other hand, regression models 2-4 represent the parsimonious model by excluding the explanatory variables that did not show statistically significant results or match with the expected sign conditions. Regression models 1-5 consider the robust standard errors (to control for heteroskedasticity). The significant values of F statistics for Regressions 1-4 indicate that the overall model is statistically significant. The higher values of R² indicate that Regression 1 explains a good percentage of total variation in the dependent variable. The study has also calculated the adjusted R², as it adjusts for the number of explanatory terms in a model, i.e., it incorporates the model's degrees of freedom. The multicollinearity problem does not seem to be troublesome, as the mean VIF values do not exceed 10 for Regression model 1-5.

Regression 1 shows that city-wise total self employed male has a negative impact on the percentage of rural to urban migration. In particular, a 100 percent increase of city-wise total self employed males decreases rural to urban migration by 8 percentage points. However, percentage of city-wise total self employed female has a positive impact on the percentage of rural to urban migration. This indicates that cities having higher percentage self employed female attract higher rural to urban migration whereas cities having higher percentage self employed male discourage to urban migration. This may be the case that if women have the chance to make them self employed in the city; more rural women from rural households will migrate to urban areas to earn more provided that their male partners also find jobs in the same city. The possible increases in income of the households make rural to urban migration easier and also attractive. On the other hand, city-wise availability of higher number of electricity connections has a positive impact on rural to urban migration. The estimated result shows that a 10 percent increase of total number of electricity connection in the host city increases rural to urban migration by about 65 percent. It is important to indicate here that availability of electricity connections stand as a proxy of availability of infrastructure facility. The result indicates that infrastructure facility has a positive impact on rural to urban migration. Finally, regression 1 shows that city wise per capita income also has a negative impact on percentage of rural to urban migration. This means that if a city has higher per capita income (i.e., richer city), it discourages rural to urban migration. It therefore indicates that a richer city may be more expensive for a person to migrate from rural to urban areas. City-wise total number of colleges also has a negative impact on percentage of rural to urban migration. This indicates that the educational facilities do not attract higher percentage of rural to urban migration. The other independent variables i.e., city-wise level of inequality, road distance from a city to nearest railway station, poverty ratios, medical facilities, number of universities, average rain fall, and total receipt through taxes and revenue derived from municipal properties do not show any statistically significant effect on the percentage of rural to urban migration.

Regression 2 shows very important results; it shows that level of inequality in a city has a negative impact on the percentage of rural to urban migration. On the other hand, road distance from the nearest railway station to a city exerts a positive impact. In particular, a one percent increase in level of inequality (or road distance from nearest railway station to a city) decreases (or increases) 32 (or 2) percentage of the rural to urban migration. The result indicates that if a city has higher level of inequality, it discourages rural to urban migration. On the other hand, if a city has higher road distance from the nearest railway station, naturally indicates the lower economic potential and therefore it encourages rural to urban migration. This means that cities having lower economic potential attract higher rural to urban migration. Similarly, cities having lower percentage (number) of the higher number of persons those are not in labour force attract lower percentage of rural to urban migrations. This shows that employment potential in the host city is one of the main factors behind rural to urban migration. People move from rural areas with the expectation of getting absorbed in the urban areas. City wise total number of self employed male or females, and total number of electricity connections of the host city has a similar impact on percentage of rural to urban migration as explained in regression 1. However, city-wise total number of universities, number of male casual worker, poverty head count ratio, medical facilities, and average rain

fall again do not show any statistically significant effect on percentage of rural to urban migration. Most importantly, city wise per capita income lost its significant level in regression 2 compared to regression 1.

Regression 3 shows that city-wise total number of male casual worker has a negative impact on rural to urban migration. A 100 percent increase in total number of casual workers decreases rural to urban migration by about 5 percent. This clearly indicates that cities need to provide formal regular jobs than making the migrants casual workers to attract higher level of rural to urban migration. City-wise total number of self employed males or females, level of inequality, road distance from nearest railway station to a city, availability of electricity connections and number of persons not in labour force show a similar impact on percentage of rural to urban migration. However, city-wise poverty situation does not have any significant impact on rural to urban migration.

Regression 4 shows that city-wise higher poverty ratio (measured by poverty head count) has a negative impact on city-wise rural to urban migration. A 10 percent increase in poverty head count ratio decreases city-wise rural to urban migration by about 5.5 percent. This indicates that poorer cities discourage rural to urban migration. On the other hand, city-wise higher total receipt received through taxes and revenue derived from municipal properties, also have a positive impact on rural to urban migration. This indicates that strong economic conditions encourage higher rural to urban migration. The availability of electricity connection in a city shows a positive impact on rural to urban migration as explained in regression 3. However, city wise total number of universities and squared poverty gap ratio again do not show any statistically significant affect on city-wise rural to urban migration.

Finally regression 5 considers the total numbers of rural to urban migrants as the dependent variables. The estimated results show that city-wise total number of self employed males has a negative impact, and city-wise total number of self employed female has a positive impact on city-wise rural to urban migration. These results are identical to the results obtained in regression models 1-3. However, other independent variables do not show any statistically significant effect on city-wise rural to urban migration. It also indicates that the data considered in this study does not fit properly when the total number of rural to urban migrants is considered as a dependent variable.

4. CONCLUSION AND POLICY IMPLICATION

This paper tries to investigate the determinants of rural to urban migration in large cities of India based on 2001 data. For this analysis, data from various sources such as Census of India and unit/individual level data of National Sample Survey data on employment and unemployment and consumption expenditure data have been used for analysis. Due to lack of city-wise data district level data is used by considering urban sample located in that particular district as a proxy of the city. OLS regression method is used to analysis data in this study. City wise rural to urban migration rate and total number of rural to urban migrants are considered as dependent variables.

The descriptive analysis shows that India's urbanization rate is much lower than other developed countries. Natural increase in population is one of the main sources of increase in urban population in India. The net rural to urban migration from 1991 to 2001 is about 21 percent. Economically developed states have been witnessing higher rural to urban migration than economically underdeveloped states. Among the large cities, Mumbai has recorded the highest (i.e., 17.32%) rural to urban migration rate in the time span of ten years and more, among all other large agglomerations. City-wise analysis shows that reasons for rural to urban migration are predominantly work/employment and marriage.

The OLS regression results show that city-wise total number of male self-employed, level of city level inequality, males not in labour force, male casual labour, city-wise per capita income, city level poverty measured by poverty head count ratio, and city wise total number of colleges have a negative effect on city-wise percentage of rural to urban migration. On the other hand, city wise total number of self employed female, road distance to nearest railway station from a city, total of number of electricity connections and city-wise total receipts through taxes and revenue derived from municipal properties have a positive impact on city-wise rural to urban migration. On the other hand, city-wise total number of self employed male has a negative and city wise total number of self employed female has a positive impact on city-wise total number of rural to urban migrants. This results indicate that city level employment situations, city level inequality level, city level poverty and infrastructure facilities play an important role in rural to urban migration.

It is quite obvious that the country needs more rural to urban migration for economic development in India. In rural areas, more population depend upon agriculture, and the higher dependence on agriculture leads to disguised unemployment in rural area. If the disguised unemployed population is relocated in urban areas, then the supply of labour and demand of consumer goods in urban areas will increase. This will in turn lead to more production, higher level of economic activity and also higher per capita income. The level of job opportunities in the cities will also increase in this process. And this increase will promote investment which will in turn lead to further economic growth. So, the economic growth in India can be catalyzed through the growth of urbanization resulting from rural to urban migration.

In this perspective we suggest the following policies; first, we need to increase the job opportunities in the urban area for higher rural to urban migration. Second, level of urban poverty and urban inequality has to control for this purpose. Third, basic urban infrastructure facilities such as road, electricity, education etc has to increase not only to make investment friendly but also to promote rural to urban migration. Finally, living cost such as urban housing prices has to control for making Indian cities migrant friendly for higher and sustainable economic growth.

APPENDIX

Table A1. Names of Cities Used in Regression Analysis

Agra (Agra), Aligarh (Aligarh), Allahabad (Allahabad), Amritsar (Amritsar), Asansol (Bardhaman), Aurangabad (Aurangabad), Bangalore (Bangalore Urban), Bareilly (Bareilly), Bhiwandi (Thane), Bhopal (Bhopal), Bhubaneswar (Khordha), Chennai (Chennai), Coimbatore (Coimbatore), Delhi@, Dhanbad (Dhanbad), Durg-Bhilainagar (Durg), Guwahati (Kamrup), Gwalior (Gwalior), Hubli-Dharwad (Dharwad), Hyderabad (Hyderabad), Indore (Indore), Jabalpur (Jabalpur), Jaipur (Jaipur), Jalandhar (Jalandhar), Jamshedpur (Purbi- Singhbhum), Jodhpur (Jodhpur), Kanpur (Kanpur Nagar), Kochi (Ernakulam), Kolkata (Kolkata), Kota (Kota), Kozhikode (Kozhikode), Lucknow (Lucknow), Ludhiana (Ludhiana), Madurai (Madurai), Meerut (Meerut), Moradabad (Moradabad), Mumbai (Mumbai), Mysore (Mysore), Nagpur (Nagpur), Nashik (Nashik), Patna (Patna), Pune (Pune), Raipur (Raipur), Ranchi (Ranchi), Salem (Salem), Solapur (Solapur), Thiruvananthapuram (Thiruvananthapuram), Tiruchirappalli (Tiruchirappalli), Varanasi (Varanasi), Vijayawada (Krishna), Visakhapatnam (Visakhapatnam).

Note: City district (where the sample city is located) is used as a proxy of a city to measure all the variables (except population data) used in estimation of OLS regression of Equation 1 by considering urban sample persons (if data available for rural and urban separately) of that district. Name in parentheses indicates the name of the district in which the city is located. @ Delhi are considered as a whole proxy of a city district.

Appendix A2: Variable sources and definitions

Work-force participation rate (WPR) (As given in NSSO: The number of persons employed in *usual status* (ps+ss) per 1000 persons is referred to as work force participation rate (WFPR) or worker population ratio (WPR) in *usual status* (ps+ss). **Usual principal activity status:** The usual activity status relates to the activity status of a person during the reference period of 365 days preceding the date of survey. **Usual subsidiary economic activity status:** A person whose usual principal status was determined on the basis of the major time criterion could have pursued some economic activity for a shorter time throughout the reference year of 365 days preceding the date of survey or for a minor period, which is not less than 30 days, during the reference year. **Usual activity status considering principal and subsidiary status taken together:** The usual status, determined on the basis of the usual principal activity and usual subsidiary economic activity of a person taken together, is considered as the usual activity status of the person and is written as usual status (ps+ss). According to the usual status (ps+ss), workers are those who perform some work activity either in the principal status or in the subsidiary status. Thus, a person who is not a worker in the usual principal status is considered as worker according to the usual status (ps+ss), if the person pursues some subsidiary economic activity for 30 days or more during 365 days preceding the date of survey.

City output: Per capita non-primary District Domestic Product (DDP) over the period 2000-01 to 2004-05 at 1999-2000 constant prices is taken as a measure of urban economic growth. Source: Directorate of Economics and Statistics (DES), various State Governments, GoI.

City inequality level: Gini coefficient of the large city districts by considering urban sample persons of that district. Source: Unit level data of NSS 2011-12 on consumer expenditure.

Rain fall: City wise average rainfall.

Medical facilities (Numbers): City- wise Total Number of Hospital + Number of Dispensary + Number of Health Centre + Number of Family Welfare Centre + Number of TB Clinics + Number of Nursing Home + Number of Other Medical Institutions.

Total university (Numbers): City-wise total number of universities.

Electrification (Number of Connections): City- wise Total number of connection by Domestic + Industrial + Commercial + Road Lighting (Points) + Others

Railway Station distance: Railway Station Road Distance (in kms)

REFERENCES

- Agasty, M.P. and Patra, R.N. (2013), "Rural - Urban Migration: Selectivity, Determinants and Destination", *Indian Journal of Research* 2(2), pp. 84-86. Available at: https://www.worldwidejournals.com/paripex/file.php?val=February_2013_1361200095_2ba2d_27.pdf
- Akram, M. (2015), "An Analysis of Rural to Urban Labour Migration in India with Special Reference to Scheduled Castes and Schedules Tribes", *International Journal of Interdisciplinary and Multidisciplinary Studies* 2(10), pp. 53-58.
- Arzaghi, M. and Rupasingha, A. (2013), "Migration as a way to diversify: evidence from rural to urban migration in the U.S", *Journal of Regional Science* 53(4), pp. 690-711.
- Bhagat, R. B. (2014), "Urban migration trends, challenges and opportunities in India" World Migration Report 2015, Background paper, International organization for migration. Available at <http://www.solutionexchange-un-gen-gym.net/wp-content/uploads/2016/01/WMR-2015-Background-Paper-RBhagat.pdf>.
- Iversen, V. (2006), "Segmentation, Network Multipliers and Spillovers: A Theory of Rural Urban Migration for a Traditional Economy", Working Paper T9, Centre for Migration Research, Sussex University. Available at: http://www.migrationdrc.org/publications/working_papers/WP-T9.pdf
- Government of India (2011), "High Powered Expert Committee Report on Urban Infrastructure and Services", Available at www.niua.org/projects/hpec/finalreport-hpec.pdf.
- McCatty, M. (2004), *The Process of Rural-Urban Migration in Developing Countries*. Carleton University, Ottawa, Ontario.
- Mitra, A. and Murayama, M. (2009), "Rural to Urban Migration: A district level Analysis for India", *International Journal of Migration, Health and Social Care*, 5 (2), pp. 35-52.
- Tripathi, S. (2013), "Do large agglomerations lead to economic growth? Evidence from urban India", *Review of Urban and Regional Development Studies* 25(3), 176-200.
- Tripathi, S., and Mahey K. (forthcoming). "Urbanization and Economic Growth in Punjab (India): An Empirical Analysis." *Urban Research & Practice* 1-24.
- United Nations (UN) (2014), "World Urbanization Prospects: The 2014 Revision, Highlights, New York", United Nations, Population Database, Population Division, Department of Economic and Social Affairs, accessed on 15 June 2014 from <http://esa.un.org/unpd/wup/Highlights/WUP2014-Highlights.pdf>.

RS08.2. Migration and Labor Markets

1126 AN ISTANBUL CASE STUDY OF RECIPROCAL RELATIONSHIP BETWEEN EDUCATION AND EMPLOYMENT IN CREATIVE INDUSTRIES

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ABSTRACT

In the 21st century, parallel with the knowledge economy, knowledge, innovation and creativity are the most important products, and the universities, which are the main knowledge production and transfer places of these phenomena, are in an important position. The new economic geography brings with it new considerations and requirements for labour motivation. Relevant departments of universities in creative fields are increasingly facing the challenge of developing curriculum for more employable creative people. In Turkey, as an emerging economy, creative industries have not yet argued in urban and regional economy in relation to the political axis and higher education. The main purpose of the study is investigate reciprocal relationship between creative employment and education in creative industries in terms of education-industry relations in Istanbul, having highest share of creative industries and higher education institutes both in quality and quantity, as a reflection of Turkey. In this paper, creative capital theory regarding to urban and regional development and industry-education relationship in relation with the theory are discussed. Interviews with selected educational institutions and professional organizations were conducted for deeply understanding of current situation of education in creativity fields and its contribution to the development of creative industries with respect to urban economy in particular creative economy. As a result, quality of education in related industries is not able to meet to the needs of industry, but this is due to reciprocal situation and problems too. Co-operations are not clear and institutional enough because of the financial and administrative problems and inefficiency of academic staff is another problem for collaborations between industry and higher education institutes. This study will shed light on future researches for the development of creative industries, are very important for urban and regional economic development today, by discussing to gain educated employment to these industries.

Keywords – Creative Economy, Creative Industries, Creative Class, Education, Istanbul.

JEL Codes – O18, O43, R11, Z10

INTRODUCTION

Creative economies are emerging from the concept in the agenda of the countries and regions since the year 2000. The competitive environment that emerged as a result of globalization has made new, different, original and specific things valuable. Therefore, the importance of a creative economy is increasing in ensuring the economic sustainability of cities and regions.

By the end of the 1990s, the manufacturing industry, which had been influential but largely lost its significance, had to leave its place to the service sectors with the developing technological climate and the postmodern economic approaches in an effort of articulate to the global world. Since the industrial changing labour force structure, services and sociological interactions in cities, where many different models have been tried to be idealized, have also been drawn towards post-fordist production standards. In this process, the economic and labour force structure of cities has shifted to a more powerful service and knowledge-based economy (Hamnett and Shoval, 2003).

Countries that developed creative industries have begun to realize higher education quality in creative fields. In general, education in creative fields has to cope with certain challenges in terms of employment and its sustainability (Bennett, 2009, Bridgstock and Carr, 2013, Collis, 2010, Menger, 1999, Towse, 2006). According to Zelenko and Bridgstock (2014), graduates are experiencing increasingly dynamic, unknown and ontologically unfamiliar work life. For this reason, graduates in creative industries need to have equipment that will respond to this rapidly changing and complex working environment (Daniel and Daniel, 2014).

Within the context of this study, creative industries that are important for modern city economies have been addressed with in the context of the development of cities. Istanbul is the city in which the locomotive of creative industries in Turkey was discussed through education and labour relations in relation to creative industries, theoretical framework, data of the industry and interviews made with university-professors.

CREATIVE CLASS, INDUSTRIES AND EDUCATION

Changing production and lifestyles have changed the urban land use and consumption structure. Creative and cultural industries directly contribute to economic growth through creative output, while at the same time increase the innovative potential of the rest of the economy with creative products offered by other industries (Chapain et al., 2010; Lazzeretti et al., 2014).

The concept of creative class emerged from Richard Florida who is an American social science expert, as a labour force in America's post-industrial cities to guide economic development. Florida (2002) divided the labour force into three main classes using the professional analysis approach: Creative Class, Employee Class, and Service Class (see Table 1). Creative class is divided into two sub-groups. Super creative class; occupations related to computer and mathematics, architecture, engineering, social and physical sciences, education, librarianship, art and design studies, entertainment,

sports and media. Creative professions are occupations about management, financial operations, legal positions, health, and technical professions.

Table 1. Labour force classification

		
Creative Class - Super Creative Class - Creative Professions	Service Class Occupations related daily services	Employee Class Works based on physical strength

Source: Florida (2002)

In order to systematically analyse the structural characteristics of creative industries, many different classifications have been made up to now. UNCTAD's (2010) this paper is based on the creative class classification (see Table 2).

Table 2. Creative class classification

Cultural Heritage	Art	Media	Creative Services
Traditional Culture Handicrafts Festivals Celebrations Cultural Sites: Archaeological Areas Mills Libraries Exhibitions Etc.	Visual arts Picture Statue Photo Antiques Performance Arts Live music Theater Dance Opera Circus Puppetry	Media and Publishing: Books Magazines and Other Publications Visual Media Radio Cinema Television Other Publications	Design Interior architecture Graphic design Industrial design Fashion Gem Toy Creative Services architecture Advertising Culture And Entertainment Creative Research and Development New Media Software Video games Digital Creative Content

Source: (UNCTAD, 2010)

THE RELATIONSHIP BETWEEN INDUSTRY AND EDUCATION: SITUATION IN CREATIVE INDUSTRIES

With the emergence of post-industrial economies, concepts such as knowledge, talent and human capital appear to be at the forefront in the literature. The theory of human capital was revealed by Becker (1964); assumes that fees will rise with the level of knowledge or ability. According to Florida, in recognizing regional economic development, creativity is important, not education. But Florida did not fully support his theory with empirical analyses (Marlet and Woerkens, 2007). At the same time, it was argued in the academic community that Florida's creative class theory would be too broad and uncertain to evaluate the regional performance empirically (Marrocu and Paci, 2012). Glaeser et al. (2004) indicated that; if Florida argues that creativity has superior effects on economy than human capital, he had to prove it. The creative class and widely accepted human capital theories have strongly correlated and coincided (Glaeser (2004). As a result, the lack of a clear definition of creativity and education components in empirical analyses creates a measurement problem involving deviation caused by multiple linearity or neglected variables (Marrocu and Paci, 2012).

CHANGING CONTENT OF HIGHER EDUCATION IN CREATIVE INDUSTRIES AND EMPLOYMENT

A consequence of this transition has been the transformation of the workforce, from labour intensive into flexible, decentralized, networked and multi-skilled. This transition requires new cross public sector strategies, systems and policies for educational innovation. (Wright et al., 2013). It has become imperative for individuals and organisations to continuously evolve, learn, create and apply knowledge to participate in "lifelong learning" (Bentley, 1998). To this end, Bentley (1998) argues that education systems should strive for three things (1) autonomy, (2) responsibility and (3) creativity. Bentley (1998); a new "landscape of learning" that understands the business climate and extends beyond teacher responsibility in the classroom, to address the pressing challenges of promoting active citizenship, developing employability and tackling under achievement and social exclusion, is required. As universities are seen as the central actors in this networked knowledge economy, it is critical that their role and contribution as a key stakeholder is

understood and clarified to ensure future policy is directed to generating conditions in which they best perform (Dodgson, 2012).

Harvey and Blackwell, (1999) and Ball, Pollard, and Stanley (2010) revealed that the equipment and skills of creative industry workers did not match the characteristics of working environment. The Council of Higher Education Funds in the UK (in 2003) reported that as a result of the research on employability in higher education, the skills of creative graduates were very different from those needed to be employed in business life. Likewise, in the UK Lambert Review of Business-University Collaboration Report (2003), it is emphasized that creative industry employers have not been able to fully develop the skills necessary for successful career development in the business world, because of recent expansion of creative industry-related departments. Creative Skillset (2009) reported that despite the excessive supply of alumni in creative industries, universities failed to achieve the skills needed in the industry.

Knight and Yorke (2003) in the UK higher education institutions are now charged with promoting graduate employability -contributing directly to the stock of human capital- and their performances are monitored. As a consequence of the educational policy bases, there is an assumption that the inclusion of university management, curriculum development and teaching transferable employment skills is the main concern of the teaching staff (Thornham and O'Sullivan, 2004).

Rapid change in labour force requirements (particularly in digital skills and knowledge) means that skill forecasting will always be inaccurate. In addition, given the fluidity of the creative industries labour market, it is impossible to identify the exact destinations of graduates ahead of time, and thus know what their various skill needs are going to be. Finally, the process of renovating course content can be unwieldy, time-consuming, and expensive, and by the time the process is completed, courses are often once again out of date (Bridgstock, 2011).

Ball, Pollard, and Stanley (2010) emphasized that "Creative Graduates Creative Futures" contributes to the longest continuous study of occupational choices and working patterns, offering comparable data to the pioneering Destinations and Reflections (Harvey and Blackwell, 1999) which followed more than 1,800 graduates from art and design disciplines into their early careers and was one of the first studies to provide evidence of synergy between higher education and growth in the creative industries. These reports, in addition to the role of education in the formation of next-generation ability also include the following trends. These are;

- Increasing number of lessons that provide applied learning at universities as a way to increase graduate employment
- The educational process in many creative disciplines are project-oriented, collaborative, and empirical, which improves the skills and attitudes of successful entrepreneurs and innovators that creative economies need,
- Entrepreneurship education is increasingly prevalent and it is stated that universities are actively supporting business co-operation and entrepreneurship projects.

Pollard (2013) indicated that strategies for increasing employability;

- Placement and implementation of simulations,
- Research collaborations with the industry,
- Curriculum design with industry practitioners.

Employment literature often emphasizes the importance of post-graduate employment security and internships in terms of placement and ideas in the workplace. These are part of a modern and flexible economy and are useful to both trainees and employers (Pollard 2013).

Universities UK (2010) have made suggestions for the education of the creative class according to the results of their work. These suggestions, which may be guiding in the scope of the study, are listed in two chapters; 'addressing the barriers to successful engagement' and 'investing in opportunity'.

The approaches taken from the results of the extensive studies mentioned above are summarized. In the conclusion part of the paper, these approaches have been evaluated together with case study findings.

CREATIVE CLASS/INDUSTRIES IN ISTANBUL

The first analytical work on creative industries in Istanbul is the Environmental Plan (2006) by the IMP. In this plan study, some detailed analyzes were made by the cultural industry working group within the IMP (Kerimoğlu, 2012). With the election of Istanbul as the European Capital of Culture in 2010, the Ministry of Culture and Tourism announced the support of local governments, non- governmental organizations, renewal projects that will cooperate with education, culture and art institutions (Kerimoğlu, 2012). Based on the distribution by employment and employee data, basic indicators according to local unit activities and population and demographic statistics, Seçilmiş (2015) revealed that, Istanbul has the highest clustering rate in creative industries in Turkey. Aksoy and Enlil (2010) provided some information about Istanbul's cultural activity possibilities and the economic percentages of creative and cultural industries in Istanbul and Turkey on Istanbul Cultural Economy Inventory study (see Table 3-4).

Table 3. Share of the creative industries in 2008

Creative Industries	share of creative industries in Istanbul	share of creative industries of Istanbul in Turkey
Software	33.25	51.35

Publishing	1.15	45.35
Cinema	7.63	77.33
Programming and publishing	0.99	64.34
Computer programming	2.27	38.02
Information services	1.04	27.38
Architecture and engineering	23.00	31.94
R&D	0.06	5.37
Advertising	19.76	58.93
Scientific activities	2.19	31.67
Creative arts and entertainment	5.56	55.59
Librarianship	0.24	28.38
Sports and recreation	2.86	58.32
The sum of industries	100.00	45.93
Total		30.55

Source: (Aksoy and Enlil, 2010)

Table 4. Distribution of firms by the creative industries in 2009

Number of firms	Percentage of all creative firms
Publishing	29,83
Advertising	29,20
Cinema	11,54
Architecture	10,30
Culture and art services	4,05
Radio and television	2,92
Information&communication services	2,77
Performance arts	2,55
Music	2,50
Graphic Design	1,21
Fashion Design	1,05
Arts	0,82
Industrial Design	0,66
Design	0,46
Museology	0,10
Library	0,05

Source: (Aksoy and Enlil, 2010)

According to YEKON (2014) the number of individuals working in creative industries in Istanbul constitutes 52.4% of the individuals working in creative industries in Turkey, and the share of total endorsement in creative industries in Istanbul is 74.5%, while total employment in creative industries was 1,09%, the total number of individuals working in creative industries in Istanbul was 3,28% in 2011 (TUIK, 2001; YEKON, 2014).

It is quite obvious that there is a need for a comprehensive case area research and knowledge base in Istanbul that will serve as a basis for making policies that will guide the future of the industry.

AN EVALUATION OF RELATIONSHIP BETWEEN EDUCATION AND EMPLOYMENT IN CREATIVE INDUSTRIES IN ISTANBUL

In the scope of the study, in-depth expert opinions within the descriptive methodological framework were obtained from the open-ended questions generated from the literature and the answers obtained were evaluated comparatively.

Methodology

Within the scope of the study, the conceptual framework and various classifications of creative industries were examined and the analysis of economic development and educational situation in Turkey and Istanbul and the relationship between industry and education was examined through the contribution of urban development and creative class theory and education-industry relations were revealed. The contributions of education-industry relations have been identified through world examples. Accordingly, in the determination of the creative industries to be worked on, priority was given to the creative industry classifications determined by UNCTAD (2010) (see Table 2), and then, taking into consideration the economic shares and the development potentials of the industries in Istanbul, universities and professional organizations were selected within the determined criteria.

While industry choices are made, multiple variables are treated separately. The following steps have been taken in the selection of creative industries:

1. First of all, the software (33.25%), architecture (23.00%) and advertising (19.76%) industries, which have the greatest proportions, were selected by considering the economic shares of creative industries in Istanbul (see Table 3),
2. The cinema industry was included in the study because of the fact that the Istanbul cinema industry has the largest share in Turkey (77.33%),

3. It has been decided to go through the creative services, which is one of the four main titles of UNCTAD (2010) classification, with the fact that the biggest economic shareholders in Istanbul are in the categories of creative services and the interior architecture, graphic design, industrial design and fashion departments have undergraduate programs at universities,
4. It has been researched that certain industries whether there are four-year undergraduate departments and professional organizations in Istanbul,
5. Interior design was not included in the design which is one of the three sub-titles of the creative services of the four main titles of UNCTAD (2010) classification because of architecture department, graphic design, industrial design and fashion design were included. It has been found that the advertising and architecture industries under the sub-title of creative services also provide the 4th criterion. The software industry that is under the title of new media was not included in study because of the difficulties in the division of labor in the industry on a departmental basis and the absence of a specific professional organization.

Thus, architecture, industrial design, graphic design, fashion design, advertising and television-cinema industries have been selected. Graphic design, industrial design, architecture and advertising industries can work when all the criteria are taken into account and when access is provided with departments and professional organizations. Thus, in total four different departments, six different universities, twelve teaching members and seven professional associations were interviewed.

Table 5. Interviewed universities, departments and professional organizations.

Industries/ Departments	Universities	Professional Organizations
Creative Industries	-	YEKON (Council of Creative Industries)
Advertising	Istanbul Bilgi University	Advertisers Association Advertising Creatives Association
	Bahçeşehir University	
Architecture	Mimar Sinan University of Fine Arts	Chamber of Architects Association of Freelance Architects
	Istanbul Technical University	
	Istanbul Kültür University	
	Istanbul Bilgi University	
Industrial Design	Mimar Sinan University of Fine Arts	Industrial Design Professional Organization
	Marmara University	
	Istanbul Technical University	
	Istanbul Bilgi University	
Graphic Design	Mimar Sinan University of Fine Arts	Graphic Designers Professional Organization
	Marmara University	

Findings/discussion

The following are highlights from the literature research and also topics discussed in the interviews :

Topics discussed with universities;

- Training programs and industry expectations
- Industry collaborations
- Relationships with professional associations
- Alumni networks
- Future objectives within the context of education and industry relations

Topics discussed with professional organizations;

- The place of creative industries in urban economy
- Evaluation of creative class
- Education of creative class
- University collaborations
- The importance of industry and educational cooperation
- Recommendations to universities.

The study could be used in the context of policy making in the future, but the government agencies were not included in this study because it is aimed at defining university-industry relations.

The problems that emerged as a result of interviews between education and industry in creative industries, summarized in terms of university and industry (see Table 6).

Table 6. Problems in university and industry collaborations

University	Industry
<ul style="list-style-type: none"> • No updating education programs • Inability to have a flexible structure • To be able to establish industry and education balance • Lack of state funds • The lack of graduate follow-up systems is due to the 	<ul style="list-style-type: none"> • A market environment in which interests are dominant impedes the development of cooperation • The fact that the current industry structure is not able to transfer the desired ones or the approach to university collaborations with very defined and limited demands • University partnership is used as an advertising tool and therefore

<p>methodological inadequacies in collaborations</p> <ul style="list-style-type: none"> • The fact that market dynamics can not be taught in universities and subjects such as accounting and law are weak, information about the legal infrastructures of the industry is not given • The current educational approach could not respond to industry expectations and there is even a big gap between education and industry • Need for instructors who can collaborate. 	<p>can not progress in a way that is appropriate for the purposes of industry and educational relationships.</p>
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The departments stated that benefits of industrial cooperation as;

- Industry try to attract talented students who meet in industrial partnerships,
- The development of master-apprentice relations,
- Students have the opportunity to create networks.

As a result of the interviews, the work of the universities and professional organizations on education- industry integration and cooperation are summarized (see Table 7).

Table 7. Practices in the context of university and industry integration and cooperation

University	Professional organizations
<ul style="list-style-type: none"> • The introduction of outside professionals in elective courses and compulsory courses, • Internships, • Mentoring courses, • Master-apprentice relationships • Common training models 	<ul style="list-style-type: none"> • To cooperate with the university, • To support the education system, • Seminars, conferences, etc. related to vocational education. • To help students find a job before graduation and after graduation, • In order to facilitate job alignment, activities such as internship, job placement, • To work on copyright and patent rights issues

Suggestions made for industry collaborations itemized (see Table 8). When problem areas of two different groups are overlapped; the fact that the perspectives for cooperation are not clear from both the universities and the industries, the financial impossibilities of developing the university-industry interaction and the lack of the flow of state funds have emerged as barriers to cooperation and hence to the industry.

Table 8. Proposals for the development of university and industry collaborations

<ul style="list-style-type: none"> •The development of education to contribute to the society and the relations with the industry,, •In terms of being able to show how education works in real life, it is important to be in touch with the industry, to be open to mutual development and to be able to blend current topics in educational programs in a rapidly changing industry climate, •The fact that education is a structure that adopts the differences of the students in the flexible structure means that if all the students are taught the same thing, this work is taken away from the logic and the necessity of leaving the students free, •The development of awareness that could be a guide to the way many learners want to be directed rather than challenging, •The emphasis on the ideological dimension of the work done in education, •Instructors' involvement in industry, •The academicians are expected to gain industry experience and constantly improve themselves, •Academicians should be aware of the difference of generation and educate in this direction, •Ensuring that project production processes are dominant, •More responsibility is given to students, •Providing students to think about projects they do •Beyond traditional lessons, •In addition to academic knowledge, one develops himself / herself •Commercialization of universities and demonstration of how they are done •The need for universities to raise awareness in decision making •When you graduate from university you do not know what to do, •Ownership of the projects to be realized and endeavoring to achieve, •Failure to be passive in industrial relations, •The realization of the collaborations, both intellectual and creative dimension, •Preventing the approach of the industry as an advertising tool for university collaborations •The state should regulate education and industry relations •Experience of master-apprentice relationship •Gaining experience while studying •Giving all equipment required in the industry, •Establishment of collaborative environments with different disciplines, •Giving flexible and diversified projects.
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IN BRIEF

The studies (Wright et al., (2013), Bentley, (1998), Dodgson, (2012), Harvey and Blackwell, (1999), Ball, Pollard, and Stanley, 2010) on the employment of creative industries and the creative class have focused on the characteristics of the changing employment structure of the industry. The properties of this changing structure are flexible, part-time, decentralized, free or short-term jobs, small or medium sized business.

It appears that the discussion of education on the basis of human capital has recently been dealt with in a professionally specific way on the axis of creative capital. It has been shown that Florida does not treat education as a fundamental element in the development of a creative industry in a city, and that it cannot be empirically proven that it is unhealthy to evaluate education and creative class-work independently.

The socio-economic transformations emphasize the necessity of accommodating industrial concerns in universities, but the fact that faculty members are lagging behind the creative industry market in Istanbul has distracted them from educating students for industry needs. To make this distinction in terms of universities and to be able to provide the education industry balance, it has become a problem area that must be realized.

One of the reasons for the failure of university and industry relations, which is often emphasized in the development of creative industries, is the lack of methodological approaches. For the development of collaborative methodologies by universities and professional bodies it has become clear that it is important for universities to identify their roles in industrial cooperation and to ensure that they have a certain quality in approaching university collaborations, avoiding advertising projects, and determining the frameworks of collaboration processes.

It is seen that the expectations of the creative class educator meet the needs of the universities in the literature to develop creative class employment.

The most fundamental issues raised by universities regarding the development of education and industry relations are; the existence of administrative obstacles and therefore financial impossibilities, the rapid movements in bureaucracy and the inability to access the appropriate infrastructure and methodological deficiencies in cooperation. This seems to constitute a disadvantage for the employment of the creative class. Prioritized areas of education for creative class, which are at the center of creative industries that play a key role in urban economic development are the recapitalization of universities, the liberalization of the university from traditions and the making of public-private investments.

The most serious problems concerning the industry are; no analytical analysis of the economic value of creative industries that can be expressed in numbers, and an industry that is not recognized in the politically.

In the framework of the recommendation of the Universities UK (2010) study discussed in the previous chapters, when the problems and suggestions arising from the case area are summarized and evaluated:

Under the subheading of addressing the barriers to successful engagement;

- It is observed that in Istanbul there are methodological problems in the process of working universities with the creative industry and that the speed of interaction of traditional education and management approach is obstructed. In the face of a proposal to emphasize industrial relations in evaluating academic performances, the necessity of academicians to gain industry experience in Istanbul has proven to be an advantage of having strong relationships with industrial associations. In this context, the existence of policy supports that the increase in weight of industry interaction in academic performance will encourage academicians to engage with the industry.
- The demonstration of university and industry influences as priority targets for development agencies is consistent with the objectives of the Istanbul Development Agency to increase education and industry interaction in the development of creative industries.
- With the overlap of the job descriptions of professional organizations with the literature, it has become necessary to take place more effectively between universities and industry.
- The need for universities to develop policies and work on their ownership of intellectual property rights has also been voiced in Istanbul, and in this context it is crucial that studies on intellectual property rights are passed on.

Under the subheading of investment in opportunities;

- It is stated that the importance of the mentioned third wave funds is increasingly emphasized on the interface mechanisms that will enable the transfer of information and technology between universities and industry and their commercialization in the Istanbul regional plans. It was also emphasized that these contacts would be beneficial for both sides. In this context, it is necessary for the state to develop third wave funds to develop the industry.
- The necessity of the training given in universities with different disciplines was also challenged in Istanbul regarding the expectations of creative class education. In this context, education in creative industries is required to offer diversity.
- The proposal of professional associations to contribute to the education arrangements related to the curriculum could not be more than stated in the professional organizations in Istanbul. Occupational organizations as well as public institutions must be involved in the process of training programs.
- It is also seen that there is a profound dilemma in Istanbul, as universities continue to raise talent to challenge the world and argue that industry expectations should be increasingly focused on employability and entrepreneurship. Nevertheless, it appears that there are no major concerns about employability and

entrepreneurship at the universities in Istanbul. In this context, the contents of the university education program need to be re-examined on the axis of industry expectations, employability and entrepreneurship.

- Activities such as collaborations between the university and industry to develop opportunities such as real business reports and practical learning are being implemented at universities in Istanbul, but the industry emphasizes that these applications are inadequate. In this context, developments towards applications are required.

In this context, considering the suggestions from the literature and the problems and suggestions from the policies and interviews investigated within the scope of the study, it is possible to see the existence of the universities in Istanbul concerned about responding to the industry expectations that are based on the recommendations in the literature, but the problems brought about by the inadequacy of the creative industry market in Istanbul, lack of policy and funding.

For the identification of current educational and industrial relations and problems in Istanbul it is crucial to include strategies for resolving these problems in future policies on creative industries. In this context, it is necessary first to systematize the data related to the industry in Istanbul, to treat creative industries as a separate industry field and to create policies around the country. The role of the government in providing policy makers and funding in educational and industrial relations may be possible with the existence of national decisions and policies.

As a result, creative economies have become one of the most important sources of economic development for cities and regions. In addition to having this source and employment, the role of creative class education and approaches developed to keep the creative class in line with changing condition. This role has been an important axis in ensuring the sustainability of creative industries in cities. In a rapidly changing economic environment, the education of the creative class must be able to adapt to these processes and even be far ahead. In this context, the consideration of education as a key component in the creation of labor and employment for creative industries and raising awareness in this regard will contribute to industrial development and consequently, urban economic development.

REFERENCES

- Aksoy, A. ve Enilil, Z. (2010). *Kültür Ekonomisi Envanteri İstanbul 2010*. İstanbul: Bilgi Üniversitesi Yayınları.
- Ball, L, Pollard, E. & Stanley, N. (2010). *Creative Graduates Creative Futures*. London: Report for Council for Higher Education in Art and Design.
- Becker, G (1964). *Human Capital*. New York, Columbia University Press for the National Bureau of Economic Research.
- Bennett, D. (2009). *Academy and the real world: Developing realistic notions of career in the performing arts*. *Arts and Humanities in Higher Education*, 8(3), 309-327.
- Bentley, T. (1998). *Learning Beyond the Classroom*. In I. Hargreaves and I. Christie (Eds.), *Tomorrow's Politics: The Third Way and Beyond* (pp.80-95). London: Demos.
- Bridgstock, R. (2011). *Skills for creative industries graduate success* ARC Centre for Excellence in Creative Industries and Innovation. Queensland University of Technology, Kelvin Grove, Australia.
- Bridgstock, R., & Carr, L. (2013). *Creative entrepreneurship education for graduate employability in the creative arts*. In J. Holmes (Ed.), *The CALTN papers: The refereed proceedings of the creative arts Asia-Pacific Journal of Cooperative Education, Special Issue, 2015, 16(3), 199-209* 208 learning and teaching network symposium (pp. 8-35). Tasmania, Australia: Tasmanian College of the Arts.
- Chapain, C., Cooke, P., De Propriis, L., MacNeill, S. ve Garcia, J.M. (2010). *Creative Clusters and Innovation*. NESTA, London.
- Collis, C. (2010). *Developing work-integrated learning curricula for the creative industries: Embedding stakeholder perspectives*. *Learning and Teaching in Higher Education*, 4(1), 3-19.
- Creative Skillset (2009). *Strategic Skills Assessment for the Creative Media Industry*. Access link: [http://creativeskillset.org/assets/0000/6036/Skillset Strategic Skills Assessment for the Creative Media Industries in England 2010.pdf](http://creativeskillset.org/assets/0000/6036/Skillset%20Strategic%20Skills%20Assessment%20for%20the%20Creative%20Media%20Industries%20in%20England%202010.pdf)
- Daniel, R., Daniel, L. (2014). *Enhancing capacity for success in the creative industries: Undergraduate student reflections on the implementation of work-integrated learning strategies* *Asia-Pacific Journal of Cooperative Education, Special Issue, 2015, 16(3), 199-209*. James Cook University, Townsville, Australia.
- Dodgson, M. (2012) *A smart strategy to drive Australia's knowledge economy*. Access link: <http://theconversation.com/a-smart-strategy-to-drive-australias-knowledge-economy-6188>
- Florida, R. (2002). *The Rise of the Creative Class: And how it's transforming Work, Leisure, Community and Everyday Life*. New York, Basic Books.
- Glaeser, E. L., La Porta, R., Shleifer, A. (2004). *Do Institutions Cause Growth?* *Journal of Economic Growth* 9(3): 271-303.
- Hamnett, C., Shoval, N. (2003). *Museums as Flagships of Urban Development*. *Cities and Visitors, Regulating people, markets and city space*, Blackwell publishing.
- Harvey, L., Blackwell, A. (1999) *Destinations and reflections: careers of British art, craft and design graduates*.
- Kerimoğlu E. (2012). *Creativity And Culture: A Discussion Of Their Contribution To Urban Development In Istanbul*. 15th International Planning History Society Conference. Brasil.
- Knight P. & Yorke M. (2003). *Employability And Good Learning In Higher Education Centre For Outcomes- Based Education*, Open University, Milton Keynes Mk7 6aa, And Centre For Higher Education Development, Liverpool John Moores University, Liverpool, UK.
- Lazzeretti L., Capone F., Seçilmiş İ. E. (2014). *Türkiye'de Yaratıcı ve Kültürel Sektörlerin Yapısı*. *Maliye Dergisi*, 166, 195-220.
- Marlet, G., van Woerkens, C. (2007). *The Dutch Creative Class and How it Fosters Urban Employment Growth*. *Urban Studies*, Vol. 44 (13), pp. 2605- 2626.
- Marrouc E., Paci R. (2012). *Regional Development and Creativity*. *International Regional Science Review*, SAGE Publishing, vol. 36(3), pages 354-391.
- Menger, P. (1999). *Artistic labor markets and careers*. *Annual Review of Sociology*, 25, 541-574.
- Pollard. 2013. *Making Your Way*. *Empirical Evidence from a Survey of 3,500 Graduates*. In *Cultural Work and Higher Education*, edited by D.Ashton and C.Noonan, 45-66. Basingstoke: Palgrave Macmillan.
- Seçilmiş, E. (2015). *Türkiye'de Yaratıcı Endüstrilerin Kümelenmesi*. *Ege Akademik Bakış Dergisi*, 15, 1, 9-18.

- Thornham, S. and O'Sullivan, T. (2004) Chasing the Real: 'Employability' and the Media Studies Curriculum, *Media, Culture & Society* 26(5): 717-736.
- Towse, R. (2006). Human capital and artists' labour markets. In Ginsburgh, V., & Throsby, D. (Eds.) *Handbook of the economics of art and culture* (pp. 865-894). Amsterdam, The Netherlands: Elsevier.
- TUİK (2011). NACE Rev. 2 Kodlarına göre Ekonomik Faaliyetlere Göre İstihdam ve Bazı Temel Göstergeler. İstanbul.
- UK Lambert Review of Business-University Collaboration Report (2003). Access link: http://www.eua.be/eua/jsp/en/upload/lambert_review_final_450.1151581102387.pdf
- UNCTAD (2010). Creative Economy Report 2010: A Feasible Development Option. Erişim adresi http://unctad.org/en/Docs/ditctab20103_en.pdf
- Universities UK (2010). Creating prosperity: the role of higher education in driving the UK's creative economy", London: Universities UK. Access link: <http://www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2010/creating-prosperity-the-role-of-higher-education.pdf>
- Wright, N., Davis, R., Bucolo, S. (2013). The creative citizen: Understanding the value of design education programs in the knowledge economy. 2nd International Conference for Design Education Researchers Oslo, 14- 17 May 2013.
- YEKON (2014). İstanbul Yaratıcı Ekonomi Çalışmaları Atölyesi Final Raporu. İstanbul Bilgi Üniversitesi Kültür Politikaları ve Yönetimi (KPY) Araştırma Merkezi.
- Zelenko, O., & Bridgstock, R. (2014). Developing agency in the creative career: A design-based framework for work integrated learning. In Hearn, G., Bridgstock, R., Goldsmith, B., & Rodgers, J. (Eds.) *Creative work beyond the creative industries: Innovation, employment and education* (pp. 211- 225). Cheltenham, UK: Edward Elgar.

1132 THE ELECTORAL MIGRATION CYCLE

ABSTRACT

This paper proposes a new test of Tiebout sorting that relies on the exogenous time structure of recurrent local elections. The test is based on the idea that the uncertainty that is associated with periodic competitive elections should be expected to induce procrastination of costly migration decisions until political uncertainty is resolved, thus projecting the calendar of local elections onto the timing of sorting processes. Conversely, interjurisdictional migration flows that have nothing to do with the demand for public goods and policies over which localities vote recurrently ought to be orthogonal to the timing of elections in a reduced-form migration equation. I exploit the staggered schedule of mayoral elections in Italy to analyze migration, election, and budget data across several thousands of municipalities, and find evidence of a systematic influence of the electoral calendar on the timing of migration decisions, with the political budget cycles induced by the electoral schedule rather than the recurrence of uncertainty per se turning out to be the most likely cause of the observed time pattern of sorting.

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1516 URBAN INFORMAL HOUSEHOLD FORMATION IN SOUTH AFRICA: A LIFE COURSE TRANSITIONS PERSPECTIVE

ABSTRACT

This study uses the South African National Income Dynamics Survey (NIDS), collected biennially between 2008 and 2015, to examine how individuals select into urban informal settlements in South Africa. The advantage of using this panel data set is that it allows for the inclusion of individual retrospective (lagged) variables that are not readily available using cross-sectional data sets. This work is unique in that it uses longitudinal data to shape a dynamic perspective on new urban informal household formation in the South African context. The sample is restricted to black and coloured individuals between the ages of 20 and 64 years old who report being the household head or partner to a household head in the current wave. Probit regression analysis reveals that new household formation in urban informal areas is highly age-selective. Young individuals are most likely to form new households in urban informal areas. However, age may be a proxy for life stage transitions, with young adulthood in South Africa coinciding with labour market entry, partnership formation and migration. These critical life course transitions are conceivably associated with the transition from the teenage years to adulthood, a hypothesis that is lent some credence by the declining significance of age as a predictor of urban informal household formation when marital status changes between periods are added to the regression. An explanation for this finding is that newly married adults may find the relatively low cost of urban informal household formation attractive, while newly divorced adults may also be incentivised by the financial hardship associated with divorce to settle in urban informal settlements. While area of origin does not predict urban informal household formation, being a migrant and the destination area type are significant predictors of new household formation in urban informal areas. Migrating across district council (DC) borders increases the probability of forming an urban informal household (relative to staying within DC boundaries). Moving to a metro municipality from a non-metro municipality also increases the probability of forming a new urban informal household. The findings from the regression analysis seem to support the widely-held view that urban informal settlements offer low-cost labour market entry points for young and migrating individuals. Additionally, informal settlements also offer low-cost accommodation for both recently married individuals looking to form new households and recently divorced individuals who may be faced with economic hardship.

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1716 WHAT DRIVES MIGRATION MOVES ACROSS URBAN AREAS IN SPAIN? EVIDENCE FROM THE GREAT RECESSION

ABSTRACT

In Spain, economic disparities between regions have traditionally played a relevant role in migration. Nevertheless, during the previous high-instability period, analyses provided conflicting results about the effect of these variables. In this work, we aim to determine the role that labour market factors play in internal migration during the Great Recession, paying special attention to the migration response of the heterogeneous population groups. To do so, we resort to an extended gravity model and we consider as a territorial unit the 45 Spanish Functional Urban Areas. Our results point to real wages as having a significant influence on migration motivations.

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RS08.3. Migration and Labor Markets

1122 DOMESTIC INCOME TRANSFER IN AN OPEN DUAL ECONOMY²⁴⁸

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ABSTRACT

This paper investigates the welfare effects of an income transfer from urban manufacturing workers to rural agricultural workers in an open dual economy where the urban manufacturing wage is fixed under the minimum wage legislation. Then we show that the utility of a rural worker may reduce by the transfer if capital is specific but such a transfer paradox never appears if capital is mobile between industries. We also derive the result that the transfer makes the urban unemployment decrease in the specific capital case but possibly increase in the mobile capital case.

1. INTRODUCTION

Most developing countries are experiencing a wide income gap among regions. It is recognized in particular that the wage of urban areas is much higher than that of rural areas. This is one of the strong engines for a large scale inflow of rural labor force into an urban area in those countries. In order to improve the living standard of the national people, the government adopts the minimum wage legislation. But it tends to be executed mainly for the urban workers from a practical point of view. Therefore the legislation seems to enhance a regional income gap. The direct method to resolve this deficiency is the income transfer from urban workers to rural workers. In the present paper, we examine how this transfer works for rural workers as well as urban workers under the existence of the minimum wage legislation.

There exist vast literature concerning the modern treatment of the international transfers appears after the Keynes and Ohlin dispute in 1929 and the penetrating comment by Samuelson (1947). Among others, a rigorous and comprehensive treatment was explored by Kemp (1995) and a survey in this field was proposed by Brakman and Marrewijk (1998). On the contrary, there are few studies concerning the theoretical treatment of the domestic transfers, particularly focusing developing countries. One exceptional work is Ravallion(1984). He analyzed the domestic transfer in a dual economy of the Harris and Todaro type but assumed that labor is the only primary factor in his model. Therefore the role of capital is disregarded in the analysis. In our present paper we show that the role of capital is crucial in the welfare of the regional workers.

In order to deal with this topic we consider an open dual economy based on Harris and Todaro (1970). So there are two sectors which are a manufacturing sector located in an urban region and an agricultural sector located in a rural region. The minimum wage legislation is applied to the urban manufacturing sector. The production of each sector is operated by the use of labor and capital. We consider two cases. One is where capital is sector-specific and the other where capital is mobile between sectors. Then we examine the effect of the domestic income transfer from the urban manufacturing workers to the rural agricultural workers. The analysis is simple but the derived result seems to be interesting. In the specific capital case, there possibly appears the transfer paradox that the rural workers become worse off by the transfer. In the mobile capital case, however, such a paradox never appears. In this sense capital mobility between sectors plays a crucial role to the emergence of a transfer paradox. Based on these discussions we also show that the labor income disparity between these two sectors necessarily contracts in any cases. Finally we investigate the effect of the income transfer to urban unemployment and reveal that urban unemployment necessarily reduces by the transfer in the specific capital case, while the transfer possibly enlarges the urban unemployment in the mobile factor case.

Our paper is organized as follows: Our basic model is presented in Section 2. Sections 3 and 4 deal with the specific capital case and the mobile capital case, respectively. The effect of the transfer to urban unemployment is analyzed in Section 5 and our conclusion is placed in the last section.

2. MODEL

We consider a dual open economy of the Harris and Todaro type. There are two industries which are rural agricultural and urban manufacturing industries. In the production of each industry, labor and capital are used as production primary inputs.

Let the production functions of the manufacturing and agricultural industries be, respectively,

$$M = F(L_M, K_M), \tag{1}$$

and

$$A = G(L_A, K_A) \tag{2}$$

where M and A are, respectively, the outputs of the manufacturing and agricultural goods, L_M and L_A are, respectively, the labor inputs in the manufacturing and agricultural industries, and K_M and K_A are, respectively, the

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capital inputs to the manufacturing and agricultural industries. The production functions $F(\cdot)$ and $G(\cdot)$ are assumed to be linearly homogenous, concave and twice continuously differentiable with positive first derivatives.

Perfect competition prevails in all industries. The minimum wage legislation is, however, introduced into the urban manufacturing industry, so that the wage is fixed at \bar{w} in the manufacturing industry. Labor is assumed to be mobile between the rural and urban regions according to the difference in the expected wage between two regions.

There are four different income groups which are

- (i) Manufacturing worker group,
- (ii) Agricultural worker group,
- (iii) Manufacturing capitalist group,
- (iv) Agricultural capitalist group.

In each group, every individual owns one unit of the respective primary factor, provides it in production inelastically to all prices and consumes the manufacturing and agricultural goods.

Each individual's demands for the manufacturing and agricultural goods are determined by the individual's utility maximization behavior. The utility function of each individual is assumed to be identical within the same group. We assume that the economy is small and open and the manufacturing and agricultural goods are tradable.

The profit maximization conditions for each industry are described as

$$F_L = \bar{w}, \tag{3}$$

$$F_K = r^M, \tag{4}$$

$$pG_L = w^A, \tag{5}$$

$$pG_K = r^A, \tag{6}$$

where $F_L \equiv \partial F / \partial L_M$, $G_L \equiv \partial G / \partial L_A$, $F_K \equiv \partial F / \partial K_M$, $G_K \equiv \partial G / \partial K_A$, P is the price ratio of the agricultural good to the manufacturing good, w^A is the wage of the agricultural industry, r^M and r^A are, respectively, the rental prices of capitals to the manufacturing and agricultural industries.

The labor market equilibrium condition is

$$L_M + L_A + L_U = L, \tag{7}$$

where L_U is urban unemployment and L is the labor endowment of this economy and supposed to be given and constant.

Let t^{ML} , t^{AL} , t^{MK} and t^{AK} be, respectively, the per capita income transfer to the manufacturing workers, agricultural workers, manufacturing capitalists and agricultural capitalists. Then the per capita income of each group (i) to (iv) becomes $\bar{w} + t^{ML} \equiv i^{ML}$, $w^A + t^{AL} \equiv i^{AL}$, $r^M + t^{MK} \equiv i^{MK}$ and $r^A + t^{AK} \equiv i^{AK}$, respectively. Here we assume each worker to be risk neutral, so that all workers move from the lower expected income region to the higher expected region. Then the arbitrage condition for the labor movement between urban and rural areas is described as

$$w^A + t^{AL} = \frac{L_M}{L_M + L_U} (\bar{w} + t^{ML}) \tag{8}$$

Throughout of this paper, we basically consider the transfer scheme from the manufacturing worker group to the agricultural worker group. Let T^{ML} and T^{AL} be, respectively, the total income transfer received by the manufacturing worker group and agricultural worker group. Now we suppose the case where $T^{AL} = -T^{ML} \geq 0$ and initially $T^{AL} = T^{ML} = 0$. T^{ML} and T^{AL} should be $t^{ML}L_M$ and $t^{AL}L_A$, respectively. Then, by the use of (7), (8) can be rewritten as

$$w^A + \frac{T^{AL}}{L^A} = \frac{L_M}{L - L_A} \bar{w} + \frac{T^{ML}}{L - L_A} \tag{9}$$

3. SPECIFIC CAPITAL CASE

In this section we consider the case where capital is specific to the industry and cannot move between industries. So K_M and K_A are given and fixed. Then, once T^{ML} and T^{AL} are given, the equilibrium is described by the set of equations

(3) to (7) and (9), which determine L_M , L_A , L_U , w^A , r^M and r^A .

In particular, equations (3), (4) and (9) determine L_M , L_A and w^A . Total differentiation of these equations gives

$$F_{LL}dL_M = 0, \tag{10}$$

$$pG_{LL}dL_A = dw^A, \tag{11}$$

$$dw^A - \frac{\bar{w}}{L-L_A}dL_M - \left(\frac{T^{AL}}{L_A^2} + \frac{L_M\bar{w} + T^{LM}}{(L-L_A)^2}\right)dL_A = -\frac{1}{L_A}dT^{AL} + \frac{1}{L-L_A}dT^{ML}, \tag{12}$$

where $F_{LL} \equiv \partial^2 F / \partial^2 L_M < 0$ and $G_{LL} \equiv \partial^2 G / \partial^2 L_A < 0$.

Equation (10) implies $dL_M = 0$. Moreover, $dT^{AL} = -dT^{ML} > 0$ and $T^{AL} = T^{ML} = 0$ by assumption. Thus (12) becomes

$$dw^A - \frac{L_M\bar{w}}{(L-L_A)^2}dL_A = -\frac{L}{L_A(L-L_A)}dT^{AL},$$

which is further expressed as

$$\left[pG_{LL} - \frac{L_M\bar{w}}{(L-L_A)^2}\right]dL_A = -\frac{L}{L_A(L-L_A)}dT^{AL},$$

from (15).

So we have

$$\frac{dL_A}{dT^{AL}} = -\frac{\frac{L}{L_A(L-L_A)}}{pG_{LL} - \frac{L_M\bar{w}}{(L-L_A)^2}} > 0, \tag{13}$$

and

$$\frac{dw^A}{dT^{AL}} = -\frac{\frac{pG_{LL}L}{L_A(L-L_A)}}{pG_{LL} - \frac{L_M\bar{w}}{(L-L_A)^2}} < 0. \tag{14}$$

The transfer effect to the per capita income of a typical agricultural worker is calculated as

$$\begin{aligned} \frac{di^{AL}}{dT^{AL}} &= \frac{dw^A}{dT^{AL}} + \frac{1}{L_A} - T^{AL} \frac{1}{L_A^2} \frac{dL_A}{dT^{AL}} \\ &= \frac{-\frac{pG_{LL}L}{L_A(L-L_A)}}{pG_{LL} - \frac{L_M\bar{w}}{(L-L_A)^2}} + \frac{1}{L_A} \\ &= \frac{-pG_{LL}L_A - w_A}{L_A(L-L_A)(pG_{LL} - \frac{L_M\bar{w}}{(L-L_A)^2})}, \end{aligned} \tag{15}$$

from (18) and the assumption that initial T^{AL} is nil. This yields

$$\frac{di^{AL}}{dT^{AL}} > 0 \Leftrightarrow \varepsilon^{AL} < 1$$

$$\varepsilon^{AL} \equiv -\frac{L_A}{G_L} \frac{dG_L}{dL_A}$$

where ε^{AL} is the labor elasticity of the marginal labor productivity of the agricultural industry.

Concerning the transfer effect to the per capita income of the manufacturing worker group, it works as a negative impact, implying that the transfer lessens the income of each manufacturing worker. This is because \bar{w} is not affected by the transfer and the present transfer works negatively to the income of this group.

As for the per capita income of the manufacturing capitalist group, (9) and (14) assume

$$F_{KL} \frac{dL_M}{dT^{AL}} = \frac{dr^M}{dT^{AL}} = 0$$

So the transfer does not affect the income of any manufacturing capitalist. On the other hand, the transfer raises the income of any agricultural capitalist since

$$pG_{KL} \frac{dL_A}{dT^{AL}} = \frac{dr^A}{dT^{AL}} > 0$$

by (10).

Under the assumption that the prices of all goods are given and constant, any consumer's utility rises if and only if the consumer's income goes up.

Finally, in view of (13), (7) and the fact that $dL_M / dT^{AL} = 0$, we can easily see $dL_U / dT^{AL} < 0$. Now we can establish

Theorem 1

Suppose a small open country where capital is immobile between industries. And consider the introduction of the income transfer from manufacturing workers to agricultural workers. Then,

- (i) *the level of unemployment decreases,*
- (ii) *any manufacturing worker's utility falls,*
- (iii) *any agricultural worker's utility rises if and only if the labor elasticity of the labor marginal productivity in the agricultural industry is less than one,*
- (iv) *any manufacturing capitalist's utility is unchanged,*
- (v) *any agricultural capitalist's utility rises.*

In the above theorem, the most important result is (iii), which was shown by Ravallion (1984) and states that, if the labor elasticity of the marginal labor productivity in the agricultural good is large enough, the income transfer from manufacturing workers to agricultural workers lowers the utility of agricultural workers. This transfer paradox appears even if there is no price effect.²⁴⁹ The direct effect of the income transfer necessarily raises the agricultural wage. This wage increase, however, attracts the urban workers to the agricultural industry, so that the agricultural wage falls. If this indirect effect is greater than the direct effect, the transfer paradox occurs.

Even though there is a possibility of the transfer paradox, we can prove that the labor income disparity between two sectors always contracts. In order to see this, it is sufficient to consider the case where the income of an agricultural worker decreases by the transfer, since the income of a manufacturing worker necessarily decreases by the transfer. On

the one hand, since $i^{ML} = \bar{w} - (T^{AL} / L_M)$, we have

$$\frac{di^{ML}}{dT^{AL}} / i^{ML} = -\frac{1}{L_M} \frac{1}{\bar{w}}$$

for $T^{AL} = 0$ initially. On the other hand, since di^{AL} / dT^{AL} is expressed by (15), we have

$$\frac{di^{AL}}{dT^{AL}} / i^{AL} = \frac{-pG_{LL}L_A - pG_L}{L_M \bar{w} (pG_{LL}L_A - L_A pG_L / (L - L_A))} < 0$$

by the assumption that $di^{AL} / dT^{AL} < 0$. The it is obvious that

²⁴⁹ If the agricultural production function is the Cobb-Douglas type, $\varepsilon^{AL} < 1$. Hence the paradox never occurs.

$$\left| \frac{di^{AL}}{dT^{AL}} / i^{AL} \right| - \left| \frac{di^{ML}}{dT^{AL}} / i^{ML} \right| = \frac{1}{L_M \bar{w}} \left[\frac{-pG_{LL}L_A - pG_L}{-(pG_{LL}L_A - L_A pG_L / (L - L_A))} - 1 \right] < 0, \quad (16)$$

because

$$-(pG_{LL}L_A - L_A pG_L / (L - L_A)) > -pG_{LL}L_A > -pG_{LL}L_A - pG_L > 0.$$

The inequality (16) means that the labor income disparity between sectors contracts even when the agricultural income decrease by the transfer.

Now we can state

Theorem 2

Suppose a small open country where capital is immobile between industries. And consider the introduction of the labor income transfer from manufacturing to agricultural workers. Then the labor income disparity between these two sectors necessarily contracts.

The possibility of this transfer paradox has nothing to do with the stability of the Walrasian price adjustment since all good prices are given and constant. If labor moves sluggishly between two regions according to the difference of the expected wages of two industries, the labor movement process is expressed as

$$\dot{L}_A = a \left(w^A + \frac{T^{AL}}{L_A} - \frac{L_M}{L - L_A} (\bar{w} + \frac{T^{ML}}{L_M}) \right),$$

where a is an adjustment speed and assumed to be a positive parameter. Then the equilibrium is shown to be globally stable, for

$$\begin{aligned} \frac{d\dot{L}_A}{dL_A} &= a \left[\frac{dw^A}{dL_A} - \frac{\bar{w}}{L - L_A} \frac{dL_M}{dL_A} - \left(\frac{T^{AL}}{L_A^2} + \frac{L_A \bar{w} + T^{ML}}{(L - L_A)^2} \right) \right] \\ &= a \left[pG_{LL} - \left(\frac{T^{AL}}{L_A^2} + \frac{L_A \bar{w} + T^{ML}}{(L - L_A)^2} \right) \right] < 0 \end{aligned}$$

The paradox possibly appears under these circumstances.

Although we have considered the case where the transfer is from manufacturing workers to agricultural workers, we can extend the scheme to the case where the transfer is from capitalists as well as manufacturing workers to agricultural workers. Even in this extended case the primal results such as (i), (ii) and (iii) carry over because the income transfer of the capitalists does not have any influence in the equation system described by (3) to (7) and (9).

4. MOBILE CAPITAL CASE

In this section we examine the case where capital can move freely between industries. Then the equilibrium system can be described by the following set of equations:

$$F_L = \bar{w}, \quad (3)$$

$$F_K = r, \quad (4')$$

$$pG_L = w^A, \quad (5)$$

$$pG_K = r, \quad (6')$$

$$L_M + L_A + L_U = L, \quad (7)$$

$$w^A + \frac{T^{AL}}{L_A} = \frac{L_M}{L_M + L_U} \left(\bar{w} + \frac{T^{ML}}{L_M} \right), \quad (9)$$

$$K_M + K_A = K, \quad (17)$$

where K is capital endowment and assumed to be given and constant.

By (2') and (4') we have

$$F_K = pG_K, \quad (18)$$

The endogenous variables L_M, L_A, K_A, K_M and w^A are determined by (3), (5), (17), (18) and (9) once T^{AL} and T^{ML} are given.

Now we examine how the individual utility of each income group is influenced by the introduction of the transfer, where the capitalist income groups are now combined together as one capitalist income group and each capitalist receives income r .

Let $F(L_M, K_A) = L_M f(k_M)$, where $k_M \equiv K_M / L_M$. Then (3) can be expressed as $f(k_M) - k_M f'(k_M) = \bar{w}$, where $f' \equiv df / dk_M$, so that the transfer has no impact on k_M . Since $f'(k_M) = r$, r does not change by the transfer.

Therefore, $k_A \equiv K_A / L_A$ does not change because of (6') and neither does w^A by (5). Thus the transfer raises the per capita income of the agricultural worker group and reduces that of the manufacturing worker group necessarily, implying that the individual utility of the agricultural worker group rises and that of the manufacturing worker group falls. Since r stays constant to a change in the level of transfer, the individual utility of the capitalist income group does not change. Obviously these results hold without the condition that the initial level of the transfer is zero.

Now we can assert

Theorem 3

Suppose a small open country where capital is mobile between domestic industries and there is an income transfer from manufacturing workers to agricultural workers. If the level of the transfer is raised, then

- (i) any agricultural worker's utility rises,
- (ii) any manufacturing worker's utility falls,
- (iii) any capitalist's utility does not change.

The results (i) and (ii) of Theorem 3 immediately bring forth of

Theorem 4

Suppose a small open country where capital is mobile between domestic industries and there is an income transfer from manufacturing workers to agricultural workers. Then labor income disparity between these two sectors necessarily contracts.

Since neither w^A nor r is affected by a change in the level of any transfer, we can extend the above theorem. We show it as the following remark:

Remark

Suppose a small open country where capital is mobile between domestic industries. For any transfer scheme that income is transferred from some income groups to some other income groups, the individual utility of the donor group falls, that of the recipient groups rises and that of the outside group does not change by an increase in the level of the transfer,

All these results have nothing to do with the stability of any dynamic adjustment process. The key equation to produce these results is (3) which characterizes the dual economy of the Harris and Todaro type. Because of (3), none of factor prices receive any impact from any sort of income transfer.

5. TRANSFER EFFECT TO URBAN UNEMPLOYMENT

In a dual economy much attention is centered to urban unemployment. We focus it in this section. In the analysis of Section 3, it was already revealed that, if capital is industry specific, the agricultural employment increases and the urban unemployment decreases by a rise in the income transfer from manufacturing workers to rural workers.

So we deal with the mobile capital case. In view of the analysis of the previous section we know that the capital-labor ratio of any industry on the agricultural wage never varies for a change in the income transfer. Keep these in mind, we differentiate (8') totally. Then we have

$$\frac{L_M \bar{w}}{K_M (L - L_A)} \left(\frac{K_A}{L_A} - \frac{K_M}{L - L_A} \right) dL_A = - \frac{L}{L_A (L - L_A)} dT^{AL}, \tag{19}$$

by the use of (7), (17) and the assumption that $T^{AL} = T^{ML} = 0$ initially and $dT^{AL} + dT^{ML} = 0$.

Therefore we find

$$\frac{dL_A}{dT^{AL}} > 0 \Leftrightarrow \frac{K_A}{L_A} < \frac{K_M}{L_M + L_U},$$

implying that, if and only if the capital-labor ratio of the urban area is greater (smaller) than that of the rural area, the labor employment of the agricultural industry increases by the introduction of the transfer. Since $k_M \equiv K_M / L_M$ and

$k_A \equiv K_A / L_A$ are constant to the introduction of the transfer and $dK_M = -dK_A$, we easily show that an increase in L_A implies an increase in K_A and decrease in L_M and K_M , and vice versa.

Based on these facts, we investigate the sign of dL_U / dT^{AL} . By (19) and the fact that $L_A K_M dL_M + L_M K_A dL_A = 0$, we obtain

$$\begin{aligned} \frac{dL_U}{dT^{AL}} &= -\left(\frac{dL_M}{dT^{AL}} + \frac{dL_A}{dT^{AL}}\right) \\ &= \left(1 - \frac{L_M K_A}{L_A K_M}\right) \frac{\frac{L}{L_A(L-L_A)}}{\frac{L_M \bar{w}}{K_M(L-L_A)} \left(\frac{K_A}{L_A} - \frac{K_M}{L-L_A}\right)} \\ &= \frac{L_M L}{L_A \bar{w}} \frac{\frac{K_M}{L_A} - \frac{K_A}{L-L_A}}{\frac{K_A}{L_A} - \frac{K_M}{L-L_A}} < 0, \end{aligned}$$

if

$$\frac{K_A}{L_A} < \frac{K_M}{L_M + L_U}. \quad (20)$$

Thus, if the capital-labor ratio of the urban areas is greater than that of the rural area, the introduction of the transfer reduces the urban unemployment. The condition (20) is a global stability condition of the following dynamical factor movement process:

$$(D) \quad \begin{cases} \dot{L}_A = \alpha_L \left(w_A - \frac{\bar{w} L_M}{L - L_A} \right), \\ \dot{K}_A = \alpha_K (pG_K - F_K), \end{cases}$$

where α_L and α_K are positive and constant parameters implying adjustment speeds. The proof of the stability is provided in Appendix²⁵⁰.

Now we can summarize results derived in this section as

Theorem 5

Consider the income transfer from manufacturing workers to agricultural workers. Then,

- (i) *in the specific capital case, a rise in the level of transfer always increases the labor employment in the agricultural industry and decreases the urban unemployment,*
- (ii) *in the mobile capital case, the introduction of the transfer increases (decreases) the labor employment as well as capital employment in the agricultural industry and decreases (increases) the labor employment as well as capital employment in the manufacturing industry if and only if the capital-labor ratio of the urban region is greater (smaller) than that of the rural region,*
- (iii) *in the mobile capital case, the introduction of the transfer reduces the urban unemployment if the capital-labor ratio of the urban area is greater than that of the rural area.*

6. CONCLUSION

We investigated the welfare effect of a domestic income transfer from urban workers to rural workers in a dual open economy and showed that the transfer possibly lowers the welfare of the rural workers in the case where capital is sector-specific but such a transfer paradox never occurs in the case where capital is perfectly mobile between sections. This is, because, in the specific-capital case, the rural income goes up by the transfer and thus labor flows into the rural area and reduces the rural wage. If this latter effect overwhelms the former, the rural workers will be worse off. This paradoxical phenomenon appears when the wage reduction is very sensitive to the labor inflow. In the mobile capital case, labor should move together with capital since the capital-labor ratio of each sector is constant by the fixed urban wage. Thus, the transfer does not influence the rural wage, so that the paradox cannot occur. All these results has nothing to do with

²⁵⁰In the mobile capital case the stability was first investigated by Neary(1981).

the dynamic stability condition of which is often made use. The reason is the open economy assumption which enables the good prices to be constant.

Based on these two distinct outcomes, one policy implication could be proposed that the effect of a domestic transfer to raise the welfare of the rural worker depends on the capital mobility. If only labor flows into the rural region by the transfer, the policy may not be effective. If capital also together with labor flows into the rural region, however, the policy becomes necessarily effective. For the purpose to shrink the wage disparity, however, this transfer policy is effective in both cases. We also inspected the effect of the transfer to the urban unemployment and derived the result that the transfer always reduces the urban unemployment in the specific capital case but it does not so in the mobile capital case. The sufficient condition to reduce the urban unemployment is the urban region is more capital-intensive than the rural region.

Finally we should notice that our transfer scheme is slightly different from that of Ravallion(1984). Ravallion considers the source of income transfer to agricultural workers comes from manufacturing firms, so that the labor cost in production goes up while the labor income in the manufacturing sector stay constant. In our supposition, however, the source of income transfer relies on the income of manufacturing workers, which implies that the labor income of manufacturing workers necessarily goes down but the labor cost in manufacturing production is not affected. This difference does not influence our results much but a little. Suppose Ravallion's transfer scheme. Then, in the specific capital case, the income disparity expands if and only if the agricultural wage decreases. In the mobile capital case, we can see easily that the agricultural wage necessarily increases and the rental of capital decreases.

Our present analysis is simple enough to derive clear results, since we assume the economy to be small and open. If the economy is closed, the analysis becomes complicate by the disturbance of the endogenous good prices. Although most developing countries are small and open, the close economy case is more interesting from a theoretical point of view and it is a future topic to tackle.

APPENDIX

In this appendix we prove that, if $T^{AL} = T^{ML} = 0$, the equilibrium is globally stable under factor movement dynamic process (D). Total differentiation of (D) with respect to the endogenous variables yields

$$dL_A \equiv dw^A - \frac{\bar{w}(L-L_A)dL_M + \bar{w}L_M dL_A}{(L-L_A)^2},$$

$$d\dot{K}_A = pG_{KK}dK_A + pG_{KL}dL_A - F_{KK}dK_M - F_{KL}dL_M.$$

Therefore Jacobian matrix of (D) is exhibited as

$$J \equiv \begin{bmatrix} pG_{LL} - \frac{\bar{w}L_M}{L-L_A} & pG_{LK} - \frac{\bar{w}F_{LK}}{(L-L_A)F_{LL}} \\ pG_{KL} & pG_{KK} + F_{KK} - \frac{F_{KL}^2}{F_{LL}} \end{bmatrix},$$

since $pG_{LL}dL_A + pG_{KK}dK_A = dw^A$, $F_{LL}dL_M + F_{LK}dK_M = 0$ and $dK_M + dK_L = 0$.

Every diagonal element of J is negative. The determinant of J is derived as

$$|J| = (pG_{LL} - \frac{\bar{w}L_M}{(L-L_A)^2})(pG_{KK} + F_{KK} - \frac{F_{KL}^2}{F_{LL}}) - pG_{KL}(pG_{KL} - \frac{\bar{w}F_{LK}}{(L-L_A)F_{LL}})$$

$$= (\frac{F_{KL}^2}{F_{LL}} - pG_{KK} - F_{KK}) \frac{\bar{w}L_M}{(L-L_A)} + pG_{KL} \frac{\bar{w}F_{LK}}{(L-L_A)F_{LL}}$$

$$= \frac{p\bar{w}G_{KL}}{L-L_A} \frac{L_A L_M}{K_A K_M} (\frac{K_M}{L-L_A} - \frac{K_A}{L_A}),$$

implying that $|J|$ is positive in sign if the urban area is more capital intensive than the rural area.

Applying the stability theorem in Oleck(1963) to these results, we can assert that the equilibrium is globally stable in the case where $T^{AL} = T^{ML} = 0$.

REFERENCES

- Brakman, Steve, and Charles van Marrewijk, 1998, *The Economics of International Transfers*, Cambridge University Press
- Harris, John R., and Michael Todaro, 1970, Migration, Unemployment and Development: A Two-Sector Analysis, *American Economic Review* 60, 126-142.
- Kemp, Murray C., 1995, *The Gains from Trade and the Gains from Aid*, Routledge.
- Keynes, John Maynard, 1929, The German Transfer Problem, *Economic Journal* 39, 1-7.
- Neary, J. Peter, 1981, On the Harris-Todaro Model with Intersectoral Capital Mobility, *Economica* 48, 219-234.
- Ohlin, Bertile, 1929, The Reparations Problem: A Discussion; Transfer Difficulties, Real and Imagined, *Economic Journal* 39, 179-83.
- Olech, C., 1963, On the Global Stability of an Autonomous System on the Plane, in *Contributions to Differential Equations*, ed. by J.P.LaSalle and J.B.Diaz, Wiley, 389-400.
- Ravallion, Martin, 1984, How much is a transfer payment worth to a rural worker?, *Oxford Economic Papers* 36, No3/November, 478-489.

1160 STUDY ON THE DETERMINANTS OF CREATIVE CLASSES AND ITS IMPACTS ON REGIONAL ECONOMIC GROWTH: CASE STUDY FROM MAJOR CITIES IN JAPAN

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ABSTRACT

Understanding the mechanism and impact of creative classes (CCs) on regional economic growth is important not only for academia but also for the policy makers, practitioners and so on. In recent years, various number of empirical studies based on the theory of creative class has been conducted. However, the research of the CCs in Japan focusing on its major cities is scarce, especially on cultural diversity. The purpose of this study is to clarify the determinants of CCs and its impacts on the economic growth of the cities by using the official statistical data in Japan. Specifically, it will construct the indicators of amenity, tolerance, job opportunity and openness to clarify the determinants of CCs and its impacts on regional economic growth and innovation by using structural equation modeling (SEM) analysis. Finally, policy implication for a sustainable development of cities will be derived from the analytical results.

Keywords: Creative Class(CC), Cultural Diversity, Japan

JEL codes: R1, J1

1. INTRODUCTION

Creativity and diversity are fundamental elements in promoting innovation which is the source of economic development. Empirical analyses on creative classes (CCs) conceptualized by Richard Florida (e.g. Florida 2005) and creative capital theories have been mainly conducted in North America and Europe, and both from intra-national and international comparative perspectives. In recent years, the accumulation of empirical analysis on Asian countries has also getting progresses.

In the meantime, according to the results of a representative international comparison (MPI 2015), the creative index of Japan is the 24th among 139 countries high in its overall rank. Although the domain of Technology (2nd) is high, Talent (58th) and Tolerance (39th) are comparatively low. In addition, Westlund and Calidoni (2010) clarified that tolerance and social capital had no effect on regional development at the prefecture level of Japan in the first half of the 2000s

However, according to the results of theoretical and empirical studies about the mechanism of the diversity of human beings and cultures contributing to innovation, benefits can be drawn successfully from cultural diversity when it overcomes the obstacle of cross-cultural communication which contributes to the reduction in transaction cost. In other words, the region where it can derive the benefits of cultural diversity is the region where people can live with coexisting of heterogeneous and/or different values and is a society with a high degree of tolerance.

Therefore, in order to consider a desirable urban policy for the sustainable development of regional economy, this research attempts to clarify the determinants of the CCs and its impacts on regional economic development in Japanese cities based on the theories of CC and cultural diversity by using the structural equation modeling.

2. SURVEY OF PREVIOUS RESEARCH

2.1 Creative classes and creative cities in Japan

There have been a few empirical analyses on creative classes in Japan (Westlund and Calidoni 2010, Ishizaka 2014, Yoshimura 2009, Yoshimura 2010, Kiminami et al. 2018). Among them, Westlund and Calidoni (2010) found that human capital and population density had a significant influence on the regional development at the prefecture level in Japan (population growth, corporate growth rate, high-tech employment rate) in the early 2000s. In addition, the reason that the effects of tolerance and trust were not confirmed was considered as the immaturity of Japanese civil society. However, due to the focus of their analysis was on which fitness is high between the types of Florida's CC and Putnam's SC, the analysis about basic factors such as amenity, employment, openness and tolerance were insufficient.

Yoshimura (2009) argued that the direction of urban policy is required as to promote two coexisting characteristic functions of the agglomeration of enterprises and research institutes, and the enhancement of housing, medical care and education in order to attract creative classes through the investigation targeted the CCs in Fukuoka city and Kitakyushu city. In addition, Yoshimura (2010) conducted surveys on employment and housing orientation for technology-based employees in seven major cities across the country. The results clarified that the CCs did not have an extremely heterogeneous orientation with respect to employment or residence, but their desire for 'self-esteem' and 'self-actualization' were strong and their evaluation on the functions of cities depends on if such desire can be pursued through work. Furthermore, it clarified that the CC's evaluation on the residential environment from urban functions were put in the aspects of medical, educational and cultural facilities.

2.2 Cultural diversity and tolerance

In recent years, theoretical and empirical researches clarified that cultural diversity (Cultural Diversity) plays an important role in knowledge creation for innovation. Jacobs (1969) had early pointed out that cultural diversity was a source to encourage development in the qualitative sense of the economy. Berliant and Fujita (2011) clarified that,

although knowledge creation and innovation are promoted through communication among people in difference while having a certain extent of common knowledge, the cost of interaction will increase and make it impossible to generate positive influences if diversity progresses too much.

In these empirical analyses, the cultural diversity was measured in the meaning of the place of origin and ethnicity of immigrants, and the effects of cultural diversity on income, innovation, and entrepreneurship etc. were quantitatively clarified in general in the cases of positive (Niebuhr 2009; Ozgen et al. 2011) or in the cases of non-positive effect. In other words, there is an optimum level for cultural diversity, and “tolerance” that promotes cross-cultural communication plays an important role in knowledge creation for innovation.

Concerning tolerance, some interesting results are reported in a project called “World Values Survey” which investigates and compares values of countries around the world. The cultural values of the world are classified into two axes of the (traditional versus) secular-rational value and the (survival versus) self-expression value (called the Inglehart-Velzel diagram). As for Japan, it is reported that the secular-rational value index is high, but self-expression value index is low (Inglehart and Baker 2000, WVS homepage²⁵¹). In other words, secularization has progressed in Japan which is neither bound by tradition and religion, nor is based on individual rights²⁵². In a comparative survey among each country Inglehart and Baker (2000) found that economic growth did not necessarily accompany a rise both in secular-rational and self-expression value indexes which was thought as the processes of modernization did not always converge in one direction deterministically followed by a nonlinear path with its path dependence.

Issues of tolerance and cultural diversity can become represent the issues of suicides in societies. For example, issues of the suicide which is considered as one of the most serious social problems in Japan shall be caused by the such kind of social environment. Chen et al. (2009) clarified that suicides in high rate of suicide (generally ratio of suicide is almost 2.0-2.5 timers higher in male compared to female) in Japan can be explained by economic factors by investigating among OECD countries. Andrés et al. (2011) clarified that female suicides was positively associated with sociological factors (divorce and fertility rates) rather than economic factors (GDP per capita and unemployment). Furthermore, the existing study (Heirigs et al. 2017) clarified that ratio of suicides is positively correlated with ratio of CCs by using the cross-country analysis. It can be interpreted that low(high) ratio of suicide represents that people can(not) choice their way of life in one’s own way in the society. Thus, we also focus on the relationship between suicide and CCs in the empirical analysis.

In spite of the importance of the cultural diversity, researches on the relationship between cultural diversity and regional economic development for Japan has not been done so far (See also Kemeny 2017; Hagiwara and Nakajima 2014), although empirical economic analyses of foreign workers in Japan has been conducted in recent years (Nakamura et al. 2009; Machikita 2015; Hashimoto 2015)²⁵³. We would like to make an empirical analysis to add some new consideration on this issue.

3. ANALYTICAL FRAMEWORK AND METHODOLOGY

3.1 Analytical framework and hypothesis

Based on the literature review in the previous section, we constructed the conceptual framework for this research as shown in Figure 1. We also set hypotheses of H1-a, H1-b and H 2 as working hypotheses for the analysis.

That is, when hypothesis 1 is satisfied, it means that the regional development based on the creative class theory is realized in the region. Furthermore, when hypothesis 2 is satisfied, it means that regional development has been realized in line with diversity theory.

Hypothesis 1 - a. Determining factors for the residence of creative classes are amenity, employment, and tolerance.

Hypothesis 1 - b. The residence of creative classes positively influence the sustainable development of the region.

Hypothesis 2. A high tolerance linking with a high cultural diversity will promote sustainable development of the region.

251 See World Value Survey (<http://www.worldvaluessurvey.org/wvs.jsp>) for more details.

252 In addition, Florida (2005, Ch.5) also introduced the results of the survey, and pointed out that Japan and Germany are in a similar situation. However, Japan has a higher secular-rational value index and a lower self-expression index than Germany.

253 As for the empirical economic analysis on the labor market of immigrant in Japan, please see Nakamura et al. (2009). and as for the recent trend of labor market situation, please see Machikita (2015) for example. As for the technology transfer policy and institutional problems in the agriculture and construction sectors, please also see Hashimoto (2015).

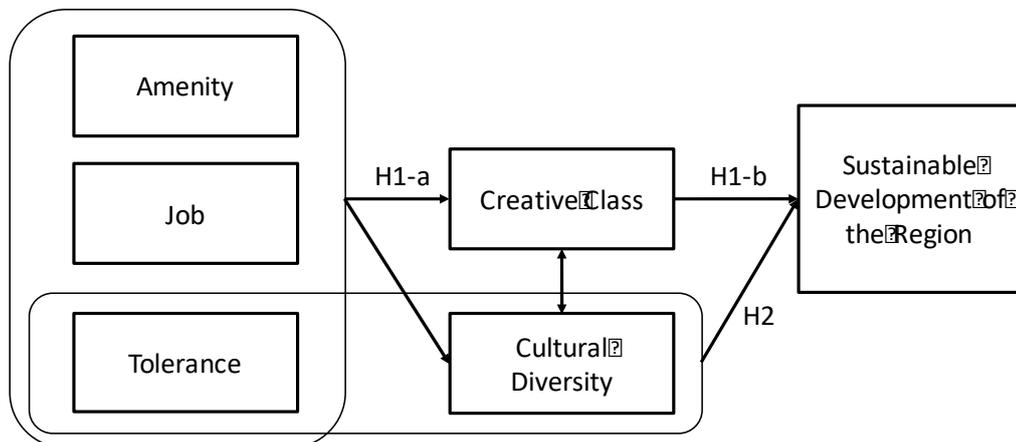


Figure 1. Conceptual Framework and Hypotheses

3.2 Data and analytical method

We introduced the method of covariance structure analysis (Structural Equation Modeling). The framework of path diagram for the SEM analysis is shown in Figure 2. The summary of the variables used for the analysis is shown in Table 1. For the third layer, we will use population growth rate, growth rate of income per capital and growth rate of patent growth as proxy indicators for sustainability, economic performance and innovation respectively.

Next, as for the CCs, we use the ratio of the total of professional, technical and artistic jobs in socio-economic classification divided by total number of employment in the region. As for the index of cultural diversity, we use two type of indexes: the Shannon index of nationality of foreigner and foreigner ratio in total population. Regarding the diversity of nationality, although the diversity of the area of origin should be used in precisely, such kind of statistical data is unavailable in Japan, the Shannon index of the number of foreign nationals by nationality is used as a proxy index²⁵⁴. We also use the ratio of suicide based on the literature review in the above section (low ratio of suicides indicates high level of cultural diversity in general sense).

Finally, for amenity, employment and tolerance, the number of urban parks, unemployment rate and tolerance are used as proxy variables. Population density is used as a control variable as the degree of urbanization. The tolerance index is calculated as a subjective indicator (see Appendix 1).

The data of the first hierarchical is in the year of 2000 and the second hierarchy is the data in 2005-06. For the third layer, growth rate of the variables for the period from 2005 to 2010 (for patents 2014 to 2016) is used.

The number of cities to be analyzed is 109 and they are major cities in Japan: core cities, special cities (at the time of enforcement) and prefectural government cities including Tokyo special wards (see Appendix 2).

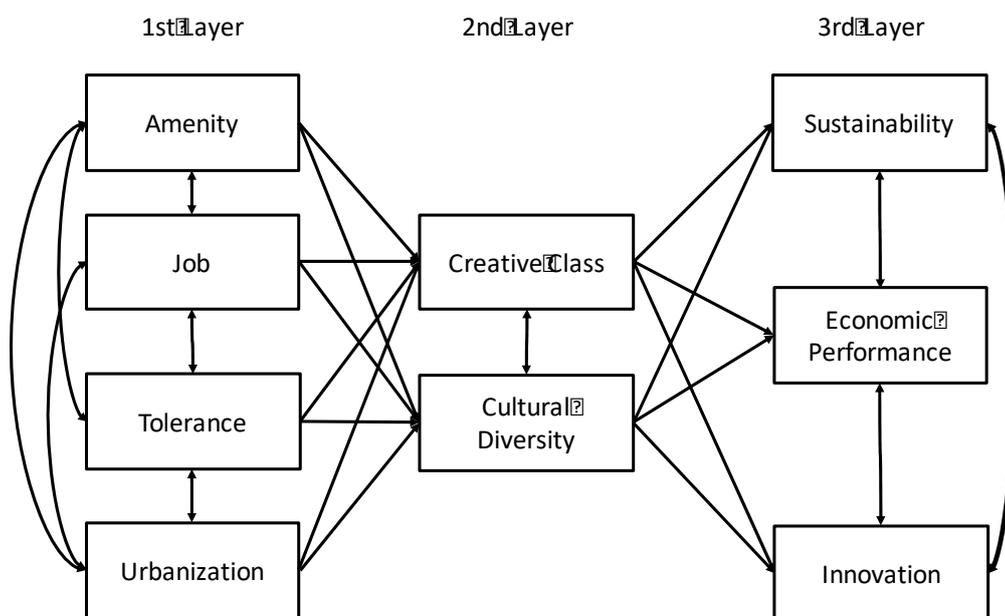


Figure 2 Framework for Path Diagram for SEM

Table 1. Explanation of Variables and Its summary

Variables	Code	Year	Explanation	Source	AVG	S.D.	Min.	Max.
Population	GP	2005-	Population growth (%)	SP	0.6	2.4	-5.1	7.4

254 These indicators only represent surface of the diversity. Because nature of diversity should be measured based on differences in abilities, experiences, way of thinking and value (ethics) at individual levels, not based on the nationality or origin of birth.

Growth Income Growth	GIPC	10 2005-10	Increase rate of taxable income per capita per person (%)	SP	-2.7	2.5	-9.0	4.8
Patent Growth	GPatent	10 2014-16	Increase rate of patent cases (%)	RE	1.3	9.9	-46.4	28.4
CC Ratio	CC2005	2005	CC job (profession, technical work, art job) / working population (%)	SP	10.6	1.8	7.5	19.2
Cultural Diversity (1)	Immigrant Diversity	2006	7 Nationality Diversity of Foreigners by Segment (Shannon Index)	ZG	1.5	0.2	0.7	1.9
Cultural Diversity (2)	Foreigner	2005	Foreigner population / Total population (%)	SP	1.2	0.8	0.1	4.3
Cultural Diversity (3)	Suicide	2003-2007	Average suicide ratio (Number of suicide/100,000 population) Average of male and female	NP	25.8	3.5	19.6	37.4
Urban Park	Park	2000	Number of urban parks per 1,000 inhabitants	CE	0.7	0.3	0.2	1.7
Unemployment	Unemp	2000	Total unemployed / Labor force population (%)	SP	4.9	1.1	3.1	9.8
Tolerance	Tolerance	2000-02	Subjective indicator	JG	2.5	0.2	1.8	3.2
Population Density	PD	2000	Total population / residential area (people / ha)	SP	36.4	28.9	5.0	130.9

Source:

SP: System of Social and Demographic Statistics (e-Stat)

RE: Regional Economic Analysis System(REAS)

ZG: Statistics on foreign residents in Japan (Ministry of Foreign Affairs)

NP: National Center of Neurology and Psychiatry(NCNP)

CE: Cabinet Office economic and fiscal data (Cabinet Office)

JG: JGSS 2000-02 data (see Appendix 1)

Note: Covariance between variables is assumed in the first hierarchy and covariance of error terms is assumed in layer 2.

4. RESULTS OF THE ANALYSIS

The results of covariance structure analysis are shown in Figure 3, Figure 4, Figure 5 and Table 2²⁵⁵. The results showed that employment and degree of urbanization had influences on the CCs, but tolerance and amenity didn't have. Thus, about for the Hypothesis 1-a, it was verified that only the job factor is determinants of CCs. On the other hand, there was a positive correlation between unemployment rate and urbanization; tolerance and urbanization; tolerance and urbanization, but the correlation between amenity and other indicators could not be confirmed. This indicated that urbanization in Japan had been generally undertaken in the employment-driven way and the supply of amenity was relatively weak. Furthermore, such kind of employment-driven urbanization would further promote population concentration in specific areas (OECD 2016).

Regarding the impacts of the CCs on the sustainable development of regions, the higher the CCs ratio, the higher rate of population growth and per capita income was confirmed. This means that the CCs contributes to the economic performance and population growth. However, their effect on promoting innovation could not be confirmed since no significant results were obtained with respect to the patent growth rate. Therefore, the Hypothesis 1 - b. "The residence of creative classes positively influence the sustainable development of the region" was only limitedly verified.

Regarding the influence of diversity on the sustainable development of the region, it was confirmed that the immigrant diversity was negative with respect to the economic growth rate, and the ratio of foreigner was positive to the population growth rate. In addition, the ratio of suicide was negative with respect to population growth. It was positive with respect to economic performance. The one of the possible explanation of the high ratio suicides with high economic growth is that income growth might positively correlates with longer working hours²⁵⁶. Therefore, Hypothesis 2 "The higher the cultural diversity, the more sustainable development of the region" was also limitedly verified in Japan, because the foreigners contributed to the population growth rate in the Japanese Cities but their capability for the economic growth could not be sufficiently drawn out due to the employment-driven urbanization mentioned above. Such kind of situation can be explained by the concentration of foreign workers from specific countries in the cities in Japan.

255 In order to test whether our results hold or not in the case where largest cities excluded from the sample, we conducted additional SEM analysis. We conducted SEM analysis by using sub sample which the 4 largest cities (Tokyo 23 wards, Yokohama, Osaka, Nagaya city > 2 million of population) are excluded from the sample. The result show the almost same result of the full sample model (109 cities) and signs of the coefficients and level of significant is stable except for the relationship between "Foreigner and CC (become not significant)" and "Foreigner and GIPC (become significant)". Thus, our hypotheses verification and conclusion also holds in this case.

256 In general sense, it can be considered that low level of tolerance leads to low level of cultural diversity, and it can not promote the regional economic growth because of the exclusion problems. This contradictory (high rate of suicides with high growth rate of income per capita) result might show the characteristics and distortion of labor markets of Japanese society.

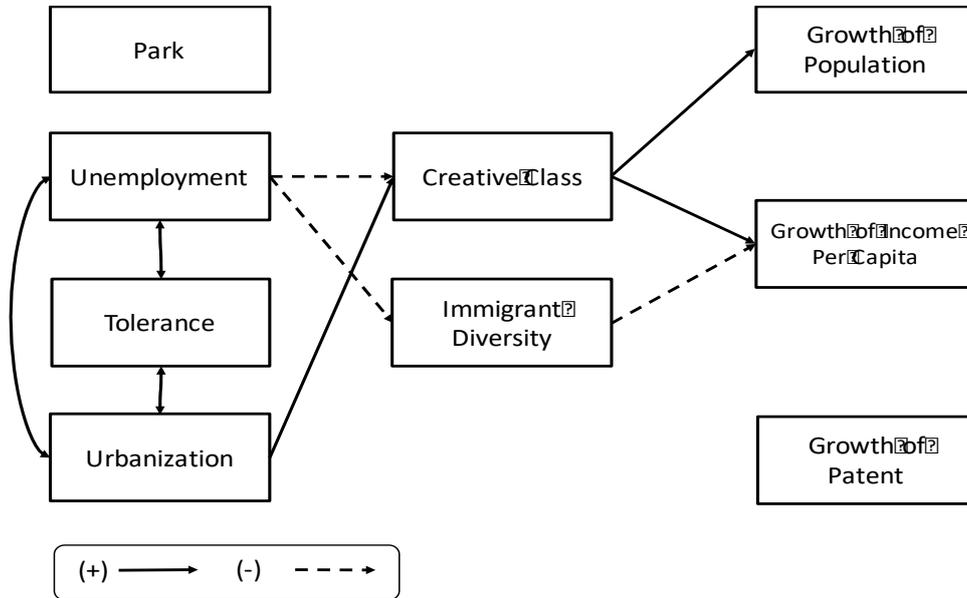


Figure 3. Path Diagram (1): Immigrant Diversity

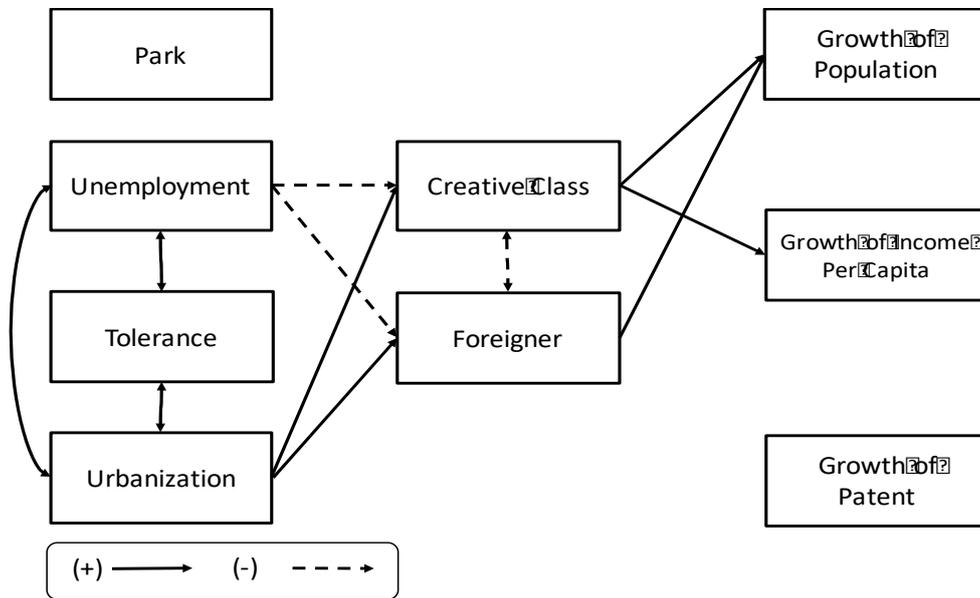


Figure 4. Path Diagram (2) Foreigner

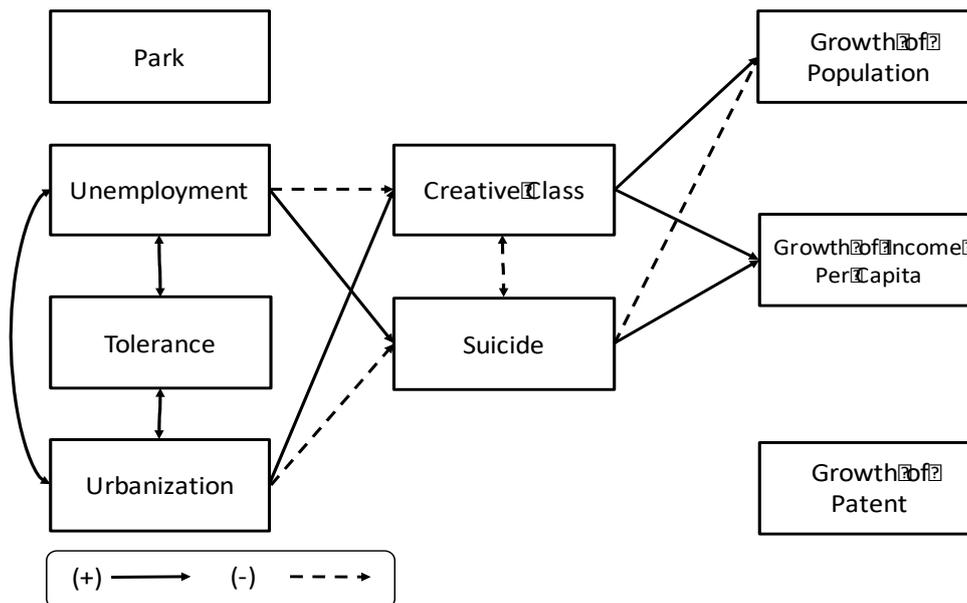


Figure 5. Path Diagram (3): Suicide

Table 2. Result of Structural Equation Modeling

	(1)	(2)	(3)
	Immigrant Diversity	Foreigner	Suicide

		r			r			r		
		Coef.	Z-value	P>|Z|	Coef.	Z-value	P>|Z|	Coef.	Z-value	P>|Z|
CC2005	ParkPC2000	0.77	1.58	0.11	0.77	1.58	0.11	0.77	1.58	0.11
	Unemployment	-0.41	-2.18	0.03	-0.41	-2.18	0.03	-0.41	-2.18	0.03
	Tolerance	0.88	1.28	0.20	0.88	1.28	0.20	0.88	1.28	0.20
	PD	0.03	3.45	0.00	0.03	3.45	0.00	0.03	3.45	0.00
Immigrant	ParkPC2000	-0.10	-1.69	0.09	0.20	0.91	0.36	-0.40	-0.44	0.66
Diversity /Foreigner	Unemployment	-0.05	-2.29	0.02	-0.31	-3.63	0.00	1.69	4.83	0.00
	Tolerance	0.10	1.17	0.24	0.06	0.20	0.84	0.96	0.74	0.46
/Suicide	PD	0.00	-1.21	0.23	0.01	3.99	0.00	-0.08	-5.81	0.00
GP2	CC2005	0.74	6.63	0.00	0.77	7.37	0.00	0.50	4.42	0.00
	Immigrant Diversity/ Foreigner/Suicide	1.38	1.52	0.13	1.01	4.39	0.00	-0.29	-5.30	0.00
GIPC2	CC2005	0.29	2.29	0.02	0.26	2.04	0.04	0.44	3.09	0.00
	Immigrant Diversity/ Foreigner/Suicide	-2.75	-2.65	0.01	-0.58	-2.05	0.04	0.19	2.71	0.01
GPatent	CC2005	0.38	0.68	0.50	0.33	0.59	0.56	0.75	1.21	0.23
	Immigrant Diversity/ Foreigner/Suicide	-3.56	-0.78	0.44	-2.39	-1.96	0.05	0.45	1.46	0.14
Covariance	e.Diversity(1)/(2)/(3),e.CC2005	0.04	1.24	0.21	-0.20	-1.76	0.08	-1.77	-3.51	0.00
	e.GP2,e.GIPC2	-0.65	-1.46	0.15	-0.46	-1.10	0.27	-0.27	-0.68	0.50
	e.GP2,e.Gpatent	-2.71	-1.38	0.17	-1.44	-0.81	0.42	-1.62	-0.93	0.35
	e.GIPC2,e.Gpatent	0.61	0.27	0.78	0.19	0.09	0.93	0.21	0.09	0.93
	ParkPC2000,Unemployment	0.02	0.69	0.49	0.02	0.69	0.49	0.02	0.69	0.49
	ParkPC2000,Tolerance	-0.01	-1.03	0.30	-0.01	-1.03	0.30	-0.01	-1.03	0.30
	ParkPC2000,PD	-0.80	-0.95	0.34	-0.80	-0.95	0.34	-0.80	-0.95	0.34
	Unemployment, Tolerance	0.08	2.94	0.00	0.08	2.94	0.00	0.08	2.94	0.00
	Unemployment,PD	14.7	4.95	0.00	14.7	4.95	0.00	14.7	4.95	0.00
	Tolerance,PD	4	4.95	0.00	4	4.95	0.00	4	4.95	0.00
		1.98	3.05	0.00	1.98	3.05	0.00	1.98	3.05	0.00
	LR test, chi2(12)		30.367			18.699			18.500	
	P-value		0.002	**		0.096			0.101	
	RMSEA		0.121			0.073			0.072	
	CFI		0.791			0.929			0.950	

Note: ‘**’ and ‘*’ indicates statistically significance at 1% and 5% respectively.

5. CONCLUSIONS

The conclusions derived from the above-mentioned results are as follows. First, the direction of urbanization shifting from the employment-driven to a sustainable development linked with a sufficient supply of amenity is required. For example, it is confirmed that supply of amenity through the multi-functionality of urban agriculture brings positive utility to residents and enhances the sustainability of cities (Kiminami and Kiminami 2007; Kiminnami et al. 2018).

Secondly, the acceptance of foreign workers, as well as the acceptance of foreign labor force in Japan has been focused on the technology transfer and labor shortage which has made great contribution to the regional economic growth (especially to the population growth) in policy. However, in order to promote the sustainable and inclusive development of regions in the long-term, policy on the innovation that includes social innovation²⁵⁷ (OECD 2011; Nicholls and Murdock 2012) through enhancement of tolerance including the acceptance of cultural diversity is called for. These kinds of policy innovation can also contribute to solve social problems such suicide in Japan because it will lead high level of cultural diversity with tolerance for all people of the society.

Finally, because economic development of cities has multiple aspects, analyses by considering the institutional environment and structure of cities, and from the perspectives of international comparison based on the understanding each country’s context will be necessary. These will be our future research challenges.

ACKNOWLEDGEMENTS

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<FOR JGSS DATASET>

The Japanese General Social Surveys (JGSS) are designed and carried out at the Institute of Regional Studies at Osaka University of Commerce in collaboration with the Institute of Social Science at the University of Tokyo under the direction of Ichiro TANIOKA, Michio NITTA, Hiroki SATO and Noriko IWAI with Project Manager, Minae OSAWA. The project is financially assisted by Gakujutsu Frontier Grant from the Japanese Ministry of Education, Culture, Sports, Science and

257 Social Innovation can be defined as the innovation and its process that can contribute to solve the social problems (e.g. addressing social needs and market and government failures) for the sustainable development of the region through the innovation at incremental, institutional and disruptive levels. It becomes effective by using the multi-sector collaboration approach based on the social entrepreneurship. As for the definitional arguments, please see Nicholls and Murdock (2012) for example.

Technology for 1999-2003 academic years, and the datasets are compiled and distributed by SSJ Data Archive, Information Center for Social Science Research on Japan, Institute of Social Science, the University of Tokyo.

APPENDIX 1. HOW TO CREATE A TOLERANCE INDEX

With respect to the tolerance index, referring to the method used in Westlund and Calidoni (2010), based on the answers of the following nine questions, the latitude ($1 = \text{tolerance}$, $0 = \text{not tolerance}$) Was calculated.

Specifically, after calculating the response rate (Tir , $0 \leq Tir \leq 1$) for each region ($r = 1, \dots, 58$), the total value of nine items ($i = 1, 2 \dots 9$) is calculated, The tolerance index ($\sum Tir$, $0 \leq \sum Tir \leq 9$). In some areas, since there were cases where it was a small number of samples, in order to reduce the sample bias, the average value of data for three years was calculated. Specifically, after calculating the same index for each year of JGSS - 2000, JGSS - 2001 and JGSS - 2002, average values were calculated.

<JGSS-2000 and JGSS 2001> (Note)

<Foreigner1>

Are you for or against an increase in the number of foreigners in your community?

Yes=1, No and Others=0

<Foreigner 2>

Have you had any contact with foreigners in Japan?

Yes=1, No=0

<Marriage and Family View>

When a marriage is troubled and unhappy is it generally better if the couple gets divorce for wife?

Yes=1, No and Others=0

<Gender View 1>

If a husband has sufficient income, is it better for his wife not to have a job?

Yes=0, No and Others=1

<Gender View 2>

Can a working mother establish just as warm and secure a relationship with her children as a mother who does not work?

Yes=1, No and Others=0

<Gender View 3>

A husband's job is to earn money; a wife's job is to look after the home and family. Do you agree?

Yes=0, No and Others=1

<Gender View 4>

Is having a job the best way for a woman to be an independent person?

Yes=1, No and Others=0

<View of Life and Death>

When a person has a fatal disease, do you think doctors should be allowed by law to end the patient's life by some painless means if the patient and his/her family request it?

Yes=1, No and Others=0

<LGBT View>

Do you think that sexual relations between two adults of the same sex are wrong?

Wrong and Others=0, Not wrong=1

Note: With regard to JGSS-2002, there is a change in the question items (foreigner 2, marriage / family view, gender view 2 & 4) with JGSS-2001 and JGSS-2002, so do not strictly connect. Also, regarding LGBT view, there is no question item, so it is not taken as the target of summarization of the index calculation.

In addition, in the same survey, information on city size ("13 large cities", "other cities", "other districts") is investigated in addition to information on prefectures as residential areas. Therefore, for Yokohama City and Kawasaki City, among the 13 major cities, Fukuoka City and Kitakyushu City, the aggregated values of "13 large cities" categories in Kanagawa Prefecture and Fukuoka Prefecture, respectively, are used for other large cities, we use the aggregate value of "13 large cities" category of prefecture (total 11 areas).

For core city, special case city and prefectural government cities, aggregate values of "other cities" category of each prefecture are used (total 47 areas).

APPENDIX 2. LIST OF TARGET CITIES

No.	Prefectures	City
1	Hokkaido	Sapporo-shi
2		Hakodate-shi
3		Asahikawa-shi
4	Aomori-ken	Aomori-shi
5		Hachinohe-shi
6	Iwate-ken	Morioka-shi
7	Miyagi-ken	Sendai-shi
8	Akita-ken	Akita-shi
9	Yamagata-ken	Yamagata-shi
10	Fukushima-ken	Fukushima-shi
11		Koriyama-shi
12		Iwaki-shi
13	Ibaraki-ken	Mito-shi
14		Tsukuba-shi
15	Tochigi-ken	Utsunomiya-shi
16	Gumma-ken	Maebashi-shi
17		Takasaki-shi
18		Isesaki-shi
19		Ota-shi
20	Saitama-ken	Saitama-shi
21		Kawagoe-shi
22		Kumagaya-shi
23		Kawaguchi-shi
24		Tokorozawa-shi
25		Kasukabe-shi
26		Soka-shi
27		Koshigaya-shi
28	Chiba-ken	Chiba-shi
29		Funabashi-shi
30		Kashiwa-shi
31	Tokyo-to	23 wards
32		Hachioji-shi
33	Kanagawa-ken	Yokohama-shi
34		Kawasaki-shi
35		Sagamihara-shi
36		Yokosuka-shi
37		Hiratsuka-shi
38		Odawara-shi
39		Chigasaki-shi
40		Atsugi-shi
41		Yamato-shi

No.	Prefectures	City
42	Niigata-ken	Niigata-shi
43		Nagaoka-shi
44		Joetsu-shi
45	Toyama-ken	Toyama-shi
46	Ishikawa-ken	Kanazawa-shi
47	Fukui-ken	Fukui-shi
48	Yamanashi-ken	Kofu-shi
49	Nagano-ken	Nagano-shi
50	Nagano-ken	Matsumoto-shi
51	Gifu-ken	Gifu-shi
52	Shizuoka-ken	Shizuoka-shi
53		Hamamatsu-shi
54		Numazu-shi
55		Fuji-shi
56	Aichi-ken	Nagoya-shi
57		Toyohashi-shi
58		Okazaki-shi
59		Ichinomiya-shi
60		Kasugai-shi
61		Toyota-shi
62	Mie-ken	Tsu-shi
63		Yokkaichi-shi
64	Shiga-ken	Otsu-shi
65	Kyoto-fu	Kyoto-shi
66	Osaka-fu	Osaka-shi
67		Sakai-shi
68		Kishiwada-shi
69		Toyonaka-shi
70		Suita-shi
71		Takatsuki-shi
72		Hirakata-shi
73		Ibaraki-shi
74		Yao-shi
75		Neyagawa-shi
76		Higashiosaka-shi
77	Hyogo-ken	Kobe-shi
78		Himeji-shi
79		Amagasaki-shi
80		Akashi-shi
81		Nishinomiya-shi
82		Kakogawa-shi
83		Takarazuka-shi

No.	Prefectures	City
84	Nara-ken	Nara-shi
85	Wakayama-ken	Wakayama-shi
86	Tottori-ken	Tottori-shi
87	Shimane-ken	Matsue-shi
88	Okayama-ken	Okayama-shi
89		Kurashiki-shi
90	Hiroshima-ken	Hiroshima-shi
91		Kure-shi
92		Fukuyama-shi
93	Yamaguchi-ken	Shimonoseki-shi
94		Yamaguchi-shi
95	Tokushima-ken	Tokushima-shi
96	Kagawa-ken	Takamatsu-shi
97	Ehime-ken	Matsuyama-shi
98	Kochi-ken	Kochi-shi
99	Fukuoka-ken	Kitakyushu-shi
100		Fukuoka-shi
101		Kurume-shi
102	Saga-ken	Saga-shi
103	Nagasaki-ken	Nagasaki-shi
104		Sasebo-shi
105	Kumamoto-ken	Kumamoto-shi
106	Oita-ken	Oita-shi
107	Miyazaki-ken	Miyazaki-shi
108	Kagoshima-ken	Kagoshima-shi
109	Okinawa-ken	Naha-shi

Notes: Target cities of municipalities were based on the date of March 31, 2016 (e-Stat).

REFERENCES

- Andrés A.R. Halicioglu F. Yamamura E. (2011) Socio-economic Determinants of Suicide in Japan, *The Journal of Socio-economics*, 40:723-731.
- Nicholls A. Murdock A. (2012) *The Nature of Social Innovation*, In: Nicholls and Murdock (eds) *Social Innovation: Blurring Boundaries to Reconfigure Markets*, Palgrave Macmillan, pp.1-30.
- Berliant M. Fujita M. (2011) *The Dynamics of Knowledge Diversity and Economic Growth*, *Southern Economic Journal*, 77:856-884.
- Chen J. Choi Y. J. Sawada Y. (2009) *How Is Suicide Different in Japan? Japan and the World Economy*, 21:140-150.
- Florida R. (2005) *The Flight of the Creative Class*, HarperCollins Publishers.
- Hashimoto Y. (2015) *Review and Challenges on the Technical Intern Training Program: Cases from Agriculture and Construction Sectors*, *The Japanese Journal of Labor Studies*, 662:5-26 (in Japanese).
- Hagiwara R. Nakajima T. (2014) *Optimal Immigration Policy for Japan: Based on a Survey of Economic Empirical Analysis*, RIETI Discussion Paper Series, 14-J-018 (in Japanese).
- Heirigs, M.H. Moore M.D. Recker N.L. (2016) *Suicide and the Creative Class: A Cross-national Examination*, *Deviant Behavior*, 38:917-927.
- Ishisaka M. (2014) *The Distribution of the Creative Class in Japan*, *Hyogo Geography*, 59:17-28 (in Japanese).
- Inglehart R. Baker W.E. (2000) *Modernization, Cultural Change, and the Persistence of Traditional Values*, *American Sociological Review*, 65:19-51.
- Jacobs J. (1969) *The Economy of Cities*, Random House, Inc.
- Kemeny T. (2017) *Immigration Diversity and Economic Performance in Cities*, *International Regional Science Review*, 40:164-208.
- Kiminami L. Kiminami A. (2007) *Sustainability of Urban Agriculture : A Comparative Analysis of Tokyo and Shanghai*, *Studies in Regional Science*, 37:585-597
- Kiminami L. Kiminami A. Furuzawa S. (2018) *Impacts of Multi-functionality of Urban Agriculture on the CCs in Japan*, *Asia-Pacific Journal of Regional Science* (Online first)
- Martin Prosperity Institute (2015) *The Global Creativity Index 2015*, Rotman.
- Machikita T. (2015) *Understanding the Recent Empirical Facts on Foreign Workers in Japan, 2000-2014: A View from Supply and Demand in Japanese Labor Market*, *The Japanese Journal of Labor Studies*, 662:5-26 (in Japanese).
- Nakamura J. Naito H. Kanbayashi R. Kawaguchi D. Machikita T. (2009) *Foreign Workers in Japan*, Nikkei Publishing Ltd (in Japanese).
- Niebuhr A. (2009) *Migration and Innovation: Does Cultural Diversity Matter for Regional R&D Activity?*, *Papers in Regional Science*,

89:564-583.

OECD (2011) LEED Forum on Social Innovations. Available at: <http://www.oecd.org/cfe/leed/Forum-Social-Innovations.htm>.
Accessed: 23 May 2018.

OECD (2016) OECD Territorial Reviews: JAPAN 2016, OECD Publishing.

Ozgen C. Nijkamp P. Poot J.(2011) Immigration and Innovation in European Regions, IZA DP No.5676.

Westlund H. Calidoni F. (2010) The Creative Class, Social Capital and Regional Development in Japan, Review of Urban and Regional Development Studies, 22:89-108.

Yoshimura H. (2009) The Character and Function of a City that talented people taking innovation evaluate, 42:59-65(in Japanese).

Yoshimura H. (2010) Accumulation of Creative Persons Leading Growth of a City, Nihon Toshi Gakkai Nenpoh, 43:18-24(in Japanese).

1672 LOCATING MIGRANT LABOUR IN INFORMAL CONSTRUCTION INDUSTRY

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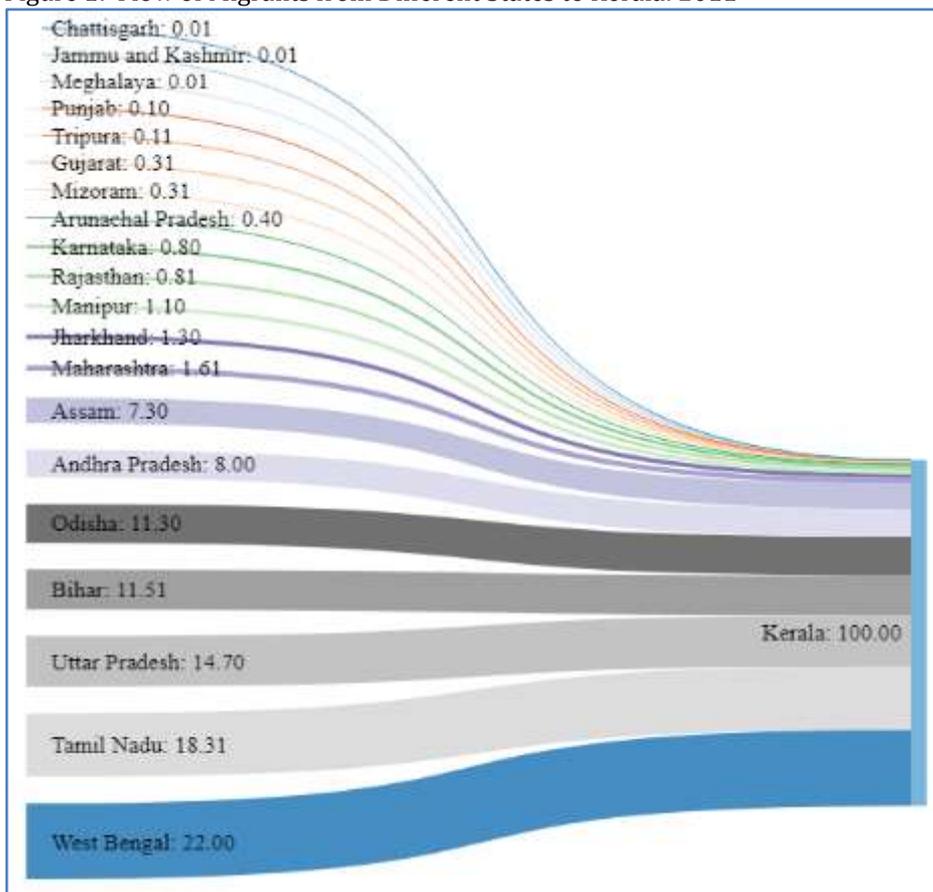
INTRODUCTION

Construction sector is an important source of employment in India also leads to sizeable amount of migration. The largely labour intensive production process in construction industry depends on cheap and flexible migrant labour in order to reduce the cost of production (Krogh, 2014) .Construction labour consists of diverse labour arranged in a hierarchical order. At the top of the hierarchy is the builder or main-contractor followed by subcontractors, supervisors of main contractor, maistry, masons and leaves unskilled labour at the lowest edge. The system of contracting in construction sector is a response to the flexible production demands derived from the “need to respond to short-term project objectives, fluctuating demand, changes and uncertainties in the worksite” (Bresen, 1985). Migrants are recruited mostly by labour only contractors (agent or dalal), middle man or through maistry. The current study is based on primary survey conducted in Northern Kerala in 2017. Construction in general and private construction in particular is noticed significantly in this region. Major chunk of the construction labour is constituted by migrants hailed from distant corners of the country. Broadly, this study is an attempt analyse the firm’s strategies to access cheap labour pool. Firstly study the process of migration with particular focus on migrant’s place of origin, channels and patterns of migration. Remaining session deals with the working condition of migrant labour in informal construction sector.

Migrant Construction Labour: Place of Origin

The flow of migration from various parts of India to Northern Kerala reveals that out of total migrants surveyed (figure 1), 45% are from West Bengal followed by Odisha (24%), Bihar (9.3%), Tamil Nadu(9.3%) , Madhya Pradesh (6.25%), Uttar Pradesh, Jharkhand etc. Majority of the migrants are hailed from eastern part of the country.

Figure 1: Flow of Migrants from Different States to Kerala: 2011

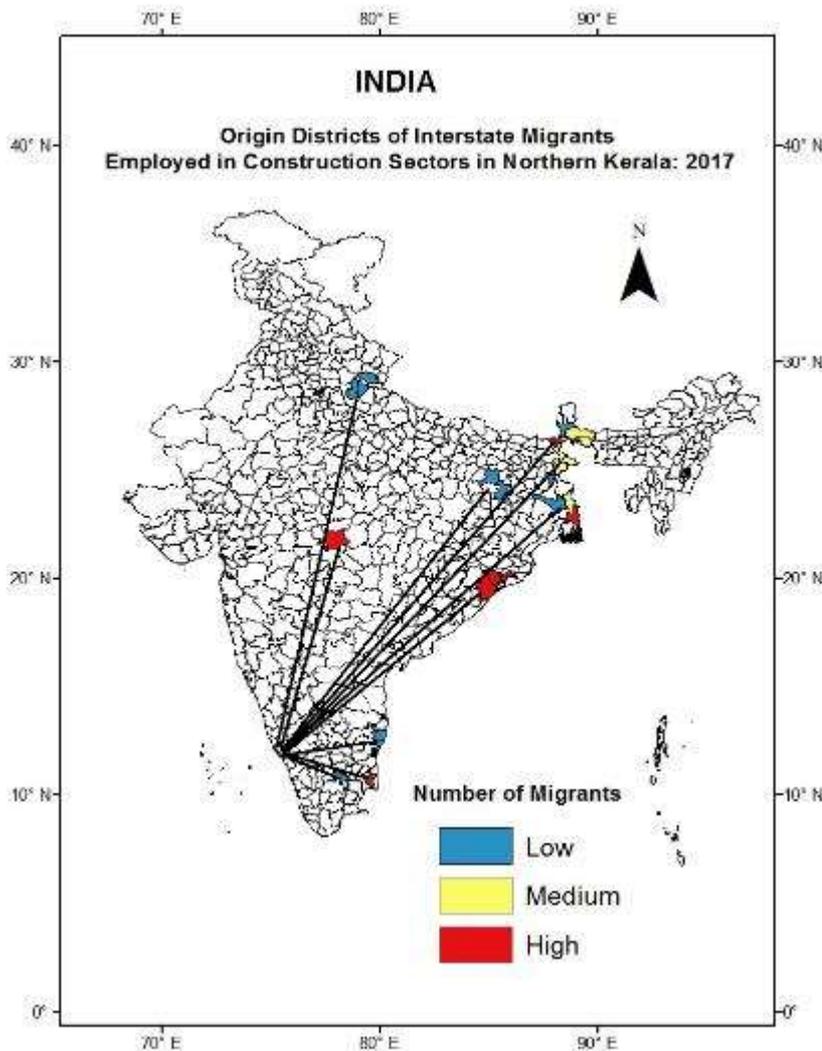


Source: ISMSK (2011)

West Bengal and Odisha together constitutes about 69% of the migrant population. These are the states from where the first flock of migrants came to Kerala. Other states from where migrants are coming very recently to Kerala are Uttar Pradesh, Bihar, Jharkhand and Uttarakhand etc.

The choropleth map of districts of migrant origin (figure 2) shows the district wise location of interstate migrants in Kerala. The categories of low, medium and high show the intensity of flow in terms of number of migrants.

Figure 2: Origin Districts of Interstate Migrants Employed in Construction Sectors in Northern Kerala: 2017



Source: Primary Survey (2017)

Migrants are coming from different spatially disjunctive centers. Generally major origin districts surrounded by medium and minor origin districts. A definite spatial contiguity is seen in the place of origin facilitated by chain migration. The 'location specific capital' at the destination encourages the probability of chain migration (Haug, 2008). "Being embedded in social networks thus has a significant influence on migration decisions" (Haug, 2008). The most developed migrant originating centre is West Bengal, especially the Bangladesh bordering and northern districts followed by districts located north of Chilka lake in Odisha; Rampur, Nainital and Moradabad districts in Uttarakhand and Uttar Pradesh boarder; Gaya and Hazaribagh districts of Bihar and Jharkhand. Betul is the only district in Madhya Pradesh from where migrants are coming. Migrant sending states in Tamil Nadu are showing a discrete pattern. Except Madhya Pradesh and Tamil Nadu, all migrant origin places show a spatial contiguity. The two major centers of migrant origin ie. Odisha and West Bengal are enlarged to see the locational characteristics in detail (figure 4 and 5).

Odisha shows a shear spatial contiguity of out migration (figure 3). Unlike others, all the migrants from Odisha were exclusively belong to traditional fishing community have been engaged in fishing for generations. All of them are settled in the banks of Mahanadi river or Rushikulya river or on the banks of Chilka lake. Negligible or very narrow margin of profitability of fishing also the ever decreasing fish resources compelled them to shift to other reliable economic activities. Odisha migrants are largely comprises of young male cohorts.

Figures 3 and 4 the Spatial Contiguity of Migrants' Place of Origin Northern Kerala, 2017

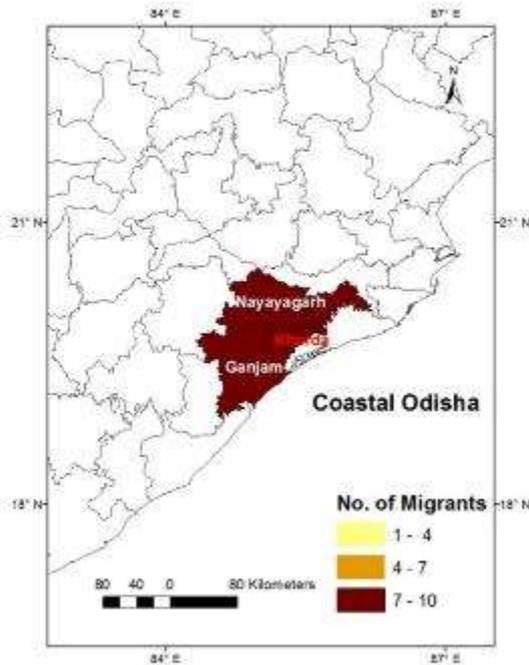


Figure 3

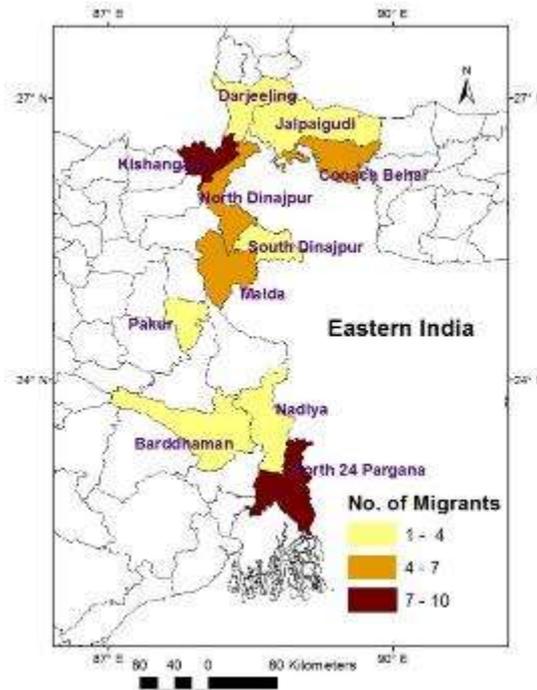


Figure 4

West Bengal is also showing a spatial contiguity of out migration in which major sending districts are surrounded by medium and minor sending districts (figure 4). There are two cores in this out migration region i.e. Kishanganj (Bihar) in the north and North 24 Parganas in southern West Bengal. Kishanganj district is located in the West Bengal-Bihar border surrounded by the northern districts such as Uttar Dinajpur, Darjeeling, Jaipalguri, Cooch Behar, South Dinajpur, Malda and Pakur. The southern core is surrounded by Burdhaman and Nadia.

The migration from Madhya Pradesh is seasonal in nature. The activities of construction and repair of roads usually carried out from January to May, which is basically agricultural off season in the place of origin. The highly remunerative road construction work is an option extended for the migrants to diversify their usual economic activity. All these seasonal migrants have a better socio economic background than other temporary migrants.

Scarcity of water for agriculture forced migration from Tamil Nadu to supplement their household income. They are also engaged in farming along with the construction work in Kerala with the help of other family members, as the distance from village is not so far. Though better economic opportunities are the driving force behind most migration, securing a decent job is one of the major initial confrontations of migrants.

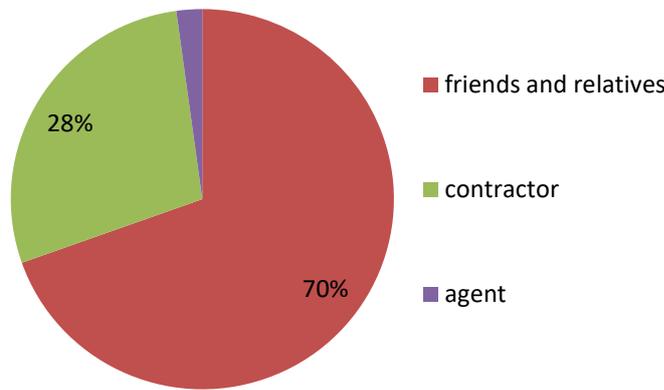
Migration channels:

The rural labour migration to construction sectors of Kerala is constituted by diverse and distinctive informal channels. The migration channel refers to the means through which migrants have been informed of the job and then recruited. The channels of migration refer to friends and relatives, contractors, agents and other sources. Figure 5 explains the percentage share of migrants recruited through different channels.

Informal networks (friends and relatives: 70%) play an important role in the recruitment of migrants followed by contractors (28%), agents (2%). Most of the migrants who were recruited by the informal channels are also paying a fixed amount regularly to their friends who brought them. Migrants prefer their friends than strange agent/contractor due to their anxiety of working in a distant place with no familiar faces. Such intermediaries in collaboration with contractors ensure a constant supply of labour to the construction sites when demanded.

The friends and relatives constitute a sizeable share of maistry informal sector. A fixed amount is given to maistry by the migrants as service charges for the necessary social capital provided at the destination.

Figure 5: Source Channels of Migration in Northern Kerala, 2017



Source: Primary Survey (2017)

Migration Pattern

Migration pattern refers to how labourers are migrating, whether in group or single. Mostly migrants prefer group migration (68.8%) than single migration (31.3%) as these social ties could provide useful resources to reduce risk and high cost and it would also help them to establish their base in the destination.

WORK CONDITION OF MIGRANTS IN THE INFORMAL CONSTRUCTION SECTOR

Task Assignment

Table 1: Task Assignment among Migrant Labour in Informal Construction Sector, Northern Kerala: 2017

Status	Persons by Type of Task Assigned (Figures in Brackets are in %)			Supervisor	Total
	Helper	Mason			
Migrant	25 (54)	21 (46)		00 (00)	46

Source: Primary Survey (2017)

Task assignment in a work site encapsulates the pattern of distribution of tasks within that worksite. Table 3 shows the task assignment within the construction work site. More than half of the migrants in construction sector are employed as helpers (54%) and the remaining (46%) are employed exclusively as masons. Mostly, migrants are employed as less remunerative helpers.

Daily Wage Rate

The following table (table 2 shows the daily wage rate across tasks classification. About 72 % of migrants employed as helpers are receiving daily wages less than Rs. 500. Reja et. al (2016) pointed out the migrant daily wages as Rs 400-500 per day, rightly emphasized that it is lower than the wages for local labour by about Rs100-150.

About 4.76% of the masons are receiving a very low daily wage rate even less than Rs. 500. There is no significant relation between job experience and type of task assigned. There is no significant relation between job experience and type of task assigned. However the highest daily wage rate received by migrant mason is about Rs.1200.

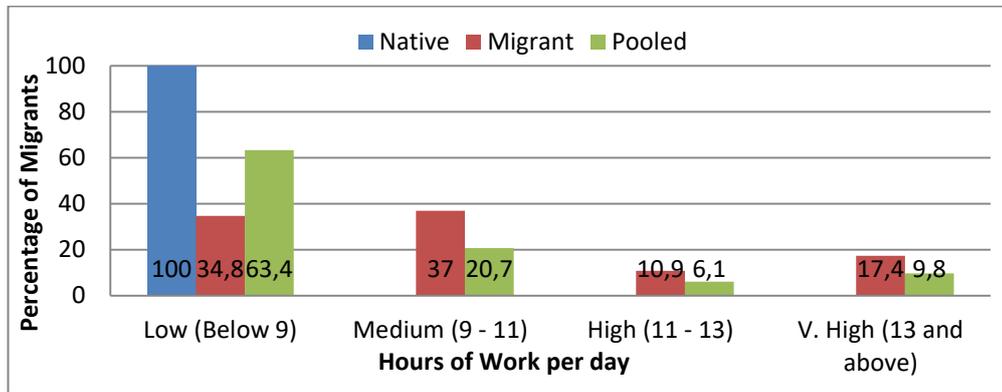
Table 2: Distribution of Migrants across Wage Levels in Informal Construction Sector, Northern Kerala: 2017

Daily Wage Rate (Rs.)	Migrants		
	Helper	Mason	Total
Below 500	72	4.8	41.3
500-600	24	38.1	30.4
600-700	4	38.1	19.6
Above 700	0	19.0	8.7
Total %	100	100	100

Source: Primary Survey (2017)

Hours of Work and Weekly Work Days

Figure 6: Hours of Work among Construction Labour in Informal Construction Sector, Northern Kerala: 2017



Source: Primary Survey (2017)

The number of hours of work is an important issue of concern when it comes to the long term health impacts, equally important is the weekly workdays. Figure 6 shows the percentage distribution of construction labour across hours of work. In case of natives 8 hours of work has strictly been taken care of. But migrant labour is seen as an instrument to complete the task shortly at low cost. Most of the migrants (65.2%) are working more than 9 hours (hours is taken because one hour overtime is quite reasonable during concrete and road tarring work due to the wrong estimate of concrete mixture or melted tar). In order to avoid the wastage, workers do overtime but anyways not more than one to maximum two hours. Alarmingly, 17.4% of the migrants take up more than 13 hours of work is a serious issue requires immediate attention.

Table 3 shows the percentage of migrants with reference to work days. About 13% of migrants are working 6 days with a break in Sundays. Around half of the migrants (58.7%) have break only in Sunday afternoons. But 28.3% of the migrants have no weekly break from routine work. They are free to take leaves in any day but. This way a minimum work can be carried out each day, also an easy way to earn money shortly for migrants.

Table 3: Weekly Work Days of Migrant Construction Workers in Informal Sector, Northern Kerala: 2017

Weekly work Days	Percentage
Whole week (break is up to the worker)	28.3%
Whole week except Sunday afternoon	58.7%
Six days work and Sunday holiday	13%
Total	100%

Source: Primary Survey (2017)

As far as regularity is concerned, there is seldom exist ant formal contracts between the contractor and labour (Wells, 2007). The stability of employment depends on the nature of relationship between labour and the contractor leads to feudal dependency of labour (Kumar; 1991). Migrants are more deprived in terms of regularity of employment.

Worksite Accidents and Treatment

Work site accidents are not rarely reported among the migrants depending upon the type of task they are assigned with. Though building and road construction works are risky and prone to accidents, the type of task determines the degree of vulnerability. Besides the incidents of workers being hit by vehicles during their work in a crowded road, the other important source of vulnerability is road tarring in construction. Nonetheless the incidents of workers fell from high storied buildings are also common in the worksites.

Health and Medical Benefits

Table 4: Health and Medical Benefits of Migrant Labour in Informal Construction Sector, Northern Kerala: 2017

	Migrants
Only Medical expenditure	82.6%
Only Health insurance	00
Medical expenditure and health insurance	6.5%
Paid sick leave and medical expenditure	8.7%
Paid sick leave, medical expenditure & health insurance	2.2%
Total (N)	100%

Source: Primary Survey (2017)

Construction work is prone to accidents and other health related risks. Table 4 shows the percentage of labourers receiving various medical benefits. Only 2.2% of the migrants have access to health insurance. In case of natives, Kerala Building Workers Union (KBWU) plays a crucial role in universalizing health insurance. Payment of medical expenses is only rendered to 82.5% of the migrants. Payment of medical expenses doesn't cover all medical expenses due to worksite accident or any occupational disease. The amount of money provided is often the mercy of the employer.

Status of Unskilled Migrants in Informal Construction Sector

The construction in unorganized sector is marked with casual nature of employment, cycles of excessive seasonality of job or lack of stability and durability of job, low wages, uncertain working hours, unhygienic and unsafe working

conditions, vulnerability to occupational diseases and serious injuries, absence of social security provisions, lack of attention of labour unions, no formal employer employee relations. Every worker surveyed for this study face some or other kind of injuries and occupational diseases due the high risk associated to their work.

Thampan Thomas, a lawyer and trade union leader said, "Death of migrant workers at workplace cannot be construed as accidents but culpable homicide since in majority of cases there is an element of criminal negligence on the part of the employer" while commenting on the refusal of compensation after the death of four migrants labourers of a plywood factory in Kochi (The Hindu; Kochi; 04/03/2014). In another incident in Thiruvananthapuram, two road construction worker from Bihar were dead in 2004 (The Hindu, Thiruvananthapuram, Dated 13th March, 2007). Incidents of occupational hazards are reporting quite often by the regional news papers.

The provision of basic needs of workers is the obligation of the contractor who employ them. Construction workers are compelled to work on poor working and living conditions by taking benefit of their 'poor bargaining' and socio-economic conditions. They are not only discriminated but also exploited by the contractors also because of ignorance of working conditions. Apart from poor bargaining power and ignorance of working conditions, another issue of concern is the 'improper channels of recruitment' to construction sites more relevant in case of migrants. These three factors can be seen as the major causes of migrants' deprivation.

The recruitment channels of migrant construction workers receive substantial attention as the root cause of migrant deprivation. Depending on the value of contract, the number of migrants who are directly recruited by the employer is decreasing. Multiple levels of subcontracting produces significant gap in between the employer and the labour. The proportion of directly recruited labour by a subcontractor in a large scale construction is significantly low. In one of the large scale construction site the ratio between migrant masons and unskilled labour remained 1:4. Every contractor maintains a small number of migrant masons, always functions as maistry but not necessarily, depending on their social capital and preference. Maistry employ fresh migrants for the construction work also functions as a bridge between the subcontractor and labourers with definite economic prospects. Such 'Fragmentation of economic relations' within the worksite allow the contractors to not take the burden of labour welfare (Shivakumar, 1991). Such practices of direct and subcontracted indirect labour are seen only in large scale construction. Medium scale contractors surveyed has arranged accommodation for the migrants and also ensured regular work.

In times of exploitation, labour department and other formal legal bodies assure justice to the labour. But the time consuming legal procedures is many a time not convenient for the construction workers due to their unawareness and frequently changing location of the job especially for the migrant adding to their lack of accessibility to formal channels. The role of trade unions are marginal in the construction sector. Those existing unions are not aware of organizing the migrants to end labour market stratification. It is interesting to note here the first state conference of the Kerala Migrant Workers Union²⁵⁸ was held in Kerala in April 2017. The unionization of migrant labour is a response to the exploitative contractors and agents also a protection from police as explained by one of the coordinator of the conference. Apart from bonus contractors are also very generous at times of financial support such as marriage or work site accidents or any diseases. However a few native workers are the only beneficiaries of it. Kettida Nirmmana Thozhilali Union is the major formal institution extends services at the time of emergencies to construction workers in Kerala which is not convenient for migrants due to the transient nature of their stay in Kerala.

On that account, nature of relationship between the contractor, maistry and labour plays a vital role during emergencies compel the labour to maintain loyalty with their maistry. Migrants attempt to build a good relation with the maistry for the existence of a secure employment, also enkindles a feeling of clemency in the superior maistry and contractors to give more than he would otherwise consider to be his minimum responsibility. This hierarchical patronage like relationships in order to secure job and income resembles a feudal relationship in an agrarian society. Dependency introduces insecurity via hierarchy undermines the working and living conditions of labour. Unlike the natives, migrants are entangled in the web of restrictive paternalistic practices of wage benefits which he receives but also for the minimum social capital sustaining him in the destination. The institution of maistry allowed sufficient chances for exploitation and leave the labourers on the borderline of subsistence. Kinship and caste norms proved functional in the profit maximization of labour recruitment in construction.

CONCLUSION

The typical production process along with the capitalist monopoly over production led to the system of subcontracting in construction industry. The 'fragmentation of economic relations within the firm' fostered a hierarchical arrangement in which contractors remained at the top and migrant labour at the bottom. The system of subcontracting and institution of maistry enhance the profitability of contractor and maistry. Because of the flexible labour requirements of varying skill levels at different levels of production direct employment of labour reduce the profitability from the contractors perspective. The institution of maistry allowed the contractor to access cheap and reliable unskilled labour force at lowest cost by utilizing the employee referral system. Young individual mostly male forms a chain migration to Kerala is overwhelmingly unskilled or semiskilled. The migrant labour accounts a sizeable share of total unskilled construction workforce in Kerala. Maistry arrange all necessary services needed for a labour in the destination includes both work and accommodation in return of some monetary gains. Migration cut the labour from his traditional sources of social security and limits it to maistry as his godfather in the new destination. The long hours of work, lower hourly wages and

²⁵⁸ Kerala Migrant Workers Union, affiliated to the All India Trade Union Congress (AITUC) was constituted by 20 members.

limited bargaining power make migrants the most economic option of a contractor whereas migrants also prefer overtime work to earn maximum amount in short while. The socio-spatial isolation, spatial dispersion of worksites and temporary to transient nature of construction work intensify migrant vulnerability.

REFERENCES

- Bresnen, M. J., Wray, K., Bryman, A., Beardsworth, A. D., Ford, J. R., & Keil, E. T. (1985). The flexibility of recruitment in the construction industry: formalisation or re-casualisation? 'D' series Migration Tables, Census of India- 2001, Registrar general of India, Govt. of India.
- Druker, J. (1998). Protecting regulated working conditions. *International Union Rights*, 5(4), 8-9.
- Interstate Migrant Survey Kerala- 2012 (ISMSK), Centre for Development studies under Ministry of Overseas Affairs, Government of India.
- Krogh, M. (2014), Degraded Work: The Struggle at the Bottom of the Labor Market, *Urban Affairs Review*, 50(6), 904-906.
- Kumar, N. Ajith (2011). Vulnerability of migrants and responsiveness of the state: The case of unskilled migrant workers in Kerala, India (Working Paper No. 26). Kerala: Centre for Socio-economic & Environmental Studies.
- Majumdar, A., & Borbora, S. (2013). Social security system and the informal sector in India: A review. *Economic and Political Weekly*, 48(42), 69-72.
- National Sample Survey: Migration Round (64th round-2007-08) and Employment and Unemployment round (68th round-2011-12).
- Nienhueser, W. (2005). Flexible Work= Atypical Work= Precarious Work?: Introduction to the Special Issue. *Management Review*, 299-303.
- Reja, M. S., & Das, B. (2016). 20 Factors associated with long-distance labour migration. India Migration Report 2016: Gulf Migration, 299.
- Shivakumar, M. S., Sheng, Y. K., & Weber, K. E. (1991). Recruitment and employment practices in construction industry: A case study of Bangalore. *Economic and Political Weekly*, M27-M40.
- Wells, J. (2006). Labour Mobilisation in the Construction Industry. In CIB W107 Construction in Developing Countries International Symposium entitled Construction in Developing Economies: New Issues and Challenges (pp. 18-20). Retrieved from <http://www.irbnet.de/daten/iconda/CIB1941.pdf>
- Wells, J. (2007). Informality in construction sector in developing countries. *Construction Management and Economics*, 25, 87-93.

RS08.4. Migration and Labor Markets

1106 EVOLUTION OF LABOUR MARKET AND MIGRATION IN NAYA VILLAGE(PATUA), PASCHIM MEDINIPUR, WEST BENGAL

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ABSTRACT

India witnessed a good number of art in different fields. Our ancestors were trend in doing number of arts by their own methods. An art which originated from the eastern Indians 'Patachitra' an integral part of intangible heritage. This art is more than 2500 years old and the style of painting is similar to the cave paintings of Mhenjodaro, Harappa and Ajanta. Patashilpa may be an art of tribal (Santal of West Bengal). Although its essence had not been spread in other parts of India but still this folk and traditional art is alive. The basic concept of the 'Patachitra' was to communicate the message visually. These drawing include the story and facts related to the religion and culture and when these are shown, are supported by lucid dialogue. Especially in last 50 years scenario of the society has changed very fast and India has also changed to adapt the global technological transformations. Telephone, Television, Cameras, Mobile and web has become strong media for fast convincing communication for all. Patuas display the painted scrolls in the houses and explains the stories related to the paintings. They are invited also in some occasions by rich and wealthy people to entertain their guests and invites. They make colours to make these paintings by their own sources and technology, e.g. yellow is made from turmeric or soil; green is from leaves of hyacinth bean plant or the leaves of wood apple. After completion of the drawing songs are created. Earlier only song was sang with the display but later on very simple musical instruments were introduced, e.g. dugdugi, flute, harmonium etc. The basic concept of the 'Patachitra' include various socio-cultural and religions incidents of social significance across the nature. Economic development of Patuas is not viable because still more to be done. Most of them do not have house and they were earlier earning Rs. 600.00(six hundred) per month only and now they earn Rs. 7000.00(Seven thousand) per month. Their children's are not getting higher education but after school education they also involve themselves in this parental business. They move other places of India there do the decoration by their art as per requirements. Modern facilities still lack such as Gas, AC, Refrigerator, Gyzer etc. No pakka road is available in Patua para. Health insurance has been lodged for the artists and their families. The art of Bengal 'Patachitra' is a typical representation of oral tradition which had been kept alive by our old generations which narrates the minute weaving of various cultures that were present in the region. Demand of the 'Patachitra' has increased in the world market. It is a manifest that the art has lost its original ethos but it shows a passive trend to the market. The rising demand in the market has attracted the newer generation to return back to the business. Now several NGO's have come forward to support this business and popularization, e.g. Daricha, banglanatak dot com etc. A good number of ancient art that existed in the world are dying due to overlap of modern technology. This art 'Patachitra' must be saved and also to be popularized so that the business must grow globally. In 2004 52 families were present now this has increased to 85 family in which 20 person living as son-in-law (Migrant person) having mixed religion. When there will be more inflow of money more family members will be attracted towards this traditional art which is the proud of India. They made picture, various decorative items such as hand-held fans, pen stands, dining table, napkin holders, dress materials etc. There is a huge scope in this business which may need slight modification as per the demand of the market. The Eastern Zonal Cultural Centre along with other bodies supported capacity building and promotional activities. All modern marketing technology including web is required to give suitable flourishing world market to these products which will not only protect the heritage patua and patachitra but also these artist will get proper recognition along with economic upliftment.

Key words: Patua, Patachitra, Naya Village.

INTRODUCTION

India has a long history of tradition of art. Although different parts of India has various trends that flourish in historical periods but south India has magnificent examples to represent this tradition (Sivaramamurti, 1994). In India it is commonly seen that painter or sculpture usually dedicated himself to his art in such a way that what he creates in the form of a painting, is almost an offering to the Divine Spirit and subordinated himself and this is the main reason most of the artists are not known or had been obscured with the time. The painter had always a delight in fashioning the pictures with his own hand and tried to complete the same as good as possible. Various steps exist in the preparation of a painting which include (rekhapradana or chitrasutradana), covering the board, and filling of the colours and achievement of modeling and so on. In the final process of making the picture, line is the Chitranmilana, and infusion of life in the picture is done. Art has a softening influence on the mind and senses of men. It is felt in China that art represents what eye's sees in the Indian art. It is not only the total view but it also gives the feelings of touch because always there is a perfectness which gives the feelings in the figure. Paintings in India make an attempt at modeling. Although several creations had been lost due to one or the other reasons but the earliest reference to a painter in an inscription in India is in the 2nd century B.C., in the Ramgarh (Jogimara) cave, in early characters, mentioning a rupadakha and his sweet heart, an adept in dance. Permeated life had given rise seedling of art, dance and music in the every young man and women of India. In later days these items becomes essential factors in literary and aesthetic education. Art was a vinodasthana, and painting, being an easier medium than modeling and sculpture, was probably more readily practiced. Indian culture and art is the reflection of the Indian way of life.

West Bengal is a confluence of a rich past, diverse Geography, architectural grandeur and culture. The cultural repertoire of W.B. is large because good numbers of festivals are celebrated in their own way. It is not limited to Durga Puja or Chhau dance of Purulia only. It is a matter of pride in hosting the world's renowned Kolkata Book Fair as well as the spring festival of Santiniketan; craft display of the Bankura, terracotta of the wooden mask of Dakshin Dianjpur.

Mystic sounds have been grooved for Boulds and Fakirs as well as the subtle points of Rabindra Nath Tagore's songs which not only explain the nature's beauty but also it touches the heart. West Bengal exhibits a unique amalgamation of number of diverse cultures and natural beauty of myriad play of colours. It is unique to note that about 1.35 billion travelers worldwide and in which 35% are interested in visiting the places of cultural significance. One should not miss the opportunity to showcase the cultural heritage of west Bengal. Patachitra and Pater Gaan (songs for Patachitra) are unique cultural traditions of Bengal. There are around 400 Patua living in Naya village in Pingla, W.B.

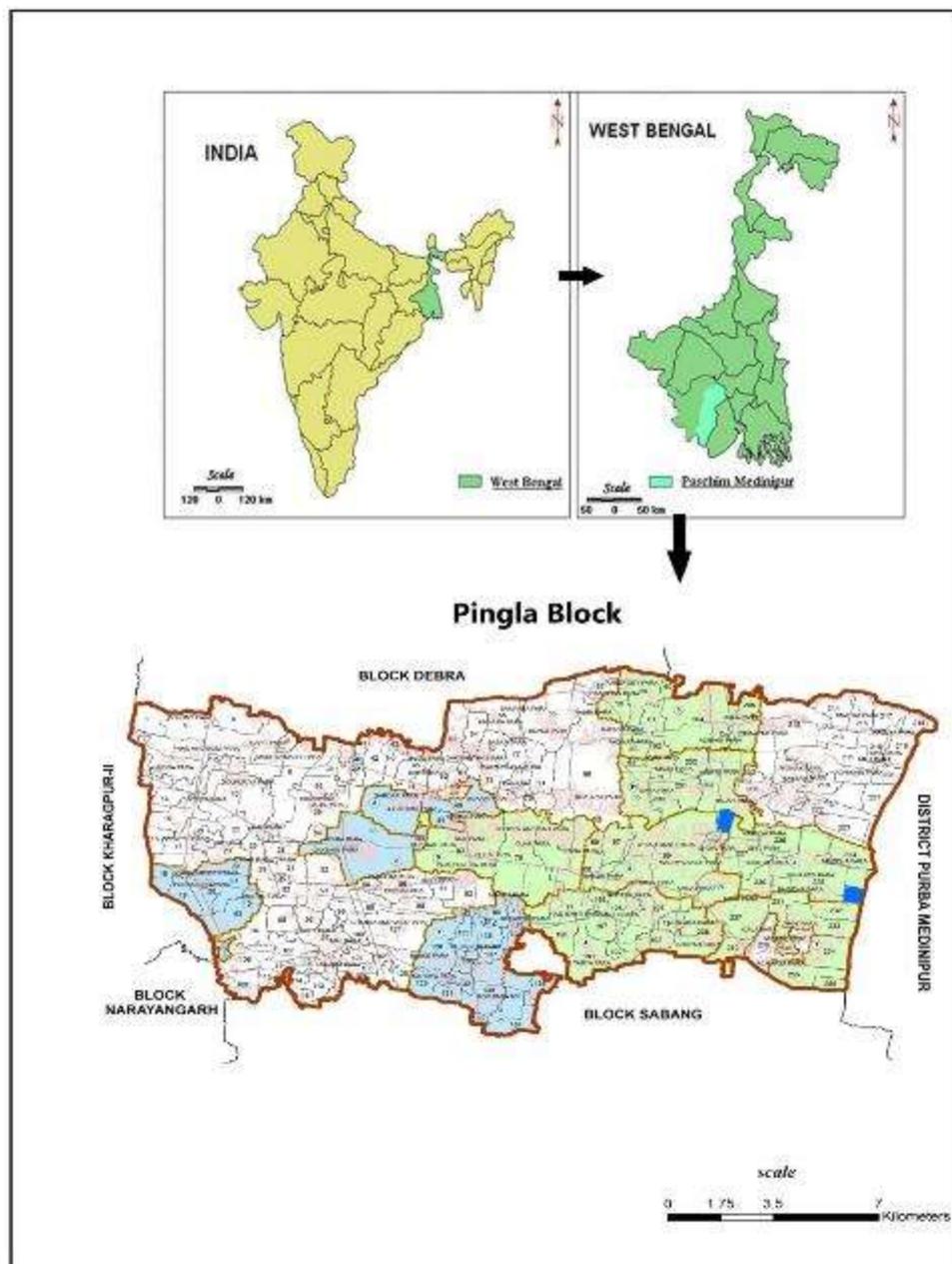


Fig. 1 LOCATION MAP

LOCATION AND APPROACH TO THE AREA

West Bengal is located in the eastern side of India which is extended in N-S direction. The widest part is Bay of Bengal side. Paschim Medinipur is situated on the south-west part. In Paschim Medinipur Pingla block is bounded in North by Debra, in west by Kharagpur -1 and in the west by Sabang block. Pingla Block is more extended in E-W direction. Chondi River flows N-S direction and almost forming the border of this block. Khirai canal (Khal) is also present in the area. Pingla (Paschim Medinipur district) can be reached from Kolkata by car about 3 hours drive only. The nearest railway station is Balichak (after panaskura) can be reached by local train. From Balichak about 30 minutes drive to reach the Naya Village, Pingla. The Pingla area is also well connected by road with neighboring places. For stay furnished rooms

with basic amenities are available in community resource centre. There are staying facilities also available at guest house in Pingla, hotels in Balichak or at artist's houses at Pingla. This is a small newly growing village with small cemented houses with a flavour of hut. Complete village look like a museum because one can see all around paintings. Although they are not financially very sound but their hospitality and behavior is very good.

PREVIOUS WORKS

Limited published literature with sufficient information related to heritage and culture of Bengal is available. There is complete paucity of published literature about the Naya village as well as about the migration of Patuas. "banglanatak dot com" stated in 2000 with a aim to develop the culture of Bengal and it's office at 58/114, Prince Anwar Shah Road, Kolkata-45. This organization accreted in 2010 with the advice of UNESCO ICH committee. UNESCO signed a partnership to promote "Art For Life" AFL across India in April 2013 and in July 2013 banglanatak dot com got special consultative status to UNESCOSOC. This organization started working for the development of 10 Rural Craft Hubs in West Bengal, supported by UNESCO and Department of Micro, Small & Medium Enterprises & Textiles (MSME&T), Government of West Bengal.

In Puranas, Epics, Ancient literatures and historical descriptions of "Patachitra" is present. The style of painting is similar to the cave paintings of Mahenjodaro, Harappa and Ajanta. The works of "Patuas" and Chitrakars has been dated back to more than 2,500 years. Some researchers believe that "Patashilpa" has come from the art of the tribal community "Santhals" (Dutta Gupta, 2011).

METHODS AND MATERIALS USED FOR THE PREPARATION OF "PATACHITRA"

It is generally felt that the mental and physical state (feelings) of painters are always reflected in their paintings. They use all natural colours. For the preparation of colours they use various vegetables. Patuas do not use synthetic colours. Generally they do not use synthetic colours. Generally they do not purchase the colours from the market but few required ingredients are purchased. Traditionally they prepare the colours eco-friendly from the leaves, fruits, flowers, plants, trees and other natural elements. For example muroom and non-boiled rice is used for the preparation of white colour. Earlier with the help of betel leaf, lime and catechu red colour were prepared but later on as per the research carried out at IIT Kharagpur, seeds of the fruit "Latkan" is used for red colour. To give natural glow to the colours bale gum is added. Saffron is extracted from Latkan leaves. Blue is from Aparajita flowers, brown from Segun tree, yellow from turmeric, black form charcoal, green form seem or babul tree, white from Ghusum mati, etc. Bright colours are used for making the "Pata" for giving the aesthetic sense meaningfully.

The paintings are made on Pata or canvas, so these are called "Patachitra". The phalaka or board is covered with the cloth/dress materials on which it is to be made. Bhatti or wall and murals were the most popular surface for painting. After completion of the colouring it takes 1 to 2 hours only for drying and then the painting is rolled and preserved in silken covers.

Patuas were mainly men even 3 to 4 decades back. They prepare these patachitra and move place to place, door to door to collect the food, clothes and other materials for their survival. Early days the women were assisting the men but last decade it is noticed that the women had come forward and prepare good number of patachitras, e.g. Patua artist Moyna Chitrakar, Rani Chitrakar, Karuna Chitrakar, Madhu Chitrakar and so on. In early days the theme of pata were centralized mainly around the religious (Ramayana, Mahabharat, Historical Stories, etc.) stories and these were circulated orally and also some comments written on the pata. They explain these "pata" either by dialogue or songs, e.g. Conflict between "Manasa and "Chand Saudagar" marriage of fish (for entertainment). With the changing time and development so many recent and significant events which occurred have influenced the pata painting. These patuas were actually educating the people indirectly. The work on the Patuas" done by Frank J. Korom is remarkable. The Patuas (West Bengal) prepare printed narrative scrolls (Patachitra) on cloth and it is shown with songs related to that by unrolling it. Now numbers of current events are also included in the theme of "Patachitra".

EVOLUTION OF THE PATACHITRA FAMILY IN NAYA VILALAGE PINGLA

As per the literature available the first Late Abdul Chitrakar and his Mrs. Late Subhodi Chitrakar came in this profession. They had 3 sons and 2 daughters, names are Subham, Mantu, Jhuntu, Arjun and Jyotsna. Family started expanding and they got married, and their names are Arati (W), Jilgun (W), Sumitra (W), Khudi (Son in law) & Akbar (son in law). In later periods it is seen that they were marrying in their own known persons generally living in this village. So "Chitrakar" surname in their significant for their recognition and also used for quick identification. Family is growing gradually and smoothly.

They live in a very simple way. Except few people most of them are financially weak. Their children are also learning all aspects of this art of painting. They run classes for this. Parents are not much interested towards the learning so they do not encourage their kids to go to school, although the school is not very far from the place where they live. Even up to few years back Rabin Chitrakar was the only graduate in this village. Government has made a museum and guest house so that visitors can see their works and also if they need can stay. These people are very homely and have an affectionate behaviour. Although they do not know English but they speak Hindi & Bengali fluently. In 2011 there were 53 families but in the present time more than 90 families are living here.

LABOUR MARKET AND MIGRATION

Almost all the members of the family do the work or help in the work except small kids. They take classes also for the people to trend them in this profession. First names of the ladies in general indicates one caste where the first names of the male indicates the other casts. Records shows that the people of one caste got marry to the girl of the area and settled here and involved themselves in this art. In this way gradually with the increase of the population the business has also got expanded. Every year they celebrate their village festival “Pat Maya” generally in the month of November. This Naya Village is surrounded by agricultural lands mainly producing rice, three times in a year. In this place people do manually as well as use modern machinery in the agriculture. The people of this area “Chitrakar” do not do the agricultural works. May be they do not have the agricultural lands. They grow the plants mainly for the preparation of natural colours for their paintings. To minimize the financial constraints state Government is giving stipend to about 300 persons in this village Rs. 1,000 p.m. All the persons having age above 18 years are eligible to get this stipend.

LIFE STYLE AND SOCIAL PROBLEMS

In the West Bengal a good number of places exists, has preserved the ancient Indian Arts. Some places can be named e.g. Bamnia, Chelyama, Nimdih & Charida (Purulia district), Gorbhanga (Nadia district), Kushmandi (Dakshin Darjpur district), Natungram & Tepantar (Bardhaman district), Panchmura (Bankura district), Ghughumari (Coach Behar district), Nanoo (Birbhum district) and Naya, Pingla block(Paschim Medinipur district).The people of Naya area live in a very simple way but their coordination in between themselves is remarkable. Although some of the “Patachitra” has been sold as costly as Rs.80,000 and this was made by Mr. Anwar Chitrakar. He got President’s award in 2006.His painting not only purchased by Delhi Metro Rail Corporation (Rs. 80,000) also got space in the Harley Gallery, United Kingdom. Smaller paintings (8” x 12” size) costs about Rs. 800 to 1,000 in general. Prices increases with the size of the paintings (Datta Gupta, 2011). Because two casts had mixed in an inseparable way so probably due to non-responds of the society they are marrying in between themselves. Male who has come from outside in this area after marrying they started living here only.

CONCLUSION

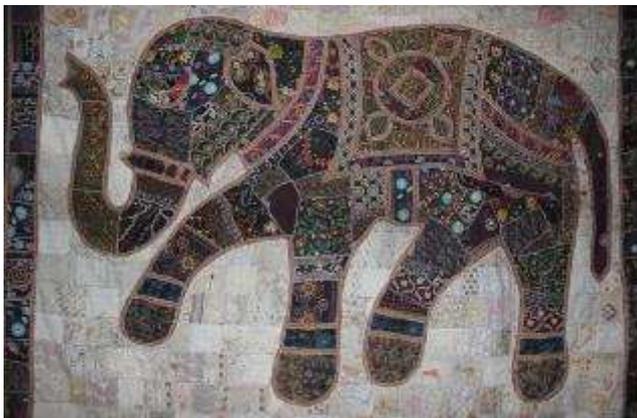
India exhibits a confluence of a good number of traditions & cultures and its impact can be seen in their festivals and also in paintings. The ancient culture and tradition are struggling for their survivals. Government and semi-government organizations have come forward to save this dyeing ancient art. The “Patachitra” is an ancient art of Bengal and this is more than 2,500 years old. The “Patachitra” might not be originated at the place where now it is blooming but not only their numbers has increased but they got the national and international recognition. Because of one or other reason original caste has mingled and now all write their surname as “Chitrakar”. They organize annual mela in November training to their children and other interested persons. These also have migrated from outside have settled here and involved themselves in this art whole heartedly. Advertisement and popularity of the art in the International market will definitely generate more export and this will finally enhance the export amount. This increase will not only help to take a forward step for the development of the Naya village along with the art but this will also provide food and shelter to the other people.



Mamani Chitrakar showing the photos of her visit to foreign countries.



Discussing with Bahadur Chitrakar, Naya village, Pingla, W.B.



Beautiful art (Elepaant) on cloth



Dr. D. K. Maity discussing with the artis



Varieties of materials are now prepared.



REFERENCES

- Datta Gupta, Sourabh (2011): Village of Painters: A visit to Naya, Pingla, Chित्रalekha International Magazine on Art and Design, vol.1, No.3, pp. 6-10.
- Frank J. Korom (2006): Village of Painters: narrative scrolls from West Bengal. Museum of New Mexico Press.
- Maitra Bajpai, Lopamudra: Intangible heritage transformations - Patachitra of Begal exploring modern new media, Int. Jr. of history and Cultural studies, vol.1, issue 1, pp.1-13.
- Sivaramamurti, C. (1974): South Indian Paintings Publications Division, Ministry of Information and Broadcasting, 1st Reprint Feb. 1994, 168p.
- <http://banglanatak.com/>

1217 MIGRATION SIGNIFICANCE IN THE DIFFERENTIAL URBANISATION MODEL

ABSTRACT

The differential urbanization model was introduced in the early 1990s and has since become widely used in different parts of the world to trace evolutionary changes in national urban systems over time. It uses changing main and substream migration trends between large, intermediate-sized and small cities as an instrument to track urban systems development over time. While migration studies have always tended to focus on mainstream migration as the only significant indicator of demographic and urban change, this model has demonstrated that substream migration could be equally significant in predicting change in urban systems. Distinctions between what could be regarded as main and substream migration at different levels of spatial aggregation has highlighted the fundamental problem in all migration analyses: The question of significance. Significance is context dependent and migration can be viewed in a number of different contexts, each leading to very different conclusions. Foreexample, migration can be viewed in gross numbers, proportional to targeted populations, proportional to target population growth rates, proportional to prior migration rates, proportional to total migration volumes, etc. Each alternative produces its own specific interpretation of the results, and different interpretations of the same results can vary diametrically based on the chosen context. This issue is of special importance when examining migration substreams, which is of growing importance internationally as the science proceeds from general to particular questions. Significance is also relative to size. Unfortunately, not every instance of migration can be afforded equal consideration, and large changes to large populations are generally more significant than small changes to minor populations. But this forces the difficult question of at what point does size start to matter, and when does it cease to. This paper examines this issue in light of general migration theory, and proposes that while different approaches will each have their own occasions of relevance, in general all theories agree that the most crucial issue is the question of how migration affects sedentary populations ability to compensate for the greater or smaller than anticipated growth rates resulting from migration. Migration significance, both for the migrants themselves, and the sending and receiving populations, is in general then relative to the amount of population stress placed on a population by population influx or departure. This presentation applies this hypothesis to the analysis of substream counterurbanisation in South Africa between 2001 and 2011.

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1265 POPULATION GROWTH IN INDIA: DOES PROXIMITY TO URBAN HIERARCHY MATTERS***Durba Chakrabarty***

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Corresponding author; email: durba.chakrabarty@okstate.edu**ABSTRACT**

This paper examines how proximity to higher-tiered centers in the urban hierarchy affects the population growth in Indian towns from 2001 to 2011 and the role of amenities in spatial distribution of population across India. There are similar trends of urban centric growth like Canada, China. The massive population growth in India is not driven by amenities. I find a negative and statistically significant effect of the nearest city distance variable on the growth rates of towns. In terms of distance penalty for towns, it is approximately 6.1% less population growth given the mean distance to its nearest city averaged at 53.57 km. Thus, my findings lend support to the hypothesis of urban hierarchical effects as evident in other countries like United States, Canada and China.

JEL classification: R11, R12, R23**Keywords:** Population Growth, Urban Hierarchy, India**1 INTRODUCTION**

There is a need to study the increasing role of distance in the urban hierarchy for India. The Urban India is rapidly growing and expanding in terms of boundaries with the level of urbanization increasing from 27.81% in the 2001 Census to 31.16% in the 2011 Census. Studies find that the trajectory of the urban hierarchy in India is stable, as most of the growth in urban India has mainly occurred in large metropolitan areas compared to small and medium size cities (Schaffar & Dimou, 2012). There exists a large regional literature in the US on proximity to urban agglomerations (Partridge et al., 2008a; Partridge et al., 2008b; Partridge et al., 2009; Partridge et al., 2010). In addition, there are studies done in Canada (Partridge et al., 2007) and China (Chen & Partridge; 2013). Until now, no such study has been carried out in India. Thus, this paper aims to study the proximity of higher-tiered urban centers in explaining the population growth across towns from 2001 to 2011 and the role of amenities in spatial distribution of population across India.

The spatial studies in India have focused on agglomerations economies for formal and informal sectors (Lall et al., 2004; Ghani et al., 2012; Ghani et al., 2014; Mukim, 2015). Even various studies have been carried out in determining the growth rates based on initial population sizes and also on the relationship between ranks and size of cities (Soo, 2014; Luckstead & Devadoss, 2014 a; Luckstead & Devadoss, 2014 b; Chauvin et al., 2017). The growth in India among different states have been tested based on economic indicators like per-capita income and well-being (Chikte, 2011; Mallick, 2014; Arora & Ratnasiri; 2015). Recent study in India looks at the distance effect on urban transformation in the national capital region of India (Jain, 2017).

Another important aspect is the role of geography and amenities (weather, man-made amenities) in shaping up the spatial distribution of population. The importance of geography holds true for the US, as there is amenity-driven migration. Though most of the growth in the US and China took place along the coastal areas, no such conclusion can be made for China (Chen & Partridge, 2013). There exists a mixed literature on the contribution of weather to the growth of European cities. While Cheshire & Magrini (2006) find amenities matter only on a national scale for the European countries, Rodriguez-Pose & Ketterer (2012) observe amenities play an important role in explaining population patterns across Europe. In the case of Canada, the growth is urban centric and weather hardly plays any role as there is little variation in climate across Canada (Partridge et al., 2007).

The population growth in India has been urban centric like Canada and China. The development trajectory for most of the countries in the world including the US and even China has been a shift from agriculture to industries and then to the services sector. However, India's growth path has been unique because of its transition from the agriculture to the service sector. In addition, the growth driven by the services and to a lesser extent by the manufacturing has taken place in high-density clusters unlike the US and China where the medium density locations are the major drivers of growth (Desmet et al., 2015).

I employ a cross-sectional population growth equation to estimate the percentage change in population growth rate of Indian towns from 2001 to 2011. A key feature of this reduced form empirical model are all the initial period values of the explanatory variables are considered and additionally, the distance to different man-made amenities (railway station, hospital, college and school) have been reported rather than the actual number of amenities, which lessens the problems of endogeneity. There is also advantage in terms of the Indian census data being used. The disaggregated level of data on towns helps to capture a large degree of heterogeneity. Further, the distance variables are measured in terms of road distance in kilometers rather than straight-line distance. This reduces to some extent the measurement error created by using straight-line distances.

One can easily conclude that the massive population growth in Indian towns is not driven by natural amenities. The weather has an insignificant role to play in explaining the growth patterns of towns, as these low-income developing countries do not have the means to pay for nice weather. They care about other necessities in life. Even for man-made

amenities, the distance to some of these infrastructure like railways, hospitals, colleges and schools have a negative but not statistically significant effect on population growth. Thus, no clear definite conclusion can be inferred that the growth is driven by amenities.

The geographical position of an area with respect to its urban hierarchy has an influence on population. The farther a town is away from the higher tiered urban centers, the lower is the growth rate of population. I find a negative and statistically significant effect of the nearest city²⁵⁹ distance variable on the growth rates of towns. Every kilometer farther away from the city is associated with approximately 0.113% less population growth in towns for 2001-2011. In terms of distance penalty for towns, it is approximately 6.1% less population growth given the mean distance to its nearest city averaged at 53.57 km (Table 1). There is a cost for remoteness in terms of lower population growth. Each of the higher ordered urban tier offers access to additional amenities and services, and thus there is an incremental distance penalty. There is the growth penalty of approximately 0.05% per incremental kilometer to reach a large city²⁶⁰, which are higher ordered city. As expected, the quadratic terms associated with the distance variables have a declining marginal effect. Thus, the penalty varies across different tiers in urban hierarchy.

Irrespective of the size of the urban center, the agglomeration effects will be greatest in the highest tiered center. The results are robust using different specifications which proves the initial hypothesis that one must incur costs for remoteness in terms of lower population growth. The agglomeration effects have much wider reach in terms of geography. The findings indicate that the proximity to cities and higher tiered cities are important in explaining the urban hierarchical effects for towns in India. Thus, the results lend support to the hypothesis of urban hierarchical effects as evident in other countries like the US, Canada and China (Partridge et al., 2007; Partridge et al., 2008a; Partridge et al., 2008b; Chen & Partridge, 2013).

The remainder of the paper is organized as follows. Section 2 discusses the geography and the population patterns of India followed by the conceptual framework and the related literature in section 3. Section 4 discusses the data and the definitions used. Section 5 specifies the empirical approach used and section 6 presents the main empirical findings. Finally, section 7 describes different robustness checks followed by conclusion in section 8.

2 GEOGRAPHY AND POPULATION PATTERNS OF INDIA

India lies in the northern hemisphere, has a long coastline, extending to about 7,500 km. The entire nation is divided into twenty-eight states and seven union territories²⁶¹ based on the recent Census of 2011. There are mainly six broad regions in India, the North, the South, the East, the West, the Central and the Northeast. At the next level, are the districts²⁶², which are the second level of administrative division of the country after states and union territories. The lowest administrative unit is town in urban areas.

There is a wide variation of topography in India, as it comprises mountains, plateaus, plains, deserts and coasts. However, there is no such tendency to concentrate along coasts such as the US and China despite having a long coastline. Most of the concentrations in India are along the major rivers of Ganges and Godavari, and hence more inward-oriented. These places were home to ancient civilizations, because of fertile soils and easy availability of water for agriculture. Initially, the migration took place from the lagging states of Bihar, Orissa, Rajasthan, and Uttar Pradesh to agriculturally prosperous northwest states of Gujarat, Maharashtra and Punjab. There have been shifts in migration from these backward states to cities in search of jobs following the Second Five-Year Plan (1956-1961), whose focus was on rapid industrial development of the country. Even after economic reforms in 1990, there have been incentives for rural people to migrate to urban areas for work. Most of the migration is inter-district rather than inter-state. The highest level of migration is observed within the same district. (World Bank, 2009).

The current growth in India is geographically scattered but concentrated along few urban areas. Desmet et al. (2015) finds the large mega cities of India that are driving the spatial development unlike the US and China where medium density locations are the major drivers. The spatial concentration of industries depends on the age of the industry. The services industries (considered as young) are located in medium-sized locations like California's Silicon Valley, Boston's Route 128, and the North Carolina Research Triangle and others in US. However, in India, it is the "young" services industry (driven by strong agglomeration forces) and to a lesser extent the "less mature" manufacturing industry that are located in high-density locations. There is no clear explanation for the obstacles faced by these medium-density locations in their growth but find evidence of low levels of highly educated persons and the inadequate local infrastructure, in terms of poor access to telecommunication services.

In addition, given the geographical size, most of the densely populated cities in the interior are not as far away from coasts as in the cases of China and the US and thus have an added advantage. Other reasons for less concentration along the coasts can be attributed to the growth in the services sector. For its operation, one needs to have good access to the internet and telephones, rather than being close to a coast for exporting manufactured goods as in China (Sachs et al., 2002; World Bank, 2009; Soo, 2014; World Bank, 2013b).

259 Towns with a population of 100,000 and more.

260 A large city is a town with a population of 500,000 and above.

261 The difference between the states and union territories is that states have their own elected governments but union territories are ruled directly by the Central Government.

262 These districts are equivalent to counties in the US and China.

The spatial aspect is an important feature especially for developing countries like India where economic geography is still shaping up. In explaining the growth in regions, both Gibrat's and Zipf's law have been tested for different sets of countries. While Gibrat's law states that growth rates of cities should be independent of initial population sizes, on the other hand, the sizes of cities are inversely proportional to ranks according to Zipf's law. Chauvin et al. (2017) observes that both these laws hold for the US and Brazil but the situation is different in case of India and China. However, Gibrat's law holds for the large cities in India. Zipf's Law does not hold for India, but holds for China and Brazil (Luckstead & Devadoss, 2014b). Initially, China had restrictive mobility of people from rural to urban areas imposed by hukou system. In recent decades, there has been relaxation of hukou requirements for China and thus the distribution of population in large cities are close to Zipf's Law. Although there exists no such restrictions in India but there are mobility restrictions in terms of variations in ethnic groups, languages, culture and traditions all across India (Luckstead & Devadoss, 2014a; Soo 2014).

3 LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

3.1 Role of Amenities

The geography determines largely the spatial distribution of population. The US is such an example as the people are highly mobile compared to other parts of the world. Despite having abundant interior land, it is mostly a coastal nation as most of the population is in counties within eighty kilometers of an ocean or Great Lake (Rappaport & Sachs, 2003). The historical conditions drove the initial concentration of human settlements in coastal places. In recent times, coastal proximity has present day contributions to both productivity and quality of life.

Nice weather is valued as a consumption amenity contributing to quality of life due to rising income levels. According to the Rosen-Roback compensating differential methodology, weather is valued as the sum of the wages that a person is willing to forgo and the increased housing prices that she/he is willing to pay to enjoy it. A significant part of the migration in the twentieth century took place due to nice weather (Rappaport, 2007). Further, in some metropolitan areas with increasing numbers of high-income households combined with inelastic supply of land, rapid housing price appreciation occurred (Gyourko et al., 2013). Here, factors like inherent local productivity, amenities, or fiscal policies alone did not lead to the high value of house prices in these superstar cities as described by the standard compensating differential models in urban economics. However, the weather did not contribute to growth of Sunbelt areas since 1950s. The Sunbelt areas are places with warm winters and hot summers and so before the introduction of air conditioning, these places were unpleasant to live. Even after the introduction of air conditioning, it has not grown because of household amenity attractiveness. Glaeser & Tobio (2008) have attributed the stronger population growth to the elastic growth in housing supply. In the US, the growth is amenity-driven leading to migration away from historically-created urban areas that is from Frostbelt to amenity-attractive areas, many in non-humid Sunbelt areas.

There exists a great deal of skepticism of amenity-related migration in Europe. Cheshire & Magrini (2006) find the importance of weather in explaining population growth but only within European Union countries. Besides economic factors, amenities play an important role in migration patterns across Europe according to Rodriguez-Pose & Ketterer (2012). The Canadian population growth was driven by the metropolitan areas from 1981-2001 supporting the hypothesis of cities being engines of growth. The role of amenities in explaining population growth in Canada is not important due to less climactic variation (Partridge et al., 2007). China too has urban centric growth patterns like Canada. In addition, the scale is much larger in China. Most of the growth in China is driven by megacities on coast (Chen & Partridge, 2013), but it is not clear whether the growth is amenity driven or not.

3.2 Urban Hierarchy and Distance

Urban places differ in size and in terms of characteristics. There are different tiers in the urban hierarchy that vary in terms of economic activity and range of services provided. For example, the higher tiered centers offer a higher end of goods and services, such as legal, accounting, and management services, operas, nice restaurants and higher order entertainment services compared to the lower tiered centers. It follows from Central Place theory (CPT) developed in 1933 by a German geographer, Walter Christaller, who studied the settlement patterns in southern Germany. He showed where and how the central places in the urban hierarchy would be functionally and spatially distributed.

According to the theory, the market town having a central location will provide goods and services to neighboring areas. Thus, a hierarchy forms based on provision of goods and services. The high-ordered central places are settlements, which provide a higher range of goods and services than other places. The number of such higher-order places are fewer and more widely distributed than lower-order places. Further, the settlements having the same hierarchical level will have the same types of business and all higher-order central places must contain all the business types already contained in lower-order places. However, Lösch modified CPT in 1954 to capture the real world. The settlements of the similar size may not have the same arrangement of business types, and the higher-order central places do not need to possess all the functions available in lower-order places (King, 1985).

The trajectory of the urban hierarchy in India is quite different from that of other countries, including China. Schaffar & Dimou (2012) finds that India urban hierarchies are more stable than Chinese urban hierarchies. Most of the growth in urban India have taken place in large metropolitan areas compared to small and medium size cities. In China, with the relaxation of hukou restrictions, there has been increase in the number of medium and small size cities. Also, there has been control over mega cities due to anti-megacities policies followed by China (Desmet et al., 2015).

With the innovations of technology, it is expected that the role of distance has diminished over time. Though there has been debate regarding the role of distance in regional economic growth and development, one cannot deny the importance of distance in accessing different tiers in urban hierarchy. Several regional studies look at the proximity to urban agglomeration as measured by distance to higher tiered areas. The proximity effects in terms of employment growth on the US counties holds for rural and nonmetropolitan samples in addition to the metropolitan sample between 1970 and 2000, particularly for the 1990s (Partridge et al., 2008a). Fallah et al. (2013) even finds the role of distance affecting specific sector employment like high-technology sector. As the distance to large cities in urban hierarchy increases, there is negative impact on high technology sector employment. Partridge et al. (2009) studies capitalized penalties for remoteness into factor prices. They observe significant distance penalties on median earnings and housing costs both for rural and urban counties across the US urban hierarchy. Further, Partridge et al. (2010) assess the relative importance of proximity to urban consumer amenities and production spillovers in explaining the changing factor price penalties for remoteness.

Chen & Partridge (2013) uses both the CPT and NEG framework to study spread and backwash effects of cities on GDP and employment growth in counties of China. The NEG models explains regional development in terms of market potential differences and hence is suitable to Chinese economy due to its large markets on the coast. However, the heterogeneous effects across the Chinese urban hierarchy supports the CPT framework. Thus to explain the differential urban hierarchical effects in India, it will be suitable to employ the CPT to study the population growth in Indian towns.

3.3 Penalty Distance to Urban Hierarchy

The urban hierarchy in India will be different from the developed countries of the world. Instead of offering higher end services and amenities, the urban places will differ in terms of basic amenities such as hospital, schools, college and infrastructure like transportation facilities. I am looking at three tiers of urban hierarchy in India. For the urban sample, at the lowest tier are the towns. The next higher level of hierarchy are the cities, one whose population is 100,000 and more. At the top level, are the large cities, those with population 500,000 and above. As stated earlier, there exists considerable differences across these tiers in terms of quality of amenities and services being provided. Both the households and firms from a lower tiered town have to travel to the nearest urban center, which is a city to access amenities, services, jobs etc. There is an incremental distance penalty for travelling to a large city as each high tier city offers additional or high quality amenities.

I measure the distance penalty in the same manner as Partridge et al. (2009). It is referred as a penalty as one is incurring a cost in terms of less population growth due to increasing distance. Here penalty is defined as the sum of added penalties on population growth for a given town i in the j th tier of the urban hierarchy.

$$Penalty_{ij} = \sum_t d^t \varphi^t$$

Suppose an area is at the lowest tier in urban hierarchy, a town, then people have to travel distance d_1 to access the nearest urban center (city) and d_2 for travelling furthest to a higher ordered city (large city with a population of 500,000 and more), and thus an incremental distance of $(d_2 - d_1)$. At the same time, being farther away from a city and a higher tiered city will incur a penalty captured by φ . For example, Murud is a town (population of 12,552²⁶³) in the state of Maharashtra. The nearest city is Panvel (population of 104,058), which is at a distance of 102 kilometers (d_1) from Murud. The topmost large city is Mumbai (population of 11,978,450) and the incremental distance from Panvel to Mumbai is 16 kilometers ($d_2 - d_1$). Thus, Mumbai is 118 kilometers away from the town of Murud. The location of tier in urban hierarchy will give different values of φ i.e., marginal penalties. Thus, the distance impacts are not the same and will have nonlinear distance effects in the urban hierarchy.

4 DATA

The data come from the District Census Hand Book (DCHB), which forms part of the Indian Census data. The Office of the Registrar General and Census Commissioner of India under the Ministry of Home Affairs, Government of India conducts the decennial Census. The first population Census started in 1872 when India was under the British rule. The first Census of independent India began in 1951. The latest one is the 2011 census. The Census of India is the largest statistical database in providing information on demographic and other socio-economic variables of India.

The DCHB contains both the Census data and the non-Census data on various civic amenities and infrastructural facilities. I am using part-A of DCHB as it has data at the town level of the district, which constitute the town directory. The town directory consists of different natural amenities and infrastructural facilities. The natural amenities include information on rainfall in millimeters, maximum and minimum temperature in centigrade. These physical aspects have been recorded by taking the average for the last ten years, i.e., from the years 1990 to 1999 for the 2001 census. The infrastructural facilities include education, medical, drinking water, communication and transport, post and telegraph, electricity, recreational, banking, and other miscellaneous facilities. The incremental distance to a large city is computed as the distance from the city (population of 100,000 and more) to the nearest large city (population of 500,000 and above). The following information has been collected from Maps of India²⁶⁴. Each of this city corresponds to the nearest city

²⁶³ All the population figures are from 2001 Census data of India.

²⁶⁴ <https://www.mapsofindia.com/aboutus.html>

associated with each of towns in the sample. I pick up the year 2001 and 2011 as the town directory for these years contain detailed information on distance variables, that is the distance to the nearest city and also the amenity distance variables.

One of the biggest advantages is the disaggregated data at town level. Most of the earlier literature considered states or districts as units of analysis as the data are of better quality and reliable at the state and district level. However, for detailed spatial analysis, it is better to have disaggregated level of data, which will capture a greater degree of spatial dimension. Further, the districts are wider geographic areas that include the rural population. Since our focus of analysis is on urban areas, it is better to have separate and demarcated data on towns. Further, it captures a larger degree of heterogeneity in terms of demographic and economic nature of variables.

A town is defined by the Census of India as areas where population is 5,000 and above; the density of population is 400 per square kilometer (i.e. 1000 per sq. mile); and at least 75 per cent of the male main working population engaged in non-agricultural pursuits. There exist different categories of towns based on population size. These are as follows: (i) Class I towns are those with population of 100,000 and above (ii) Class II towns have population between 50,000 to 99,999;

(iii) Class III towns are those with population of 20,000 to 49,999 (iv) Class IV towns have population between 10,000 to 19,999; and finally (v) Class V towns have population between 5,000 to 9,999. Class I towns are also known as cities. These cities and towns form the sample of urban areas. Another type of town are the district headquarters. These are home to administrative offices and serves as the seat of the state government. There are more than one headquarter town for each of the states.

I matched 2001 with 2011 Census data by town names resulting in 5,177 towns as some of the new towns are not part of 2001 Census data. Thus, the omitted observations is due to matching the data of 2001 with 2011²⁶⁵. One needs to keep in mind while considering the figures for urban population is the statistics suffers from downward bias. As stated by experts in India and internationally, the definition of urban areas misses the population growth occurring in urban areas just outside of the official city boundary, and hence is restrictive. Despite these problems, the Census definition of urban population is at best, just an approximation of reality (Cohen, 2004; McKinsey Report, 2010; World Bank, 2013b).

5 EMPIRICAL SPECIFICATION

This paper examines the proximity to a nearest high-ordered urban center and incremental distances to higher ordered cities affects the population growth models for urban areas. The proximity to a major center (such as city) for urban areas matters, as the cities are centers of jobs, education and household amenities. Additionally, the incremental distance to a higher ordered city means better access to potential markets, services and amenities.

The base specification is a cross-sectional growth equation given below which captures the total population growth for town i , located in state, s , for the time interval from 2001 to 2011. The dependent variable is the percentage change in population between periods 0, the initial period, and t , the end period.

$$\% \Delta \text{POP}_{is(t-0)} = \alpha + \beta \text{DEMOG}_{iso} + \lambda \text{AMENITY}_{iso} + \gamma \text{GEOG}_{is} + \theta \text{DIST}_{is} + \delta_s + \varepsilon_{is(t-0)} \quad (1)$$

DEMOG includes the initial period population density to account for the initial agglomeration including market potential and localization effects. **AMENITY** takes into account the natural amenities, like the rainfall, the maximum and the minimum temperature variables. One concern regarding the measurement of these variables is these have been recorded as averages for the last ten years. Hence, it might not be a good representation like the mean July and mean January temperatures which account for the summers and winters in the US. One of the reasons for recording in such a manner could be that India's variety of climate ranging from the tropical monsoon in south to the temperate in north and thus making overall generalization difficult.

DIST includes the man-made amenity distance variables. These are distance to the nearest rail station, distance to the nearest hospital, distance to a nearest college and distance to nearest school. These infrastructure facilities are important in determining concentrations of people. For example, the location of railways is important, as there are concentrations of people close to those networks (World Bank, 2013a). The initial development of railways was done by the British colonial India, connecting the interior to three main port cities of Kolkata, Mumbai, and Chennai, to transport raw materials from interior to coasts. After Independence, the Indian government expanded their railway networks and connected cities with other cities and suburbs. According to the Guinness Book of World Records, the Indian Railways are biggest in the world in terms of size (World Bank, 2009).

GEOG is a vector of spatial distance variables reflecting proximity to urban areas and its location in urban hierarchy. The first one measures the distance to the nearest city. The second includes the incremental distance to a higher ordered city to account for added benefits such as spillovers and agglomeration effects for being closer to large cities. Further, the quadratic terms of the distance to the nearest city variable and incremental distance to a large city are considered to capture the non-linearity in distance. δ_s are the state dummy variables capturing the fixed effects.

These account for time-invariant state-related growth factors such as migration flows, geographic location, regulatory policies in a state, etc., and ε is the residual. The standard errors are clustered

²⁶⁵ Overall, the omission of data was by 0.3% in urban sample.

by districts to address issues of spatial autocorrelation and heteroscedasticity.

All the distance variables report the road distance in kilometers. Most of the spatial literature considers straight-line distance due to its ease of interpretation and use. However, it ignores roads, rails and other forms of transportation and their travel times. Further, the straight-line distance faces the classic measurement error which would bias the distance regression coefficients towards zero (Lall et al., 2004; Partridge et al., 2008b; Partridge et al., 2014).

6 EMPIRICAL RESULTS

6.1 Summary Statistics

Table 1 reports the descriptive statistics for the urban sample consisting of towns and cities. Column 1 and Column 2 display the means and standard deviations and Column 3 and Column 4 represents the minimum and the maximum values of the variable. The mean population levels of 2011 are higher than 2001 implying there has been growth of towns. However, the mean growth rates of urban areas is approximately 20%, which is much lower compared to earlier growth rates in previous years. The nearest urban center is a city and the second closest higher tier urban center is a large city. Thus, the nearest city distance variable averaged 54 km while the incremental distance to a large city stands at an average of 81 km. Thus, one has to travel more to access a higher ordered city.

For the man-made amenity distance variables, the mean distances to hospitals and schools are approximately 4 km and 2 km respectively. These are much lower compared to other distance amenity variables. It implies that the basic amenities like hospitals and schools are present in almost all towns and people do not have to travel much to access these health and school amenities. However, to avail higher education like colleges and to access railway infrastructure, one has to travel further.

6.2 Regression Analysis for Towns

Table 2 shows the regression results for the 2001-2011 period town sample. One of the concerns for these cross-sectional regressions is the problem of endogeneity, which is taken care by considering the initial period value of the explanatory variables. Besides, the natural amenity variables and density, all the other variables are distance variables. Even for man-made amenities, the distance to different amenities is taken into account rather than the actual number of amenities, which might be endogenous. All these distance variables measure the road distance in kilometers.

Another way to is to add the different category of variables at each stage to identify the causal effects of those added variables. The stepwise regression includes five models. Model 1 includes only the natural amenity variables as shown in column (1). Model 2 adds to the initial model the distance to the nearest city along with its square term²⁶⁶ as represented in column (2). In Model 3, the incremental distance to a large higher ordered city is further added to model 2 in column (3). In column (4), model 4, which is the base model, adds further the demographic variable and the state fixed effects, and finally model 5 includes the amenity distance variables as shown in column (5).

Population density has a negative impact on the growth rates but is statically significant at 10% level implying that denser towns have lower population growth rates. The nearest city distance variable is negative and statistically significant across all models implying that proximity does matter for population growth. Thus, the further a town is located away from the city, the lower is the population growth. An increase in nearest city distance variable by one kilometer *ceteris paribus* reduces the population growth of towns by 0.113 percentage points as shown in the base model. In terms of distance penalty for towns, it is approximately 6.1% less population growth given the mean distance to its nearest city averaged at 53.57 km (Table 1). The distance penalty to reach the nearest city becomes less important at greater distances as evident by the positive coefficient for quadratic terms. The results suggest that positive marginal effects from proximity to nearest city extend out about 333 km for towns.

The next closest higher ordered urban center is a large city. All the coefficients for the incremental distance to a large city are negative and statistically significant again. Thus, one will be penalized even more if the current town is not only far away from a city but also farther away from a large city. There is an added penalty of 0.049% per incremental kilometer to reach a higher ordered large city. Also, the positive coefficient for quadratic terms points that the incremental distance penalty to reach a large city becomes less important at greater distances. Given the mean incremental distance to reach a large city from a city is 80.74 km (Table 1), the incremental distance penalty results in approximately 4% lesser population growth of towns. Adding up, the total distance penalty for a town to be farther away from a higher ordered city is approximately 10% less population growth.

The natural amenity variables do not have much impact on growth of towns. The only significant result holds for model 1 (in column 1) when only the natural amenities are included and it is the negative effect of the average rainfall variable, which is significant at the 10% level. However, there exists mixed results for these variables on population growth as these are measured as averages for the last ten years, which does not give a clear picture about natural amenity and topographic variables as in the related US literature. All of the man-made amenity distance variables have a negative impact on the population growth of towns. The only significant result holds for the nearest school distance at 10% level.

²⁶⁶ I also checked the model fit comparing models with logarithmic distances and the one with cubic and quartic distance effects added. Based on AIC/BIC, the smaller values are observed for the logarithmic distance model. However, based on R2 and Adjusted R2, there are slight differences between the two models, though the model with cubic and quartic distances have slightly higher R2 and adjusted R2.

The nearest city distance variable might actually contain these effects, as most of these amenities are present in cities. The nearest distance for these amenities might coincide with distance to nearest city for some of them.

A consistent pattern is observed for both the distance to the nearest city and incremental distance to a large city and its respective quadratic terms across all the five models. It implies strong evidence for urban hierarchical effects. Thus, the proximity to a nearest high-ordered urban center and incremental distances to higher ordered cities affect the population growth of towns in India. Moreover, one can conclude that the given findings are not driven by one particular specification or by one single model as the results holds across all specifications.

Two things need to be noted. One could argue that the model is not able to capture the large variations in town population growth as given by low R2. Despite having low R2, the model can be a good fit given the cross sectional level of data which produces large variation across individual units of observation. Thus, R2 alone cannot fully explain the suitability of the model. Another is the different number of observation being reported for different specifications. Most of it is due to the missing data on the amenity distance variables. However, I ran all the five models with the same set of observations. The resulting significance levels are the same with slight difference in magnitudes but exhibit a similar pattern.

7 SENSITIVITY ANALYSIS

Though our empirical model is in general exogenous due to the predetermined nature of the explanatory variables, several other specifications are estimated to check for robustness. Table 3 re-estimates the town level regression analysis considering the initial population levels of 2001 instead of the initial population density. The resulting coefficients and t-statistics on the distance to nearest city and incremental distance to a large city are approximately the same as for the population density model, indicating that the conclusions would be essentially unchanged regardless of using population density or initial population to measure the urban hierarchy effects.

Table 4 looks at the town level population growth considering the distance to nearest district headquarter. In this urban hierarchy, the nearest urban center is the district headquarters, and the second next urban center is the proximity to a nearest city and at the topmost level urban center is the distance to a large city. All the distance variables (related to agglomeration) are negative and statistically significant lending support to urban hierarchy claims. The distance penalty is much higher when a town is located farther away from a district headquarter than farther away from a city. However, the incremental distance to nearest city from the district headquarters is still negative and statistically significant. Even the incremental distance to a large city exhibits a similar pattern.

Jawaharlal Nehru National Urban Renewal Mission (JNNURM) is a huge mission undertaken by Government of India meant for urban development focusing on the Indian cities. It was launched in 2005 for a seven-year period (up to March 2012) to encourage cities to initiate steps for bringing phased improvements in their civic service levels. The government had extended the tenure of the mission for two years, i.e., from April 2012 to March 31 2014 for lagging projects. Given the period of my sample, this large-scale program might have an effect on the population growth of the town. Table 5 presents the regression results where I exclude from my sample the JNNURM cities and towns. The negative and significant impact of distance to the nearest city and the incremental distance to a higher ordered city on town population growth holds even for this specification. Thus, one can easily conclude that the urban hierarchy effect holds and is not driven by the massive urbanization program.

As already mentioned above, a large part of GDP growth in India is driven by the Information Technology (IT) services sector and is the second largest generation of employment after agriculture. The IT cities are Bangalore, Gurgaon, Noida, Mumbai, Hyderabad, Pune, Ahmedabad, Gandhinagar, Chennai, Trivandrum and Delhi. Therefore, Table 6 reports the regression results for the non-IT sample, which excludes the 26 IT cities mentioned above. Here again, the negative and statistically significant results for the nearest city distance and incremental distance to a large city variables point to the urban hierarchical effect and is not driven by these IT cities.

Finally, Table 7 incorporates deeper lags by taking into consideration the 1991 population level. The urban hierarchical effects holds across most of the specifications. The base model which includes the natural amenity variables, vector of spatial variables, population of 1991 and the state fixed effects points out to urban hierarchical effects as evident by distance to the nearest city and incremental distance to a large city. Thus, all sensitivity analyses supports the claim that the proximity to a nearest and higher ordered urban center matters and the distance impacts on population growth differs by its status in urban hierarchy.

8 SUMMARY AND CONCLUSIONS

Although India is a part of the South East Asian countries, it possesses distinctive traits. It is the second most populated country in the world and is the world's largest democracy. The large population caters to the world market as consumer, producer and investor. It is projected that the population of India is expected to surpass that of China within a decade or two (Mckinsey Report, 2010). It is a point of concern given that such a large population will use resources for food, clothing, housing, medical care etc. However, India will have young and working population unlike other countries like China, which will face a burden of older population.

The uniqueness is seen in the population growth patterns of India. Regional population growth in India is quite different from other countries as it has been in the interior rather than along the coasts. One could argue that the interior places in India have an added advantage compared to interior places in the US and China in that these are not far away from the coasts. Another reason is that the current growth in India is mostly driven by the high-tech services, such as Information

Technology (IT), financial, and telecommunications. This led to the development of high tech cities like Bangalore, Gurgaon, Noida, Mumbai, Hyderabad, Pune and Chennai, which are located in the interior of India, except Mumbai, because exporting these services does not require access to a coast.

However, India has experienced similar trends of urban centric growth like Canada and China. There was only one city Kolkata (then Calcutta) having a population of one million in the beginning of the twentieth century. By 1991, the number of cities had increased and also the share of urban population. There are six megacities (Kolkata, Mumbai, Delhi, Chennai, Bangalore, and Hyderabad) with population of 5 million and above in 2001. The policy reforms in the 1980s and 1990s favored the coastal provinces due to export-driven growth in China leading to a divergence between the coastal and interior regions. However, India had no such preferential policies. The economic reforms in 1991 set up the path for a market-oriented economy in India. Thus, the urban agglomerations in India are market-oriented and policy-driven by schemes like Jawaharlal Nehru National Urban Renewal Mission (Sridhar, 2010).

Based on a set of countries, World Bank (2013a) finds that China, India, Indonesia, and Vietnam are in the intermediate stage of urbanization. Thus, it is expected that cities will matter, as this will generate 70 percent of new jobs given the recent trends of urbanization. People will settle for locations close to cities to enjoy improved access to jobs, markets, and urban infrastructure or amenities (McKinsey Report, 2010; Bloom 2011). The findings also provide such insights to these projections. A strong inverse relationship exists between town population growth and the two important distance variables; the distance to the nearest city and incremental distance to a large city. Further, the positive quadratic term implies these adverse effects weaken at greater distances. In other words, a town is penalized for being located away from nearest urban center that is a city. In addition, an incremental penalty is incurred from being farther away from large cities. Thus, people have to pay a price for remoteness in terms of lower growth rate of population in town. There is insignificant impact of weather on urban growth and no clear definite conclusion can be inferred about the man-made amenities. Hence, one can conclude that the growth is not driven by amenities unlike the US, where growth is amenity-driven leading to migration away from historically created urban areas in the Frostbelt to Sunbelt areas.

Thus, the Indian policymakers need to keep in mind the role of urban centers and its differential effects due to its position in urban hierarchy. The adverse distance impacts on population growth is evident and thus policies need to be framed keeping in mind the importance of distance penalty. Thus, one should encourage public investment to reduce transportation time and costs. The place-based policies like JNNURM has been successful in terms of inputs and processes but not much can be concluded regarding the impacts (World bank, 2013b). One should focus more on the broad based policy bringing improvement in economic indicators and quality of life considerations such as environment, health, and infrastructure. Policies should target the cities given these will be highest generator of jobs in future.

Recently, India's metropolitan cities have been stagnant and have not shown any improvement in economic indicators (World Bank, 2013a). The urbanization pattern of India is following a different path. Although urban India is rapidly growing and expanding in terms of boundaries, it is not significant. The level of urbanization in recent years (2001-2011) was lesser in extent compared to the last twenty years (Sridhar, 2010 ; Sharma, 2013; Tripathi, 2013; Das et al., 2015; Mukim, 2015). Most of the concentrations have been taking place in suburbs rather than metropolitan areas, which is termed as suburbanization. It can be attributable to poor land management practices, insufficient modes of transport etc. (World Bank, 2013b). This could also be driven by restrictive definitions of urban areas whereby there exists grey zones of large villages which have urban traits (Cohen, 2004; Urban India, 2011). The towns should be given more importance as this could reduce the load from the cities that are already dense and congested. Policies such as investment in infrastructure, like schools, colleges, hospitals etc. should be taken for towns. Given the growth differences across the urban hierarchy exist and will continue to attract the attention of researchers and policymakers, future research can be carried out to decompose these growth differentials into productivity and amenity effects through wages and housing prices.

REFERENCES:

- Arora, R. U., & Ratnasiri, S. (2015). Economic reforms, growth and well-being: evidence from India. *Journal of Economic Policy Reform*, 18(1), 16-33.
- Bloom, D. E. (2011). Population dynamics in India and implications for economic growth. The Program on the Global Demography of Aging (PGDA) Working Paper No. 65.
- Chauvin, J. P., Glaeser, E., Ma, Y., & Tobio, K. (2017). What is different about urbanization in rich and poor countries? Cities in Brazil, China, India and the United States. *Journal of Urban Economics*, 98, 17-49.
- Chen, A., & Partridge, M. D. (2013). When are cities engines of growth in china? Spread and backwash effects across the urban hierarchy. *Regional Studies*, 47(8), 1313-1331.
- Cheshire, P. C., & Magrini, S. (2006). Population growth in European cities: Weather matters – but only nationally. *Regional Studies*, 40(1), 23-37.
- Chikte, R. P. (2011). Income convergence and regional growth in India: Before and after the economic liberalization. *South Asia Economic Journal*, 12(2), 239-269.
- Cohen, B. (2004). Urban growth in developing countries: a review of current trends and a caution regarding existing forecasts. *World Development*, 32(1), 23-51.
- Das, S., Ghate, C., & Robertson, P. E. (2015). Remoteness, urbanization, and India's unbalanced growth. *World Development*, 66, 572-587.
- Desmet, K., Ghani, E., O'Connell, S., & Rossi-Hansberg, E. (2015). The spatial development of India. *Journal of Regional Science*, 55(1), 10-30.
- Fallah, B., Partridge, M. D., & Rickman, D. S. (2013). Geography and high-tech employment growth in US counties. *Journal of Economic*

Geography, 14(4), 683-720.

Ghani, E., Goswami, A. G., & Kerr, W. R. (2012). Is India's manufacturing sector moving away from cities? National Bureau of Economic Research (NBER) Working Paper No.17992.

Ghani, E., Goswami, A. G., & Kerr, W. R. (2014). Highway to success: The impact of the Golden Quadrilateral Project for the location and performance of Indian manufacturing. *The Economic Journal*, 126(591), 317-357.

Glaeser, E. L., & Tobiot, K. (2008). The rise of the Sunbelt. *Southern Economic Journal*, 74(3), 609-643.

Gyourko, J., Mayer, C., & Sinai, T. (2013). Superstar Cities. *American Economic Journal. Economic Policy*, 5(4), 167-199.

Jain, M. (2017). The effect of distance on urban transformation in the Capital Region, India. *International Planning Studies*, 1-14.

King, L. J. (1985). Central place theory. *Regional Research Institute, West Virginia University Book Chapters*.

Lall, S. V., & Chakravorty, S. (2005). Industrial location and spatial inequality: theory and evidence from India. *Review of Development Economics*, 9(1), 47-68.

Lall, S. V., Shalizi, Z., & Deichmann, U. (2004). Agglomeration economies and productivity in Indian industry. *Journal of Development Economics*, 73(2), 643-673.

Luckstead, J., & Devadoss, S. (2014a). A comparison of city size distributions for China and India from 1950 to 2010. *Economics Letters*, 124(2), 290-295.

Luckstead, J., & Devadoss, S. (2014b). A nonparametric analysis of the growth process of Indian cities. *Economics Letters*, 124(3), 516-519.

Mallick, J. (2014). Regional convergence of economic growth during post-reform period in India. *The Singapore Economic Review*, 59(02), 1450012.

Mukim, M. (2015). Coagglomeration of formal and informal industry: evidence from India. *Journal of Economic Geography*, 15(2), 329-351.

Partridge, M., Olfert, M. R., & Alasia, A. (2007). Canadian cities as regional engines of growth: agglomeration and amenities. *Canadian Journal of Economics*, 40(1), 39-68.

Partridge, M. D., Rickman, D. S., Ali, K., & Olfert, M. R. (2008a). Employment growth in the American urban hierarchy: long live distance. *The BE Journal of Macroeconomics*, 8(1), 1-36.

Partridge, M. D., Rickman, D. S., Ali, K., & Olfert, M. R. (2008b). Lost in space: population growth in the American hinterlands and small cities. *Journal of Economic Geography*, 8(6), 727- 757.

Partridge, M. D., Rickman, D. S., Ali, K., & Olfert, M. R. (2009). Agglomeration spillovers and wage and housing cost gradients across the urban hierarchy. *Journal of International Economics*, 78(1), 126-140.

Partridge, M. D., Rickman, D. S., Ali, K., & Olfert, M. R. (2010). Recent spatial growth dynamics in wages and housing costs: Proximity to urban production externalities and consumer amenities. *Regional Science and Urban Economics*, 40(6), 440-452.

Rappaport, J. (2007). Moving to nice weather. *Regional Science and Urban Economics*, 37(3), 375-398.

Rappaport, J., & Sachs, J. D. (2003). The United States as a Coastal Nation. *Journal of Economic Growth*, 8(1), 5-46.

Revi, A., Idicheria, C., Jain, G., Anand, G., Sudhira, H., Seddon, J., & Srinivasan, S. (2011). Urban India 2011: Evidence. Paper presented at the Indian Institute of Human settlements India Urban Conference: Evidence and Experience (IUC 2011).

Roback, J. (1982). Wages, rents, and the quality of life. *Journal of political Economy*, 90(6), 1257- 1278.

Rodríguez-Pose, A., & Ketterer, T. D. (2012). Do Local Amenities affect the Appeal of Regions in Europe for Migrants, *Journal of Regional Science*, 52(4), 535-561.

Rosen, S. (1979). Wage-based indexes of urban quality of life. *Current issues in urban economics*, 3, 324-345.

Sachs, J. D., Bajpai, N., & Ramiah, A. (2002). Understanding regional economic growth in India. *Asian Economic Papers*, 1(3), 32-62.

Sankhe, S., & Vittal, I. (2010). India's urban awakening: Building inclusive cities. *Sustaining economic growth*. McKinsey Global Institute Report.

Schaffar, A., & Dimou, M. (2012). Rank-size city dynamics in China and India, 1981–2004. *Regional Studies*, 46(6), 707-721.

Sharma, R. (2013). The Rise of the Rest of India: How States Have Become the Engines of Growth. *Foreign Affairs*, 92, 75.

Soo, K. T. (2014). Zipf, Gibrat and geography: evidence from China, India and Brazil. *Papers in Regional Science*, 93(1), 159-181.

Sridhar, K. S. (2010). Determinants of city growth and output in India. *Review of Urban & Regional Development Studies*, 22(1), 22-38.

Statistical Book (2017). Five Year Plans, Chapter 7, 1-13.

Tripathi, S. (2013). Do large agglomerations lead to economic growth? Evidence from urban India. *Review of Urban & Regional Development Studies*, 25(3), 176-200.

World Bank. (2009). World Development Report 2009: Reshaping Economic Geography. World Bank. <https://openknowledge.worldbank.org/handle/10986/5991> License: CC BY 3.0 IGO."

World Bank. (2013a). Planning, Connecting, and Financing Cities—Now: Priorities for City Leaders, Washington, DC, World Bank.

World Bank. (2013b). Urbanization beyond Municipal Boundaries: Nurturing Metropolitan Economies and Connecting Peri-Urban Areas in India. *Directions in Development*. Washington, DC, World Bank.

TABLES:

Table 1.1: Descriptive Statistics

Variable	(1) Mean	(2) Std. Dev.	(3) Min	(4) Max
Growth rate of population (2001-2011)	20.31	74.09	-98.91	3909.88
Growth rate of population (1991-2001)	30.29	60.08	-97.63	1846.28
Population 2001	55413.21	253411	338	12000000
Population 2011	66482.67	307584	110	12400000
Population density	4426.21	5921.17	41	104267
Nearest city distance	53.57	64.46	0	1232
(Nearest city distance) ²	7187.66	41386.04	0	1517824
Nearest district headquarter distance	37.25	32.06	0	296
(Nearest district headquarter distance) ²	2414.92	4267.95	0	87616
Incremental distance to a city	16.70	65.65	-203	1190
(Incremental distance to a city) ²	4588.22	39244.38	0	1416100

Incremental distance to a large city	80.74	99.45	0	551
(Incremental distance to a large city) ²	16407.77	36073	0	303601
Average rainfall	1144.84	774.02	16	10270
Maximum temperature	36.78	5.58	9	88.4
Minimum temperature	14.64	7.13	-14.4	35
Nearest railway distance	21.85	56.14	0	1232
Nearest hospital distance	4.07	11.20	0	129
Nearest college distance	63.17	71.41	0	1232
Nearest school distance	1.78	6.56	0	150

Notes: The sample consists of towns and cities. Cities are often referred as Class I towns, population of 100,000 and above. Temperatures are measured in centigrade and rainfall is recorded in millimeters. All the distance variables are measured in terms of road distance in kilometers. Nearest city distance captures the road distance in kilometers from a town to the nearest city (population of 100,000 and more) and is equal to zero if the town itself is a city. Nearest district headquarter distance considers the distance from a town to the nearest district. Incremental distance to a large city measures the additional distance from a district headquarters to a city with population of 100,000 and more. Incremental distance to a large city measures the additional distance from a city with population of 100,000 and more to a higher ordered city with population of 500,000 and more. Amenity distance variables are zero if that amenity is present in that town. There are 5,177 towns according to 2001 Census of India. In 2011 Census, there were additional towns, which were not part of our 2001 Census data set. Thus, due to missing data, definitional problems and matching data of 2001 with 2011 resulted in 5,161 towns. Overall, the omission of data was by 0.3% in town sample.

Table 2: Town-level Analysis of Population Growth 2001-2011

Variable	(1) Natural Amenity	(2) Distance to nearest city	(3) Inc dist (500,000+)	(4) cityBase (+Demog)	(5) ModelAmenity distance
Average Rainfall	-0.002* (0.001)	-0.002 (0.001)	-0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
Max Temperature	-0.084 (0.170)	-0.188 (0.162)	-0.069 (0.168)	0.069 (0.166)	0.026 (0.170)
Min Temperature	-0.157 (0.153)	-0.219 (0.145)	-0.216 (0.145)	0.159 (0.206)	0.030 (0.214)
Nearest city dis		-0.080*** (0.018)	-0.081*** (0.019)	-0.113*** (0.025)	-0.073*** (0.028)
(Nearest city dis) ²		0.009*** (0.003)	0.008*** (0.003)	0.017*** (0.006)	0.010 (0.006)
Inc dis large city			-0.051*** (0.016)	-0.049*** (0.016)	-0.038** (0.015)
(Inc dis large city) ²			0.008** (0.004)	0.010*** (0.004)	0.007** (0.003)
Density				-0.017* (0.009)	-0.021* (0.011)
Nearest rail dis (0.047)					-0.031
Nearest hosp dis (0.100)					-0.051
Nearest college dis (0.014)					-0.015
Nearest school dis (0.195)					-0.365*
Observations	4,779	4,779	4,779	4,761	3,922
R-squared	0.003	0.009	0.014	0.075	0.092
State Fixed Effects	No	No	No	Yes	Yes

Notes: The sample consists of towns and cities. Class I towns are often referred as cities, population of 100,000 and above. Temperatures are measured in centigrade and rainfall is recorded in millimeters. All the distance variables are measured in terms of road distance in kilometers. Nearest city distance captures the road distance in kilometers from a town to the nearest city and is equal to zero if the town itself is a city. Incremental distance to a large city measures the additional distance from a city with population of 100,000 and more to a higher ordered city with population of 500,000 and more. All the distance square terms are expressed as hundreds of square kilometers. Population Density is also reported as hundreds of square kilometers. Amenity distance variables are zero if that amenity is present in that town. Standard Errors are clustered by districts. *Significant at 10% level; **Significant at 5% level; ***Significant at 1% level.

Table 3: Town-level Analysis of Population Growth 2001-2011 using initial population

Variable	(1) Natural Amenity	(2) Distance to nearest city	(3) Inc dist (500,000+)	(4) cityBase (+Demog)	(5) ModelAmenity distance
Average Rainfall	-0.002* (0.001)	-0.002 (0.001)	-0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
Max Temperature	-0.084 (0.170)	-0.188 (0.162)	-0.069 (0.168)	0.074 (0.164)	0.037 (0.169)
Min Temperature	-0.157 (0.153)	-0.219 (0.145)	-0.216 (0.145)	0.155 (0.204)	0.026 (0.211)

Nearest city dis		-0.080***	-0.081***	-0.110***	-0.067**
(Nearest city dis)2		(0.018)	(0.019)	(0.025)	(0.028)
		0.009***	0.008***	0.017***	0.009
		(0.003)	(0.003)	(0.006)	(0.006)
Incr dist large city			-0.051***	-0.048***	-0.036**
(Incr dist large city)2			(0.016)	(0.016)	(0.015)
			0.008**	0.010***	0.007**
			(0.004)	(0.004)	(0.003)
Initial Population				-0.012	0.070
				(0.162)	(0.190)
Nearest rail dis					-0.029
(0.047)					
Nearest hospital dis					-0.046
(0.099)					
Nearest college dis					-0.016
(0.014)					
Nearest school dis					-0.358*
(0.195)					
Observations	4,779	4,779	4,779	4,779	3,938
R-squared	0.003	0.009	0.014	0.081	0.100
State Fixed Effects	No	No	No	Yes	Yes

Notes: The sample consists of towns and cities. Class I towns are often referred as cities, population of 100,000 and above. Temperatures are measured in centigrade and rainfall is recorded in millimeters. All the distance variables are measured in terms of road distance in kilometers. Nearest city distance captures the road distance in kilometers from a town to the nearest city and is equal to zero if the town itself is a city. Incremental distance to a large city measures the additional distance from a city with population of 100,000 and more to a higher ordered city with population of 500,000 and more. All the distance square terms are expressed as hundreds of square kilometers. Initial Population (2001) is reported as hundreds of thousands unit. Amenity distance variables are zero if that amenity is present in that town. Standard Errors are clustered by districts. *Significant at 10% level; **Significant at 5% level; ***Significant at 1% level.

Table 4: Town-level Analysis of Population Growth 2001-2011 considering distance to the nearest district headquarter

Variable	(1) Natural Amenity	(2) Distance nearest city	(3) toInc dist (100,000+)	(4) cityInc dist (500,000+)	(5) cityBase (+Demog)	(6) ModelAmenity distance
Average Rainfall	-0.002*** (0.001)	-0.003*** (0.001)	-0.003*** (0.001)	-0.003*** (0.001)	0.001 (0.001)	0.000 (0.001)
Max Temperature	-0.086 (0.110)	-0.052 (0.100)	-0.162 (0.102)	-0.074 (0.104)	-0.013 (0.126)	-0.020 (0.133)
Min Temperature	-0.158* (0.084)	-0.092 (0.076)	-0.159** (0.077)	-0.161** (0.077)	0.173 (0.131)	0.128 (0.141)
Nearest district dis		-0.146***	-0.166***	-0.153***	-0.120***	-0.147***
(Nearest dist dis)2		(0.035)	(0.035)	(0.035)	(0.036)	(0.039)
		0.056**	0.050*	0.044*	0.017	0.032
		(0.026)	(0.026)	(0.026)	(0.028)	(0.029)
Incr city distance			-0.060***	-0.064***	-0.088***	-0.067***
(Incr city distance)2			(0.012)	(0.012)	(0.015)	(0.017)
			0.007***	0.007***	0.017***	0.009
			(0.003)	(0.003)	(0.006)	(0.006)
Incr dist large city				-0.045***	-0.047***	-0.038***
(Incr dis large city)2				(0.011)	(0.012)	(0.012)
				0.008***	0.010***	0.007**
				(0.003)	(0.003)	(0.003)
Density					-0.017*	-0.019**
					(0.009)	(0.010)
Nearest rail dis						0.032
(0.021)						
Nearest hospital dis						0.060
(0.051)						
Nearest college dis						-0.002
(0.011)						
Nearest school dis						-0.192**
(0.090)						
Observations	4,780	4,766	4,766	4,766	4,748	3,911
R-squared	0.003	0.011	0.016	0.020	0.073	0.090
State Fixed Effects	No	No	No	No	Yes	Yes

Notes: The sample consist of towns and cities. Class I towns are often referred as cities, population of 100,000 and above. Temperatures are measured in centigrade and rainfall is recorded in millimeters. All the distance variables are measured in terms of road distance in kilometers. Nearest district headquarter distance captures the distance from a town to the nearest district. Incremental distance to a large city measures the additional distance from a district headquarter to a city with a population of 100,000 and more. Incremental distance to a large city measures the additional distance from a city with population of 100,000 and more to a higher ordered city with

population of 500,000 and more. All the distance square terms are expressed as hundreds of square kilometers. Population Density is also reported as hundreds of square kilometers. Amenity distance variables are zero if that amenity is present in that town. *Significant at 10% level; **Significant at 5% level; ***Significant at 1% level.

Table 5: Town-level Analysis of Population Growth 2001-2011 using non-JNNURM sample

Variable	(1) Natural Amenity	(2) Distance to nearest city	(3) Inc dist (500,000+)	(4) cityBase (+Demog)	(5) Model Amenity distance
Average Rainfall	-0.002** (0.001)	-0.002 (0.001)	-0.001 (0.001)	0.001 (0.001)	0.000 (0.001)
Max Temperature	-0.074 (0.171)	-0.182 (0.161)	-0.069 (0.168)	0.102 (0.157)	0.065 (0.158)
Min Temperature	-0.138 (0.156)	-0.202 (0.146)	-0.216 (0.145)	0.161 (0.207)	0.027 (0.214)
Nearest city dis		-0.078*** (0.018)	-0.081*** (0.019)	-0.111*** (0.025)	-0.070*** (0.027)
(Nearest city dis) ²		0.009*** (0.003)	0.008*** (0.003)	0.016*** (0.006)	0.009 (0.006)
Inc dis large city			-0.051*** (0.016)	-0.050*** (0.016)	-0.039** (0.015)
(Inc dis large city) ²			0.008** (0.004)	0.011*** (0.004)	0.008** (0.003)
Density				-0.019** (0.009)	-0.024** (0.011)
Nearest rail dis (0.046)					-0.041
Nearest hosp dis (0.106)					-0.060
Nearest college dis (0.014)					-0.013
Nearest school dis (0.205)					-0.346*
Observations	4,715	4,715	4,779	4,699	3,863
R-squared	0.003	0.010	0.014	0.080	0.099
State Fixed Effects	No	No	No	Yes	Yes

Notes: The sample consist of towns and cities are not covered by JNNURM (Jawaharlal Nehru National Urban Renewal Mission). Temperatures are measured in centigrade and rainfall is recorded in millimeters. All the distance variables are measured in terms of road distance in kilometers. Nearest city distance captures the road distance in kilometers from a town to the nearest city and is equal to zero if the town itself is a city. Incremental distance to a large city measures the additional distance from a city with population of 100,000 and more to a higher ordered city with population of 500,000 and more. Amenity distance variables are zero if that amenity is present in that town. Standard Errors are clustered by districts.

*Significant at 10% level; **Significant at 5% level; ***Significant at 1% level.

Table 6: Town-level Analysis of Population Growth 2001-2011 using non-IT sample

Variable	(1) Natural Amenity	(2) Distance to nearest city	(3) Inc dist (500,000+)	(4) cityBase Model (+Demog)	(5) Model Amenity distance
Average Rainfall	-0.002* (0.001)	-0.002 (0.001)	-0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
Max Temperature	-0.100 (0.169)	-0.201 (0.161)	-0.083 (0.167)	0.063 (0.165)	0.019 (0.170)
Min Temperature	-0.142 (0.152)	-0.202 (0.143)	-0.200 (0.144)	0.169 (0.206)	0.043 (0.214)
Nearest city dis		-0.077*** (0.018)	-0.078*** (0.019)	-0.110*** (0.025)	-0.069** (0.028)
(Nearest city dis) ²		0.008*** (0.003)	0.008*** (0.003)	0.016*** (0.006)	0.009 (0.006)
Inc dis large city			-0.051*** (0.017)	-0.047*** (0.016)	-0.035** (0.015)
(Inc dis large city) ²			0.008** (0.004)	0.010*** (0.004)	0.007** (0.003)
Density				-0.017* (0.009)	-0.021* (0.011)
Nearest rail dis (0.047)					-0.031
Nearest hosp dis (0.100)					-0.042
Nearest college dis (0.014)					-0.015
Nearest school dis					-0.366*

(0.195)					
Observations	4,762	4,762	4,762	4,744	3,906
R-squared	0.002	0.009	0.014	0.075	0.092
State Fixed Effects	No	No	No	Yes	Yes

Notes: The sample consist of towns and cities which are not IT (information technology) driven. Temperatures are measured in centigrade and rainfall is recorded in millimeters. All the distance variables are measured in terms of road distance in kilometers. Nearest city distance captures the road distance in kilometers from a town to the nearest city and is equal to zero if the town itself is a city. Incremental distance to a large city measures the additional distance from a city with population of 100,000 and more to a higher ordered city with population of 500,000 and more. All the distance square terms are expressed as hundreds of square kilometers. Population Density is also reported as hundreds of square kilometers. Amenity distance variables are zero if that amenity is present in that town. Standard Errors are clustered by districts.

*Significant at 10% level; **Significant at 5% level; ***Significant at 1% level.

Table 7: Town-level Analysis of Population Growth 2001-2011 using 1991 population

Variable	(1) Natural Amenity	(2) Distance to nearest city	(3) Inc dist (500,000+)	(4) cityBase (+Demog)	(5) ModelAmenity distance
Average Rainfall	-0.002* (0.001)	-0.002 (0.001)	-0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
Max Temperature	-0.084 (0.170)	-0.188 (0.162)	-0.069 (0.168)	0.170 (0.171)	0.120 (0.172)
Min Temperature	-0.157 (0.153)	-0.219 (0.145)	-0.216 (0.145)	0.264 (0.184)	0.121 (0.186)
Nearest city dis		-0.080*** (0.018)	-0.081*** (0.019)	-0.091*** (0.023)	-0.042 (0.027)
(Nearest city dis) ²		0.009*** (0.003)	0.008*** (0.003)	0.015** (0.006)	0.006 (0.007)
Inc dist large city			-0.051*** (0.016)	-0.037*** (0.014)	-0.026* (0.014)
(Inc dist large city) ²			0.008** (0.004)	0.007** (0.003)	0.005 (0.003)
1991 Population				-0.059 (0.188)	0.051 (0.219)
Nearest rail dis (0.058)					-0.053
Nearest hospital dis (0.126)					-0.035
Nearest college dis (0.014)					-0.016
Nearest school dis (0.225)					-0.413*
Observations	4,779	4,779	4,779	4,057	3,352
R-squared	0.003	0.009	0.014	0.067	0.084
State Fixed Effects	No	No	No	Yes	Yes

Notes: The sample consist of towns and cities. Class I towns are often referred as cities, population of 100,000 and above. Temperatures are measured in centigrade and rainfall is recorded in millimeters. All the distance variables are measured in terms of road distance in kilometers. Nearest city distance captures the road distance in kilometers from a town to the nearest city and is equal to zero if the town itself is a city. Incremental distance to a large city measures the additional distance from a city with population of 100,000 and more to a higher ordered city with population of 500,000 and more. All the distance square terms are expressed as hundreds of square kilometers. Population Density is also reported as hundreds of square kilometers. Amenity distance variables are zero if that amenity is present in that town. Standard Errors are clustered by districts. *Significant at 10% level; **Significant at 5% level; ***Significant at 1% level.

1523 DOES UNEMPLOYMENT CAUSE MIGRATION: THE EVIDENCE FROM SRI LANKA**T. Vinayagathan**Department of Economics and Statistics, Faculty of Arts, University of Peradeniya, Sri Lanka. email: vinayagamkili@yahoo.com, Phone No: +94779353302**ABSTRACT**

This study attempts to investigate whether the unemployment causes to migration. For this aim, we use the annual data from Sri Lanka over the period of 1990 – 2016. KPSS unit root test confirmed that none of the variables are I(2), which allows us to examine long run relationship between the variables using Autoregressive Distributed Lag (ARDL) bound testing method. AIC is suggested to adapt ARDL (1, 2, 2, 2, 0) model among the top 20 models. The bound testing results detected the cointegrating relationship between the variables. The result of ARDL bounds test and Error Correction version of ARDL model reveal that unemployment and per capita GDP have positive and significant impact on net migration in the long run and the short run while other variables do not have significant impact on net migration in both periods. The results of CUSUM test of both model discloses that the estimated model is stable. The negative and significant coefficient of error correction term reveals that net migration moves backward towards steady state line with the speed of 57% in each period one period after the exogenous shocks. Both ARDL model passes the all the diagnostic test. Moreover, Granger causality test identified a causal relationship that stemming from unemployment to net migration, GDP per capita to net migration and consumer price index to net migration. These findings could be useful to policy makers when they formulating and implementing the monetary policy.

Key words: Migration, Unemployment, Bound Test, Auto Regressive Distributive Lag Model

1. INTRODUCTION

Improving the allocation of human resources is called as migration. People living in area where they are not fully employed or partially employed are expected to move to termini that having brighter futures. However, both migration analysts and policymakers seem to have mixed views as to whether private market forces are only adequate to encourage them to do so. On the one hand, there has been substantial discussion regarding policies designed to affect migration directly by permitting or tempting the unemployed to move for more hopeful labor markets. But, the implication is that the unemployed are not themselves sufficiently responsive to economic conditions. On the other hand, investment policies of in depressed places are based largely on the premise that expanded local economic chances will shrink economically forced outmigration (Julie DaVanzo, 1978).

There are many arguments about the benefits and costs of migration for both host country and countries of origin. It is clear that immigration can be beneficial for migrants, but only if their rights are protected properly. It can also be economically beneficial for both countries of origin and host countries; however, with present economic and trading structures it is the rich and powerful countries that benefit most. Migration brings social and cultural pressures that need to be taken into account in planning for future services. Migration also has the potential for bringing peoples together culturally but friction occurs if efforts are not made to dispel the myths held by local people. It is also essential to provide good information about the local way of life to newcomers and ensure opportunities for people to mix and integrate. Where the economic preconditions exist, migration is inevitable. When people try to prevent immigration it just goes underground.

When the economic environment declines, the host country population tends to fear the impact of immigration on employment or on wages (European Social Survey (2002). For instance, following the 1974 oil crisis, European governments implemented selective or restrictive migration policy in order to slow down the entry of immigrants whose assimilation into the host country labor market was not certain and to satisfy national public opinion. Nevertheless, in Sri Lanka, from 1980s to 2009, people migrated not only for finding the job and education but also for security purposes due to unstable political environment whereas after 2009, they migrate especially by targeting the labor markets.

The relationship between unemployment rate and migration is not obvious. On the one hand, many studies using survey data (e.g., Fromentin, 2013; Lansing and Mueller, 1967; Saben, 1964) found that certain unemployed workers are more likely to migrate than employed workers, but, Saben, and Lansing and Mueller studies do not use ample controls for other characteristics that may have affect migration. Lansing and Mueller (1967, p. 91) further explain that people are faintly less likely to leave depressed areas than non-depressed areas. On the other hand, some of the literatures (e.g., Lowry, 1966) have obtained mixed results using aggregate data, but Lowery explain that since unemployment is often measured at the end of the period of migration and thus may have been affected by the intervening migration. Further, Lowry confirmed that outmigration to be insensitive to conditions of local labor market. Thus, the direct contribution of unemployment to migration cannot be determined (Julie DaVanzo, 1978).

The studies of Harris and Todaro (1970) and Todaro (1969) are considered to be founding works for the investigation of migration flows in a context of underemployment, with the presence of real wages rigidities. They explain that migrations are likely to have a negative impact on the general level of employment, since workers are encouraged to migrate to certain regions, due to higher wages, even if the rate of unemployment is higher.

Some authors (e.g., Fields, 1976; Olvey, 1970; Blanco, 1964) have discussed that unemployment "push" at origin is operative but that its role is masked by improper measures of true unemployment conditions. Blanco, and Olvey suggest

and employ synthetic measures such as "potential" or "prospective" rate of unemployment, which examine what unemployment rates would be if there were no out- migration (net), and find them positively correlated to (net) outmigration.

Therefore, the query of the economic impact of migration has been broadly addressed by literature of economics, notably taking into deliberation the characteristics of the migrants and the labor market of the country, the degree of substitutability and complementarity between the workers, the elasticity of work demand and supply, the mobility of workers', the protagonists' negotiating power, global demand, etc. Although if there is a quasi-consensus appears from literature of economics regarding economic impact (e.g., Longhi et al., 2010; Okkerse 2008), the conclusions can be diverge. Nevertheless, according to the context of geographical, methodological and temporal analysis, Borjas (1994) demonstrate that "the most important lesson is that the economic impact of immigration varies by time and place and can be beneficial or harmful".

Having these mixed results, an individual characteristic can be seen in the Sri Lankan economy during the last five decades until 1997 was the experience of two-digit rate of unemployment and then it became one digit, which implies that the rate of unemployment has gradually decreased in the last five decades. However, data regarding net migration shows a high negative value in early 1990s and gradually decreased until 2001 then there is high fluctuation until 2010 and again net migration started to increase dramatically. Therefore, we could not see the clear pattern regarding the net migration. In this respect, it seems vital to ask questions about the link between migration and the labor market in Sri Lanka and to wonder about the existence of cointegration and/or of a causal relationship (unidirectional or bidirectional) between migration and economic growth, migration and unemployment.

In addition, several studies examine the relationship between immigration and unemployment instead of link between migration and unemployment by considering American (e.g., Ottaviano and Peri, 2012; Card, 2009; Borjas, 2003; Friedberg, 2001; Borjas, Freeman and Katz, 1997; Borjas, Friedberg and Hunt, 1995; Card, 1990; Grossman, 1982) and European (e.g., Galloway and Josewicz, 2008; Dustman, Fabbri and Preston, 2005; Gross, 2002; Winter-Ebmer and Zeimuller, 1999; Pischke and Velling 1997) countries since these countries have positive net migration. Among these studies, there is no consensus on whether the link between immigrant and wages or unemployment is negative, positive or null (e.g. Ottaviano and Peri, 2012; Card, 2009; Galloway and Josewicz, 2008; Fabbri and Preston, 2005; Borjas, 2003). For instance, Using the data of France, Gross (2002) found some detrimental effects in the short run perspective, but in the long run, he revealed negative relationship between immigration and unemployment rate. Nevertheless, his general result shows that the inflow of immigration on the labour market indicators was not significant and temporary. Dustman, Fabbri and Preston (2005) used the data from the British Labour Force Survey aggregated into the 17 regions and have not identified any significant effects of immigration on the employment, participation and rate of unemployment. Employing the pooled cross-sections data collected from Austria, Winter-Ebmer and Zeimuller (1999) obtained only slight effect of immigration on native employees and more significant on time labour and already employed immigrants. Pischke and Velling (1997) used 328 regions data from German and concluded that no detrimental effect of the immigration on employment. In contrast, data of Sri Lanka revealed that net migration is negative, indicating that emigrants are higher than the immigrants. And, to best of our knowledge, there is no study that investigates the relationship between unemployment and migration using Sri Lankans data. Taking this in to account, we attempt do it. In this manner also our study differs from existing literatures.

Thus, the aim of this study is to examine whether the unemployment causes to migration and the impact of unemployment on the migration using data of Sri Lanka between 1990 and 2015 with a long-term and short-term distinction, since the conclusions may diverge in particular owing to the adjustment time of the labor market (Damette and Fromentin 2013, Dustmann, Glitz and Frattini 2008, Gross 2004, Cohen-Goldner and Paserman 2004).

2. DATA, VARIABLES AND METHODOLOGY

In this study, we use annual time series data from Sri Lanka over the period of 1990-2016²⁶⁷ to examine whether the unemployment causes to migration and impact of unemployment on net migration of Sri Lanka. Net migration, unemployment rate, Gross domestic product per capita, consumer price index and wage are used as variables. All the variables data were extracted from World Development Indicator of the World Bank data base. Table 1 below shows the variables that are used in our growth regression, definition, and abbreviation.

Table 1: variables, description and abbreviation

Variables	Description	Abbreviation
Net migration (Dependent Variable)	The number of immigrants minus the number of emigrants over a period, divided by the person-years lived by the population of the receiving country over that period. It is expressed as net number of migrants per 1,000 population.	netmig
Gross domestic product per Capita	gross domestic product divided by midyear population (current LCU)	gdppc
Consumer price index	changes in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly (2010 = 100)	cpi
unemployment rate	% of total labor force (national estimate)	unemp

²⁶⁷ Due to the availability of the data of selected variables, we considered this period in our sample.

wage	Wage and salaried workers, (% of total employment)	wage
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Following the empirical literature in related to unemployment and migration, we develop the long-run relationship between the variable as below:

$$netmig_t = \alpha_0 + \alpha_1 unemp_t + \alpha_2 gdppc_t + \alpha_3 cpi_t + \alpha_4 wage_t + \varepsilon_t \quad (1)$$

where, variables name are as explained in Table 1, ε_t is the white noise error term with zero mean and constant variance and t illustrate the time period.

The estimation of equation (1) begins with the identification of the order of integration of each variable using Augmented Dickey Fuller (ADF) and Philips-Perron (PP) unit root test for this analysis. Therefore, we can compare the results of ADF test with PP test to see whether we have obtained the same conclusion or not. The AR (p) model with intercept of the ADF test can be described as below:

$$Y_t = \alpha + \sum_{i=1}^p \beta_i Y_{t-i} + \varepsilon_t \quad (2)$$

The null hypothesis of equation (2) is that the variable Y_t is non-stationary ($\beta_i = 1$) and the alternative hypothesis is that the variable Y_t is stationary ($\beta_i < 1$). If the test statistics less than the critical value we will reject the null hypothesis and conclude that the variable Y_t is stationary. Then we can use the variable Y_t in its original form. In contrast, if the test statistics greater than the critical value we will failed to reject the null hypothesis and conclude that the variable Y_t is non-stationary. In this situation, we can include linear trend in equation (2) or we can exclude both intercept and linear trend from the equation. Even in these two situations also, if we failed to reject null hypothesis then the ADF is suggested to take difference for the series. After taking the first difference, the equation (2) can be written as below:

$$\Delta Y_t = \alpha + \rho^* Y_{t-1} + \sum_{i=1}^{p-1} \beta_i \Delta Y_{t-i} + \varepsilon_t \quad (3)$$

The null hypothesis of equation (3) is that the series ΔY_t is non-stationary ($\rho^* = 0$) and the alternative hypothesis is that the series ΔY_t is stationary ($\rho^* \neq 0$). If the absolute value of test statistics is greater than the absolute value of critical value, then we will reject null hypothesis and conclude that the variable ΔY_t is stationary. Then we can use the variable Y_t in first difference form in our model. In contrast, if the absolute value of test statistics is less than the absolute value of critical value, then we will failed to reject null hypothesis and conclude that the variable ΔY_t is non-stationary. In this situation, we can include linear trend in equation (3) or we will exclude linear trend and intercept from the equation. Suppose, if we failed to reject null hypothesis in these two cases as well, then the ADF is suggested to take further difference until it became a stationary. Alternative to test statistics and the critical value, we also can compare the probability value and the alpha (significance level) value to test the hypothesis. If probability value is less than the alpha value we will reject null hypothesis and vice versa. The PP unit root test method also has the same procedure as ADF test.

In the second step of the estimation procedure, we have to identify the optimal lag length that can be used in the model. Because, the underlying theory and any hypothesized structure indicate to the economist which variable to include in the model and how many lags would be appropriate. Therefore, the method of determining the appropriate lag length is still an important issue in the time series literature since longer lag lengths increase the number of estimated parameters, reduce degrees of freedom and increase data requirements. There have been several methods proposed to deal with the problem of correctly determining the proper lag length for time series model like Vector Autoregressive (VAR), Vector Error Correction Model (VECM) and Autoregressive Distributed Lag (ARDL) etc. There are several criterions such as sequentially modified Likelihood Ratio (LR) statistics, Akaike Information Criterion (AIC), Swartz Information Criterion (SC), Hannan-Quin Information Criterion (HQIC) and Final Prediction Error (FPE) to select the optimal lag length that can be included in a time series model. However, we will adopt either one or more of these criterions in our analysis according to our results and the requirements.

In the third step, To empirically analyze the dynamic relationship between the variables, the model specified in equation (1) can be estimated by the ARDL co-integration procedure developed by Pesaran et al. (2001). Firstly, this method can be a valid amendment when endogenous variables are included in the explanatory variables. Secondly, the bound testing is applicable for a small sample size unlike Johansen cointegration, which requires a large sample size to ensure the reliability of the results. Third, with the ARDL it is possible that different variables have differing optimal number of lags. Fifth, the bound testing can be employed irrespective of whether the variables are purely I(0), I(1), or mixed integrated. However, this procedure will crash in the presence of I(2) series. Finally, the long-run and short-run effects can be estimated simultaneously in bound testing. The model includes lagged value of the dependent variables, current and lagged value of explanatory regressors. An ARDL representation of equation (1) is formulated as follows:

$$\Delta netmig_t = \delta_0 + \delta_1 netmig_{t-1} + \delta_2 unemp_{t-1} + \delta_3 gdppc_{t-1} + \delta_4 cpi_{t-1} + \delta_5 wage_{t-1} + \sum_{i=1}^{q_1} \beta_{1i} \Delta netmig_{t-i} + \sum_{i=0}^{q_2} \beta_{2i} \Delta unemp_{t-i} + \sum_{i=0}^{q_3} \beta_{3i} \Delta gdppc_{t-i} + \sum_{i=0}^{q_4} \beta_{4i} \Delta cpi_{t-i} + \sum_{i=0}^{q_5} \beta_{5i} \Delta wage_{t-i} + e_t \quad (4)$$

Where, Δ denotes the first difference operator, δ_0 is the drift component, e_t is the usual white noise error term, $\delta_1 \rightarrow \delta_5$: correspond to the long-run relationship, the remaining expressions with the summation sign ($\beta_{1i} \rightarrow \beta_{5i}$) represent the short-run dynamics of the model.

To investigate the presence of long-run relationships among the variables, bound testing procedure is used. The bound testing procedure is based on the F-test. The F-test is actually a test of the hypothesis of no co-integration among the variables against the existence of cointegration among the variables, denoted as:

$$H_0: \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = 0 \text{ (there is no cointegration among the variables)}$$

$H_1: \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq 0$ (there is cointegration among the variables)

The ARDL bound test is based on the Wald-test (F-statistic). The asymptotic distribution of the Wald-test is non-standard under the null hypothesis of no cointegration among the variables. Two critical values are given by Pesaran et al. (2001) for the cointegration test. The lower critical bound assumes all the variables are $I(0)$ meaning that there is no cointegration relationship between the examined variables. The upper critical bound assumes that all the variables are $I(1)$ meaning that there is cointegration among the variables. When the computed F-statistic is greater than the upper bound critical value, then the H_0 is rejected (thus, the variables are cointegrated). If the F-statistic is below the lower bound critical value, then the H_0 cannot be rejected (thus, there is no cointegration among the variables). When the computed F-statistics falls between the lower and upper bound, then the results are inconclusive.

In the next step of the estimation procedure we obtain the short run dynamics of parameters and long run adjustment of the model by estimating the error correction version of ARDL model pertaining to the variables in equation (4) is as follows:

$$\Delta netmig_t = \pi_0 + \sum_{i=1}^{q_1} \pi_{1i} \Delta netmig_{t-i} + \sum_{i=0}^{q_2} \pi_{2i} \Delta unemp_{t-i} + \sum_{i=0}^{q_3} \pi_{3i} \Delta gdppc_{t-i} + \sum_{i=0}^{q_4} \pi_{4i} \Delta cpi_{t-i} + \sum_{i=0}^{q_5} \pi_{5i} \Delta wage_{t-i} + \gamma ECT_{t-1} + \mu_t \tag{5}$$

where, γ : speed of adjustment, which should have statistically significant and negative sign to support the cointegration between the variables, μ_t : pure random error term.

Finally, once we confirmed the presence of co-integrating relationship among the variables, we adapted Vector Error Correction Model (VECM) based granger causality approach to identify the direction of causality between unemployment rate and net migration. Granger (1969) argued that VECM is more appropriate to examine the causality between $I(1)$ series. VECM is restricted form of unrestricted VAR and restriction is levied on the presence of the long - run relationship between the series. The system of error correction model (ECM) uses all the series endogenously. This system allows the predicted values to explain itself both by its own lags and lags of forcing variables as well as the lags of the error correction term and by residual term. The VECM equation is modeled as follows:

$$\Delta Z_t = C + \sum_{j=1}^q \Phi_{ij} \Delta Z_{t-j} + \Psi ECT_{t-1} + \varepsilon_t \tag{6}$$

where, Δ is the first difference operator, Z_t is the 5×1 vector of dependent variables C is the 5×1 vector of constant, Φ is the 5×5 matrix of coefficients, Z_{t-j} is the lagged value of Z_t , $\Psi = \alpha\beta'$, where, α is the 5×1 vector of adjustment coefficients, β' is the 1×5 vector of cointegrating coefficients, ECT_{t-1} represents the one period lagged error-term derived from the co-integration vector and the ε_t is the 5×1 vector of white noise error term. In the above equation, all variables are treated as endogenous variables. We used F test to examine the direction of any causal relationship between the variables.

3. RESULTS AND DISCUSSIONS

In this section we discuss both results of descriptive analysis and econometric analysis. First, we discuss the descriptive results and then results from econometric analysis are discussed.

3.1 Descriptive Analysis

We employed scatter plot with confidence ellipse to observe the relationship between the variables considered in this study. The Fig 1 and 2 below shows the relationship between unemployment rate (unemp) and net migration (netmig) and unemp and GDPPC respectively.

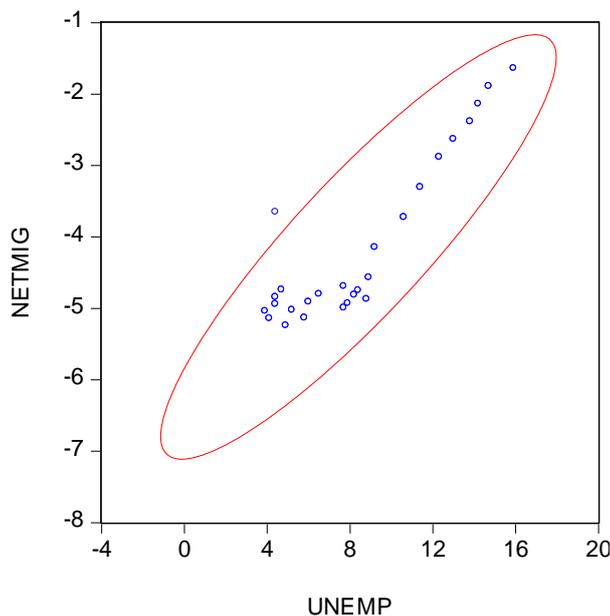


Fig 1: Relationship between netmig & unemp

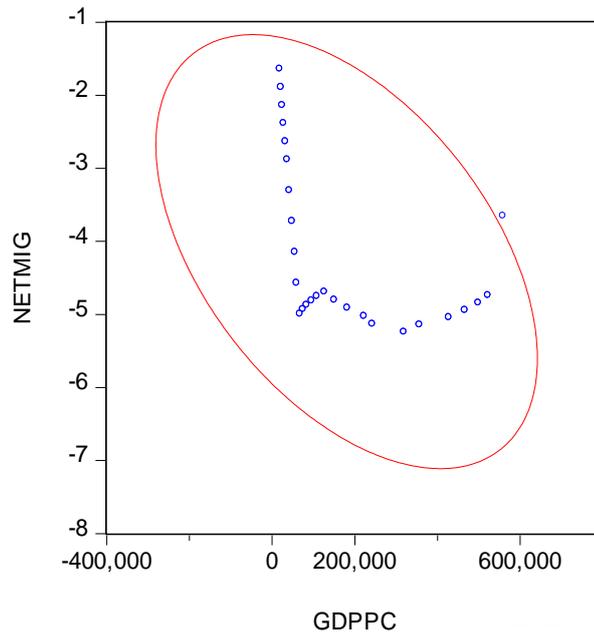


Fig 2: Relationship between netmig & gdppc

The confidence ellipse of the Fig 1 depict that a positive link between rate of unemployment and net migration. It implies that when the rate of unemployment increases in native country, then the net migration also increases in negative term, i.e. emigrants are higher than the immigrants in native country. Fig 2 shows that there is no clear association between net migration and per capita GDP. The Fig 3 and 4 below shows the relationship between net migration and consumer price index (cpi) and net migration and wage respectively.

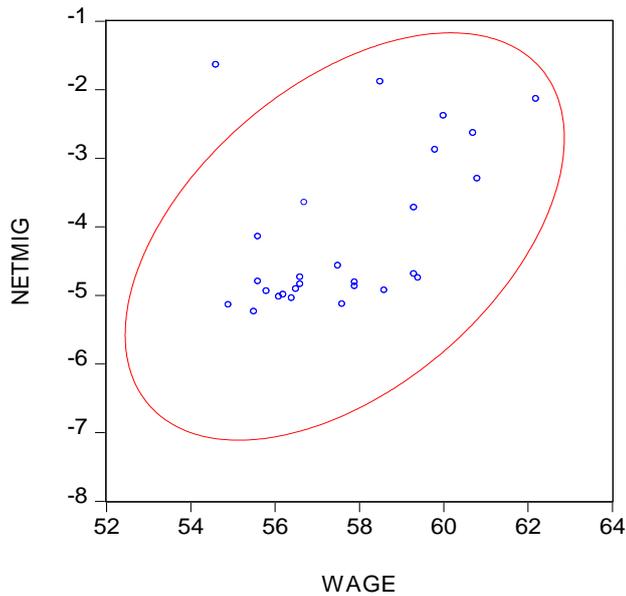


Fig 3: Relationship between netmig & cpi

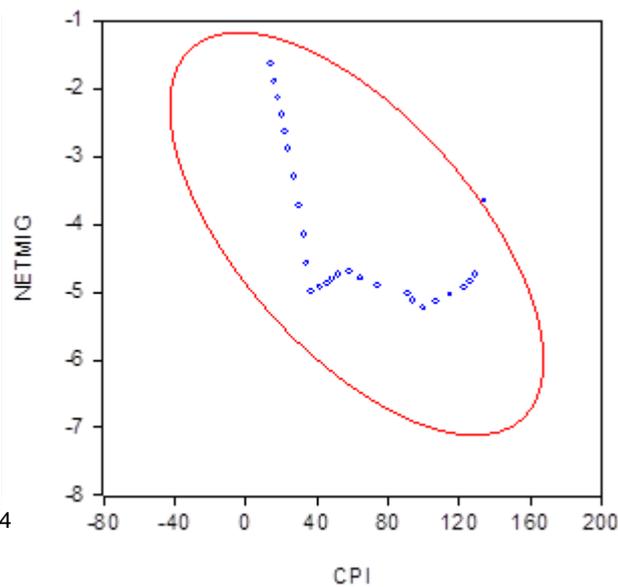


Fig 4: Relationship between netmig & wage

The confidence ellipse of the Fig 3 and Fig 4 illustrate that there is no clear association between net migration and cpi and net migration and wage. Therefore, it is crucial to examine the relationship by econometrically.

3.2 Econometric Analysis

We now used ordinary least squared (OLS) estimation technique to investigate the relationship between the variables. The results are given in Table 2.

Table 2: Results of OLS

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UNEMP	0.456922	0.046092	9.913282	0.0000
GDPPC	3.82E-06	1.92E-06	1.989170	0.0593
CPI	0.002863	0.011219	0.255169	0.8010
WAGE	-0.005356	0.032900	-0.162780	0.8722
C	-8.540647	1.992996	-4.285330	0.0003

Note: R-squared=0.951820, Prob(F-statistic)= 0.000000

Source: Authors' Calculation

The results reveal that there is a positive and statistically significant relationship between rate of unemployment and net migration, which the expected since the Sri Lanka experienced as negative net migration country. This indicates that, when the unemployment rate increase by 1 percentage which tend to increase the net migration in negative term by 457 person. That is emigrants are higher than the immigrant by 457 person. Some of the existing studies (e.g., Fromentin, 2013; Lansing and Mueller, 1967; Saben, 1964) also supports to our finding. In addition, GDP per capita affect the net migration positively at 10% level of significance. In contrast, wage and cpi do not have statistically significant impact on emigration. This required us to use different estimation method instead of OLS in order to compare the consistency of the relationship. Thus, we employed ARDL bound testing approach in this regard.

According to the results of ADF unit root test, wage is I(0) while net migration is I(1) at 10% level of significance at the same time, other all variables such that unemployment rate, cpi and GDP per capita are I(1) at 5% level of significance when we included intercept only in the model. But, PP unit root test shows that net migration and GDP per capita are neither I(0) nor I(1) in this case. Both ADF and PP unit root approaches detected that net migration is neither I(0) or I(1) when the equation contain trend and intercept in the model (see Table 3 below).

Table 3: Results of ADF and PP Unit Root Test

Form	Variables	ADF		PP	
		Intercept	Trend & Intercept	Intercept	Trend & Intercept
Level	NETMIG	0.747	0.999	0.142	0.999
	UNEMP	0.120	0.832	0.120	0.819
	GDPPC	0.838	0.563	1.000	0.980
	CPI	0.999	0.736	0.999	0.742
	WAGE	0.055*	0.002**	0.041**	0.002***
1 st Difference	NETMIG	0.074*	0.112	0.109	0.142

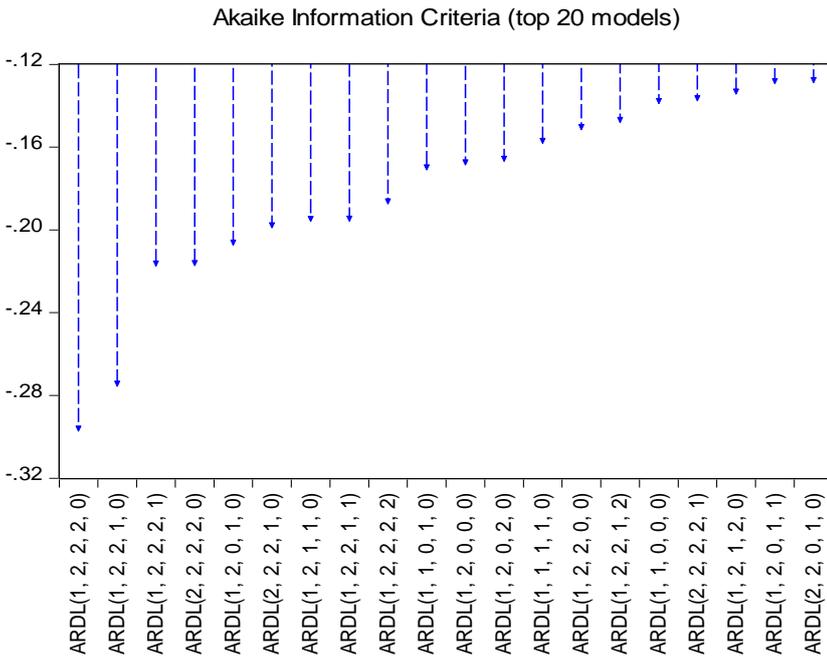
UNEMP	0.001***	0.003***	0.001***	0.003***
GDPPC	0.029**	0.012**	0.166	0.008***
CPI	0.045**	0.058*	0.047**	0.056*
WAGE	0.003***	0.013**	0.000***	0.000***

Note: Probability values are given in the Table. ***, **, * represents variables are stationary at 1%, 5% and 10% level of significance respectively.

Source: Authors' calculation

Now, we check the order of integration using other unit root test called KPSS in order to compare the consistency of the results. This unit root test procedure also confirm that there is no I(2) variables, i.e. wage is I(0) and others are I(1)²⁶⁸. Thus, taking in to consideration of ADF and KPSS procedure, which are confirmed that none of the variables are I(2) when the model include intercept only, we adopt Autoregressive Distributed Lag (ARDL) bound testing method to examine the relationship between the variables.

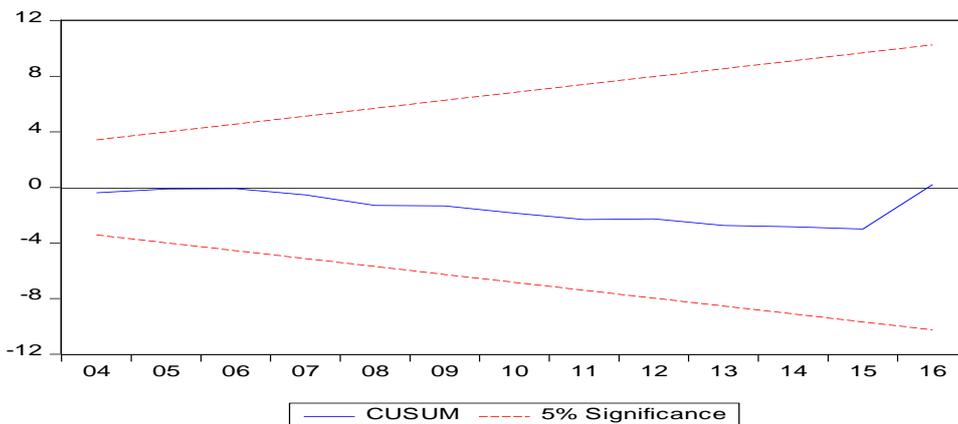
Next we employed AIC to select the optimum number of lag for each variables that can be included in the model. Since the lowest value is better, the results suggest that to employ ARDL (1, 2, 2, 2, 0) model among the top 20 models (see Fig 5 below).



Source: Authors' calculation

Fig 5: Results of Optimum Lag Length of Each Variable (AIC)

The CUSUM test plots lie between the lower and upper critical bounds at the 5% level of significance, which confirms the stability of the model (see the Fig 6 below).



Source: Authors' calculation

Figure 6: The Results of CUSUM Test for ARDL (1, 2, 2, 2, 0) model

The **ARDL (1, 2, 2, 2, 0)** model passed all the diagnostics tests (see Table 4, Panel B below). That is, firstly, Lagrange Multiplier (LM) test of autocorrelation advocates that the residuals are not serially correlated since we failed to reject the null hypothesis of no serial correlation in the residual as probability value is greater than the 5% level of significance. Second, according to the Jarque-Bera (JB) test, the null hypothesis of normally distributed residuals cannot be rejected as probability value is higher than 5% significance level, which indicates that error is normally distributed. Thirdly,

²⁶⁸ Results are not presented here but available upon request.

Breusch-Pagan-Godfrey (BPG) test of heteroscedasticity suggests that the disturbance term in the equation is homoscedastic as we failed to reject the null hypothesis since the probability value exceeded the 5% significance level. Finally, the Ramsey RESET test result confirms that there is no specification error in the estimated model since we accept the null hypothesis of no omitted variable in the model as probability value is greater than 5% level of significance.

Table 4: The Results of Diagnostics Test of ARDL (1, 2, 2, 2, 0)

Test	Probability value (F or Chi-square)
Serial Correlation [LM Test: $\chi^2_{(df)}$]	0.062
Normality Test (Jarque-Bera)	0.177
Heteroscedasticity (BPG Test)	0.251
Omitted Variable (Ramsey's RESET)	0.625

Source: Authors' calculation

The result of Wald test confirms that there is a long run relationship between the variables under considered in this study since we reject the null hypothesis of no cointegration among the variables due to the computed F-statistics (4.025) greater than the upper bound critical value (3.49) at 5% level of significance (see Table 5 below).

Table 5: The Results of ARDL Bounds Test

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	4.025577	10%	2.2	3.09
k	4	5%	2.56	3.49
		1%	3.29	4.37

Source: Authors' calculation

Therefore, now we can estimate the model further in order to identify the long run relationship between the variables, which are given in the Table 6 below:

Table 6: The Results of ARDL Long run Form

Dependent Variable: D(netmig)					
Panel A: The Results of Long run Coefficients					
Cons	unemp	gdppc	cpi	wage	R ²
-14.86851 (-3.376)	0.8372*** (3.103)	8.08E-06* (2.099)	0.0044 (0.268)	-0.0228 (-0.461)	0.980

Note: Test statistics are given in the parenthesis. ***, **, * represents the variables are significant at 1%, 5% and 10% level of significance respectively.

The long run form of ARDL results reveals that unemployment and GDP per capita has positive and significant impact on net migration in the long-run while other variables, CPI and wage, do not have significant impact on it. Nevertheless, former variable affects at 1% level of significance whereas later affects at 10% significance level. The finding of this study regarding the impact of unemployment on net migration is similar to some of the existing studies (e.g., Fromentin, 2013; Lansing and Mueller, 1967; Saben, 1964) and as the expectation. Because, Sri Lanka's data of immigration and emigration shows that the net migration (that is, immigrants minus emigrants) is negative and it increases continuously in absolute term. The reason is since the people living in area where they are facing difficulties to find the job are expected to move to places that having brighter futures. In addition, unstable political situation in the country until middle of 2009 also another reason for emigrants are higher than immigrants in Sri Lanka. But, after 2009 also net migration increases in absolute term due to increase in skilled labor emigrants. The results of OLS also found the same conclusion as in this form.

Finally we estimated the error correction representation of ARDL model in order to identify the short run relationship and long run adjustment between the variables. The results are given below:

Table 7: Results of Error Correction Representation of ARDL Model

Dependent Variable: Δ NETMIG			
Variables	Lag order		
	0	1	2
Δ NETMIG		-0.5854 (-1.73)	
Δ UNEMP	0.1935** (2.62)	0.3366*** (4.39)	0.2488*** (3.56)
Δ GDPPC	1.59E-05*** (3.73)	-3.96E-06 (-1.71)	-1.20E-06 (-0.41)
Δ CPI	0.0219 (1.54)	0.0179 (1.26)	-0.0682*** (-4.09)
Δ WAGE	0.0122 (0.52)		
ECT(-1)	-0.5736 (-5.45)		
R ²	0.924		
F - Stat	11.18246		

Note: Test statistics are given in the parenthesis. ***, **, * represents the variables are statistically significant at 1%, 5% and 10% level of significance respectively.

Source: Authors' calculation

The above table explains that as in the long run results and some of the existing studies that earlier we have discussed current and one and two year lagged value of rate of unemployment have positive and significant impact on net migration in the short run. The reason could be as we explained in under the long term situation. There is positive and significant relationship between current value of GDP per capita and net migration whereas CPI and wages do not affect net migration significantly in the short run. Further, coefficient of error correction term (ECT) is significant and negative implies that the model can get back to long run steady state line (or equilibrium) at the speed of 57.36% in each year one period after the exogenous shocks.

Finally we discuss the direction of causality between the variables via error correction representation of ARDL model. The results are presented below:

Table 8: The Results of Granger Causality Test

Null Hypothesis	Probability Value	Decision
Unemployment → Net migration	0.0042	Reject
Net migration → Unemployment	0.2312	Failed to Reject
GDPPC → Net migration	0.0089	Reject
Net migration → GDPPC	0.4123	Failed to Reject
CPI → Net migration	0.0039	Reject
Net migration → CPI	0.6213	Failed to Reject
Wage → Net migration	0.6144	Failed to Reject
Net migration → Wage	0.3452	Failed to Reject

Source: Authors' calculation

The results reveal that there is a unidirectional causality relationship between unemployment and net migration, GDP per capita and net migration and CPI and net migration in the long run at 5% level of significance. This causality relationship is running from unemployment to net migration, GDP per capita to net migration and CPI to net migration.. Further there is no causality relationship between other variables.

4. CONCLUSION AND POLICY RECOMMENDATIONS

ADF and KPSS unit root test confirmed that none of the variables are I(2), which allows us to examine long run relationship between the variables using Autoregressive Distributed Lag (ARDL) bound testing method. AIC is suggested to adapt ARDL (1, 2, 2, 2, 0) model among the top 20 models. This model passes the all the diagnostic test. The bound testing results detected the cointegrating relationship between the variables. The result of ARDL bounds test and Error Correction version of ARDL model reveal that unemployment and per capita GDP have positive and significant impact on net migration in the long run and the short run while other variables do not have significant impact on net migration in both periods. The result of CUSUM test discloses that the estimated model is stable. The negative and significant coefficient of error correction term reveals that net migration moves backward towards steady state line with the speed of 57.63 % in each period one period after the exogenous shocks. Both ARDL model passes the all the diagnostic test. Moreover, Granger causality test identified a causal relationship that stemming from unemployment to net migration, GDP per capita to net migration and consumer price index to net migration. Since the unemployment causes to emigration, the government of Sri Lanka should take necessary action to reduce the rate unemployment by providing relevant job for youth and should implement restrictive or selective migration policy in order to prevent the emigration of skilled people.

REFERENCES

- Borjas, G. J. (2003). "The Labor Demand Curve is Downward Sloping: Reexamining the Impact of Immigration on the Labor Market," *Quarterly Journal of Economics*, MIT Press, 118(4), p.p 1335-1374.
- Borjas, G.J. (1994). "The Economics of Immigration". *Journal of Economic Literature*, 22: 1667-1717.
- Borjas, G. J., Freeman, R. B. and Katz, L. F. (1997). "How Much Do Immigration and Trade Affect Labor Market Outcomes?," *Brookings Papers on Economic Activity*, Economic Studies Program, The Brookings Institution, 28(1), p.p 1-90.
- Card, D. (2005). "Is the new immigration is really so bad?" NBEG Working paper #115447
- Card, D. (2009). "Immigration and Inequality," *American Economic Review*, American Economic Association, 99(2), p.p 1-21.
- Card, D. (1990). "The impact of the Mariel boatlift on the Miami labor market," *Industrial and Labor Relations Review*, Cornell University, ILR School, 43(2), p.p. 245-257.
- Cohen-Goldner, S. and Paserman, M.D. (2004). "The Dynamic Impact of Immigration on Natives' Labor Market Outcomes: Evidence from Israel. IZA DP, No. 1315
- Damette, O. and Fromentin, V. (2013). "Migration and Labour Markets in OECD Countries: a Panel Cointegration Approach", *Applied Economics*, 45, p.p. 2295-2304.
- Dustmann, C. A., Fabbri, J. and Preston, I. (2005). "The Impact of Immigration on the UK Labour Market. CreAM Discussion Paper, 01/05.
- Dustmann, C., Glitz, A. and Frattini, T. (2008). *The Labour Market Impact of Immigration*. CR eAM Discussion Paper Series No. 0811, University College London
- Friedberg, R. M. (2001). "The Impact of Mass Migration on the Israeli Labor Market," *Quarterly Journal of Economics*, MIT Press, 116(4), p.p. 1373-1408.

- Galloway, R. and Josefowicz, J. (2008). "The Effects of Immigration on Regional Unemployment Rates in the Netherlands", *International Atlantic Economic Society*, 14, pp. 291-302.
- Gross, D. M. (2004). "Impact of Immigrant Workers on a Regional Labour Market", *Applied Economics Letters*, 11, pp. 405-408.
- Gross, D.M. (2002). "Three Million Foreigners, Three Million Unemployed? Immigration Flows and the Labour Market in France.", *Applied Economics*, 34, pp. 1969-1983.
- Grossman, J. B. (1982). "The Substitutability of Natives and Immigrants in Production," *The Review of Economics and Statistics*, MIT Press, 64(4), pp. 596-603.
- Harris, J., and Todaro, M. (1970). "Migration, Unemployment and Development: A Two-Sector Analysis.", *American Economic Review*, 60(1), pp. 26-42.
- Julie DaVanzo (1978). "Does Unemployment Affect Migration? Evidence from Micro Data". *The Review of Economics and Statistics*, 60(4), pp. 504-514.
- Longhi, S., Nijkamp, P. and Poot, J. (2010). "Joint Impacts of Immigration on Wages and Employment: Review and Meta-Analysis", *Journal of Geographical Systems*, 12, pp. 355-387.
- Okkerse, L. (2008). "How to Measure Labour Market Effects of Immigration: A Review", *Journal of Economic Surveys*, 22, pp. 1-30.
- Ottaviano, Gianmarco I. P. and Giovanni Peri (2012). "Rethinking the Effect of Immigration on Wages," *Journal of the European Economic Association*, European Economic Association, 10(1), pp. 152-197.
- Peri, Giovanni and Chad Sparber (2009). "Task Specialization, Immigration, and Wages," *American Economic Journal: Applied Economics*, American Economic Association, 1(3), pp. 135-69.
- Pischke, J., and Velling, J. (1997). "Employment Effects of Immigration to Germany: An Analysis Based on Local Labor Markets.", *The Review of Economics and Statistics*, 79(4), pp. 594-604.
- Todaro, M. (1969). "A Model of Labor Migration and Urban Unemployment in Less Developed Countries", *American Economic Review*, 69, pp. 486-499.
- Winter-Ebmer, R. and Zweimuller, J. (1999). "Do Immigrants Displace Young Native Workers: the Austrian Experience.", *Journal of Population Economics*, 12, pp. 327-340.

RS09.1. Real Estate and Housing

1144 DEVELOPMENT PREMIUMS AND PROPERTY MARKETS IN INDONESIA

ABSTRACT

This paper investigates the Indonesian property market with a particular emphasis on understanding development patterns in rural and low population density regions. We use implicit price estimates from property markets using a technique which yields robust results in areas with sparse data to analyze spatial trends in the development premium for residential and commercial properties in Indonesia. Our findings elaborate how market incentives to invest in residential and commercial development vary by region, level of development, population density, and political context. Our research fills an empirical void on development patterns in developing countries, particularly related to residential and commercial land development. We use a uniquely compiled dataset of over 80,000 residential, commercial, and undeveloped land prices extracted from an Indonesian online classifieds website, which we join to local census level data. We then estimate a geographically weighted regression and a multilevel regression with poststratification. The geographically weighted regression provides a descriptive analysis of the spatial patterns, while the multilevel regression with poststratification provides robust estimates in rural and low population density regions with fewer observations by linking property characteristics with census level data. This approach is particularly advantageous for datasets with regions of sparse data, a common problem in property market research in developing countries. The spatial extent of our data allows us to examine the spatial distribution of implicit property prices in a developing country, and the multilevel regression with poststratification enables us to further describe aspects of the property market in less populated areas with relatively scarce available data on property prices. We use the estimation results to construct a spatial index evaluating the premium for residential and commercial properties by extracting regency specific price levels for undeveloped land, residential properties, and commercial properties. This index yields a series of maps examining the geographic distribution of development premiums. In addition, we test multiple hypotheses to explain differences in the development premiums, including urban vs rural, proximity to Jakarta, the central economic hub of Indonesia, and local political differences. Overall, this research makes three significant contributions to the literature: (1) the multilevel regression with poststratification allows for robust estimates in rural and low population density regions, which to date have greatly understudied property markets in developing countries, (2) we provide a descriptive analysis of the spatial variation in relative premiums for commercial and residential development across the country, and (3) we link development premiums with regional characteristics which provide descriptive explanations for differences in the premiums. This is the first research paper to our knowledge to utilize such a large dataset of property prices in a developing country to examine development patterns and provides critical insights into understanding development trends in these areas of the world.

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1228 EQUITY IN JOB ACCESSIBILITY AND ENVIRONMENTAL QUALITY IN A SEGMENTED HOUSING MARKET: THE CASE OF GREATER LONDON*Like Jiang, Alex Hagen-Zanker*, Prashant Kumar*

Department of Civil and Environmental Engineering, University of Surrey

*Corresponding author at: Department of Civil and Environmental Engineering, University of Surrey Guildford, GU2 7XH, UK. Email: a.hagen-zanker@surrey.ac.uk**ABSTRACT**

Public services and resources such as job accessibility and environmental quality are often not equally distributed in spatial and/or social dimensions within metropolitan regions. Availabilities of these public services and resources affect the quality of residential locations, and can be expected to be capitalised into house prices. For prospective house owners, selections of properties will be based on their preferences and appreciations of different attributes of the properties, but also be constrained by their housing budgets. Such a constraint may lead to segmentation of local housing markets into submarkets by price bands, and availabilities of public services and resources, as well as prices of them, might be different between the resulted submarkets. In such a case, distribution of public services and resources might be highly dependent on the public's abilities to pay for housing, rather than based on their needs for, consumptions of, or expenses on each specific service or resource. Using Greater London as the case metropolitan region, this study examined the existence of housing submarkets by price bands, and explored the differences in availabilities, prices and trade-offs of job accessibility and environmental quality between the submarkets. Results of this study show that submarkets by price bands did exist in Greater London, and indicate that households with lower housing budgets were more likely to have lower job accessibility but enjoy higher environmental quality. They were also more likely to pay less, in relative to the total house price, for both job accessibility and environmental quality.

Keywords: social equity, job accessibility, environmental quality, submarket, hedonic price model

1. INTRODUCTION

Public services and resources such as schools, hospitals, transport infrastructure, green space, clean air, clean water, etc. are often not equally distributed in spatial and/or social dimensions within metropolitan regions, as the distributions can be affected by various factors such as ecological and physical constraints, predefined standards in the planning systems, political activism, and market process (Lucy, 1981; Mitchell, 2005; Talen, 1998). Regardless of varied conceptions of fairness, numerous studies have demonstrated the unequal distributions of various public services and resources, for example, healthcare facilities among different residing locations (Jin et al., 2015; Matsumoto et al., 2012), public transport service among different age, income and car-ownership groups (Riccardi et al., 2015), job accessibility among different racial and income groups (Grengs, 2012), green space among different racial and income groups (Sister et al., 2010; Talen, 1997), air quality among different income and education groups (Crouse et al., 2009; Padilla et al., 2014).

Availabilities of these public services and resources affect the quality of residential locations, and can be expected to be capitalised into house prices. Based on hedonic price modelling (Rosen, 1974), great amounts of research has been made to study the values or implicit prices of individual housing attributes, including specific public services and resources available to the properties. For example, for job accessibility, Ottensmann et al. (2008) shows every 10 km increase in mean distance to employment centres leads to decreases in house price by around 9% in Indianapolis, US, while every 10 minutes increase in mean travel time by car leads to price decreases by around 12.5%. With multiple measures tested, Osland & Thorsen (2008) concluded that job accessibility can explain variations of up to 0.8 million NOK in house price in the southern Rogaland region of Norway, compared to variations of up to 0.7 million explained by CBD accessibility. For green space, McLeod (1984) investigated the demand in Perth, Australia, and found that decrease in distance to parks by one street block increases house prices by 3%. In a recent study in Leipzig, Germany, Liebelt et al. (2018) found €1.15/m² to €1.52/m² increases in house price depending on property type for every 1% increase in area of green space within 300m from the properties. For air quality, a meta-analysis made by Smith & Huang (1995) reports an interquartile range of house price increase from 0 to \$98.52 for 1 mg/m³ reduction in total suspended particulates in US cities, when the annual incomes were around \$15,000. More recently, Kim et al. (2010) found increases in house price by from 5.23% to 11.32% for 1 ton/km³ decrease in total suspended particulates in four regions in the US. For sound environment, Lake et al. (1998) shows that each dB(A) increase in road traffic noise calculated in L_{10,18h} decreases property prices by 1.07% in Glasgow, Scotland, whereas in Baranzini et al. (2010) it shows that each dB(A) increase in daytime road traffic noise reduces the rent of residential properties by around 0.23% in Geneva, Switzerland. Other examples can be found for transport service (Debrezion et al., 2007; So et al., 1997), schools (Haurin & Brasington, 1996; Sah & Conroy, 2016), shopping centres (Colwell et al., 1985; Des Rosiers et al., 1996), etc.

For prospective house owners, selections of properties will be based on their preferences and appreciations of different attributes of the properties, but also be constrained by their housing budgets (Hausman & Wise, 1980; McMillan, 1979). As for many households the housing budget makes up a very large share of their total household budget, there would be little flexibility in increasing housing budget for more desired options (Stone, 2006). Thus, their options will be limited to properties within certain price bands depending on their housing budgets. Such a constraint may lead to segmentation of local housing markets into submarkets by price bands, as a result of differences in housing supply and demand between price bands.

The existence and significance of housing submarkets have long been debated (Watkins, 2001). It is argued that a market cannot be characterised by a single price model where submarkets exist, due to differences in capitalisations of housing attributes between submarkets (Watkins, 2001). However, interests have more often been found in submarkets defined in spatial and/or structural dimensions (e.g. Allen et al., 1995; Bourassa et al., 1999; Maclennan & Tu, 1996; Wu & Sharma, 2012), few studies have been made to examine submarkets defined by price bands. While there are studies on submarkets by income groups (e.g., Munro, 1986; Schnare & Struyk, 1976), or studies where income and/or other indicators of wealth are included in cluster analysis to empirically identify submarkets (e.g., Day, 2003, Keskin & Watkins, 2017), they do not directly examine whether households are allocated to different submarkets depending on the amount of money they are able to pay, i.e., their housing budgets.

If submarkets by price bands do exist, availabilities of public services and resources might be different between the submarkets depending on their spatial distributions, and prices of these services and resources would also vary between the submarkets due to different capitalisations. In such a case, distribution of public services and resources might be highly dependent on the public’s abilities to pay for housing, rather than based on their needs for, consumptions of, or expenses on each specific service or resource.

Therefore, this study aims to examine the existence of housing submarkets by price bands, and consequently, explore the potential differences in the availabilities, prices and trade-offs of public services and resources, in particular, job accessibility and environmental quality, between the submarkets. Greater London was used as the case metropolitan region, and a database of structural, neighbourhood, environmental and accessibility attributes of the sample properties was built for spatial analysis and hedonic price modelling. While this study does not debate on equity judgements, i.e., who should get what, findings of this study will shed light on the role of the housing market in equity and/or inequity in distributions of public services and resources in metropolitan regions.

The paper is structured as follows: Section 2 describes the dataset and variables used in this study; Section 3 details the steps of defining submarkets by price bands and examining their existence; Section 4 gives the final hedonic price models accounting for spatial autocorrelation; Section 5 compares the submarkets; and Section 6 concludes the paper.

2. DATASET

2.1. Case city and sample properties

Greater London was used as the case metropolitan region for this study, and house price data was collected from the Price Paid Data (HM Land Registry, 2017), which contains sales prices of properties in England and Wales submitted to Her Majesty’s Land Registry for registration. In total, 85732 sale prices were registered in Greater London during the year 2011 and they were used for this study. The year 2011 was chosen since most of the available data for socio-economic information of London were based on the UK 2011 Census (see Section 2.3).

2.2. Structural attributes

Due to the unavailability of Ordnance Survey’s AddressBase data through Edina DigiMap for academic research during the time of this study, it was not possible to link each property sale price to building features on map to estimate the floor area and height of the property or the size of the plot. Thus, only property type, tenure type and whether new build, which were provided in the Price Paid Data, were used as structural attributes (Appendix 1).

2.3. Neighbourhood attributes

Neighbourhood attributes were constructed based on the UK 2011 Census data (Office for National Statistics, 2017a). A list of the used attributes can be found in Appendix 1. All the attributes were on Lower Layer Super Output Area (LSOA) level except the secondary school Ofsted rating which was on ward level. Values of these neighbourhood attributes were attached to the house price data according to the LOSAs and wards that the properties were located in.

As would be expected, many of the neighbourhood attributes were highly correlated with each other. To reduce collinearity between independent variables to be entered into the hedonic price models, principal component analysis was used to identify major dimensions of associations between these neighbourhood attributes, and eight principal components were produced to replace the variables. Table 1 lists the components with interpretation.

Table 1. The principal components of neighbourhood attributes.

Component	Variation explained	Cumulative variation explained	Attributes with high positive loading	Attributes with high negative loading	Interpretation
Component 1	25.2%	25.2%	car ownership, home ownership, % couple households, % detached and semi-detached houses, % aged 45-64,	% household without cars, % flats, % one person household, population density, % aged 16-44, % property rented	Neighbourhoods with higher car and home ownerships, more couple households and in less populated areas
Component 2	18.6%	43.8%	% people with day-to-day activities limited, % people with fair or bad health, % people with no or low qualifications, unemployment	% people with day-to-day activities not limited, % people with good health, % people with high qualifications, employment	Neighbourhoods where residents are less healthy, less educated, and less employed

			rate	rate	
Component 3	8.5%	52.3%	% black people and people of mixed ethnic groups, % lone parent household, % aged 0-15, unemployed rate		Neighbourhoods with more black and mixed-ethnic residents, and more children
Component 4	7.9%	60.2%	% white people, % UK born people,	% Asian, % people with other qualifications	Neighbourhoods with more white and native residents
Component 5	5.6%	65.9%	Ofsted primary school rating, Ofsted secondary school rating	KS2 Assessment score, Level 3 score	Neighbourhoods with schools of lower performances
Component 6	5.0%	70.9%	% people with Level 3 qualifications, % school children and full-time students	employment rate	Neighbourhoods with more university students
Component 7	4.0%	74.9%	% terraced house, % household with one car		Neighbourhoods with more typical mid-class households
Component 8	3.2%	78.1%	% household spaces with no usual resident, crime rate		Neighbourhoods that are less safe

2.4. Accessibility attributes

Accessibility attribute used in this studies focused on accessibility to jobs, which is of main interest to this study. A list of the attribute can be found in Appendix 1. All attributes were on LSOA level. Apart from travel time, destination and origin indicators to employment centres by public transport/walk, by cycle and by car obtained from Department for Transport (2017a), we also calculated accessibility to jobs of the seven NS-SeC categories (Office for National Statistics, 2017b) by car based on Hansen’s original formula (Hansen, 1959), taking into account travel time and number of jobs.

We also included attributes that describe the Public Transport Accessibility Level (PTAL) in Greater London, which is a measure of the accessibility of a point to the public transport network, taking into account walk access time and service reliability, number and frequency (Transport for London, 2017).

2.5. Environmental attributes

Environmental attributes used in this studies include air quality, noise, land cover and accessibility to parks. A list of the attribute can be found in Appendix 1. Values of air quality and noise attributes were assigned to each property by overlaying air quality and noise maps (Department for Environment, Food and Rural Affairs, 2017; Greater London Authority, 2017; Department for Transport, 2017b) onto location points of properties in GIS. Since we did not have exact property location data, centroids of post code units where the properties were located were used as their location points.

Land cover ratios within each LSOA were calculated in GIS based on Ordnance Survey MasterMap (Ordnance Survey, 2017) and Greenspace Information for Greater London’s open space data (Greenspace Information for Greater London, 2017a). Data on accessibility to parks by four park categories and to nature were obtained from Greenspace Information for Greater London (2017b), and the measures were on ward level.

3. EXAMINING THE EXISTENCE OF SUBMARKETS BY PRICE BAND

The examination followed the procedure introduced by Schnare & Struyk (1976) which has been commonly used in subsequent studies for testing submarket existence. We first defined a number of potential submarkets by price bands, and then defined the specification of the hedonic models to be developed. Finally, we tested for significant differences in model parameters between the submarkets, which indicate differences in monetarisation of housing attributes between the submarkets, and thus the existence of the submarkets.

3.1. Defining the potential submarkets

To define the submarkets in an a priori manner by price bands, the number of submarkets needed to be determined first. According to the 2011 Great British Class Survey (Savage et al., 2013), households in the UK can be divided into seven social classes, among which four housing groups can be identified, as shown in Table 2. Without more relevant stratification schemes available, assuming four submarkets were thought to be appropriate for the purpose of this study. Nevertheless, it should be noted that the housing market in London is distinct from the rest of the UK, and the average house prices could be expected to be much higher than those reported in Savage et al. (2013).

Table 2: The four housing groups based on results of the Great British Class Survey (Savage et al., 2013).

Housing group	Average house price	Social class
1	£325k	Elite
2	£163k - £177k	Established middle class, Technical middle class
3	£127k - £129k	New affluent workers, Traditional working class
4	N/A (likely to rent)	Emergent service workers, Precariat

To determine the range of each price band that demarcates the submarkets, optimal locations of the three price breakpoints were estimated, by minimising the sums of squared errors of the four resulted hedonic price models (one for each resulted submarket) over all possible alternatives, to achieve the best fit to the data. The calculation was run in R and the package 'strucchange' was used (Zeileis et al., 2002). To reduce calculation load, smaller datasets, each

containing 10000 house sales randomly selected from the full sample with a limited number of key attributes, were used for the calculation. Five random samples each with two different sets of key attributes were tested and their results compares. The ten sets of estimated breakpoints have similar locations. Based on these locations, we defined the four submarkets to be tested: Submarket 1: below £190,000, 14610 properties; Submarket 2: £190,000 - £320,000, 33770 properties; Submarket 3: £320,000 - £595,000, 24471 properties; Submarket 4: above £595,000, 12881 properties (Figure 1).

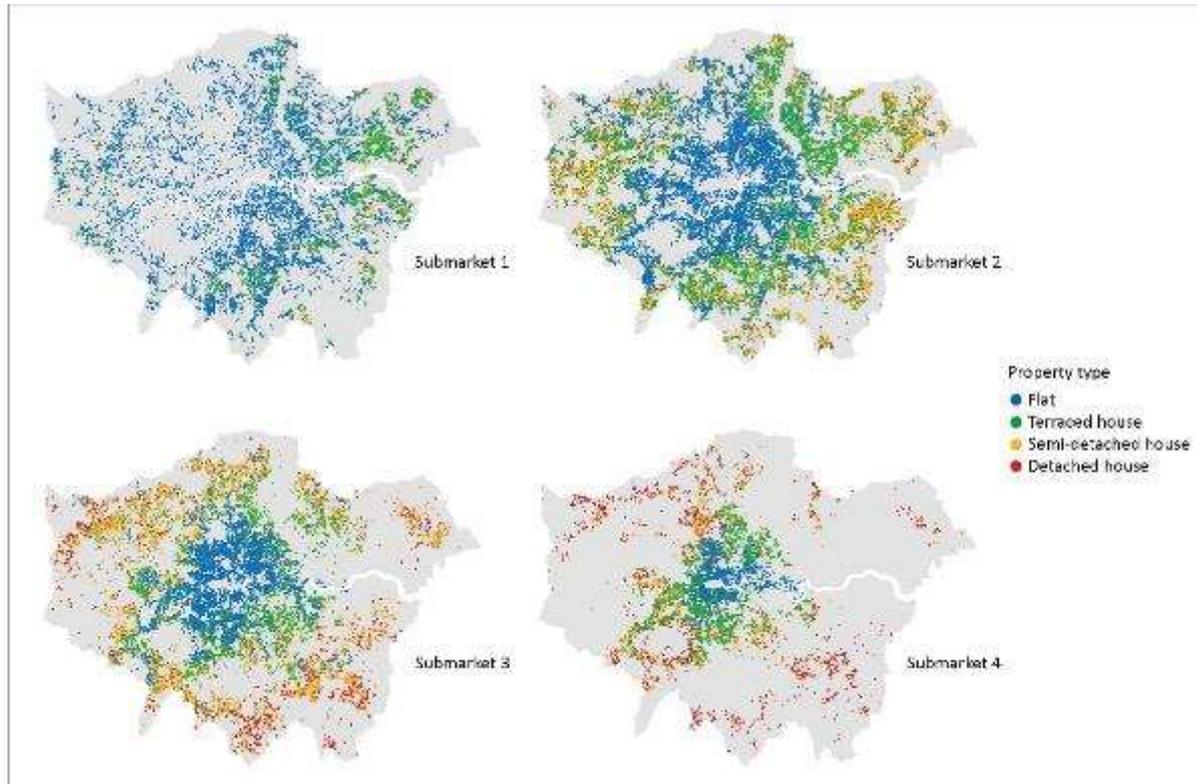


Figure 1. The four submarkets by price band: Submarket 1: below £190,000, 14610 properties; Submarket 2: £190,000 - £320,000, 33770 properties; Submarket 3: £320,000 - £595,000, 24471 properties; Submarket 4: above £595,000, 12881 properties.

3.2. Defining the model specification

We used the natural logarithm of house price as the dependent variable and kept the independent variables untransformed. For one reason, we were interested in comparing marginal prices of housing attributes in relative to the house prices (e.g., per unit increase in air quality costs a certain percentages of the house price) between submarkets, for the other, this is a usual assumption of functional form in the absence of indications from the literature (Day, 2003).

With the existence of submarkets, it would be expected that model specifications that best describe the characters of the submarkets would differ from each other. However, to be able to compare the marginal prices of housing attributes between submarkets, consistency in model specifications across the submarkets was needed. For this purpose, we first ran an ordinary least square (OLS) regression with backward stepwise variable selection for each submarket, to get model specifications that fit the individual datasets. Then we adjusted variable selections in each model, controlling multicollinearity and significance, as well as taking into account research interests, to achieve the same model specification for the four submarkets. Table 3 shows the achieved model specification and the resulted models details. It should be noted that R²s of the submarket models are very low. This is probably due to the relatively narrow range of price in each submarket, which means even small variations in price due to error could lead to a low R².

Table 3. Hedonic price models for the full sample and the four submarkets, using ordinary least square regression.

Variable	Full sample	Submarket 1	Submarket 2	Submarket 3	Submarket 4
Constant	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Whether detached house (1 = yes, 0 = no)	11.504	11.929	12.341	12.536	11.027
Whether semi-detached house (1 = yes, 0 = no)	0.989	0.082	0.174	0.221	0.67
Whether terraced house (1 = yes, 0 = no)	0.7	0.16	0.142	0.145	0.519
Whether new build (1 = yes, 0 = no)	0.56	0.152	0.098	0.122	0.427
Neighbourhood Component 1 (score with 0 mean for full sample)	0.168	0.072	0.054	0.037	0.16
Neighbourhood Component 2 (score with 0 mean for full sample)	-0.035	0.012	-0.004	-0.016#	-0.084#
Neighbourhood Component 3 (score with 0 mean for full sample)	-0.159	-0.019	-0.031	-0.037	-0.093
Neighbourhood Component 3 (score with 0 mean for full sample)	-0.106	-0.02	-0.025	-0.015	-0.041

Neighbourhood Component 4 (score with 0 mean for full sample)	0.066	0.012	0.009	0.019	0.012*
Neighbourhood Component 5 (score with 0 mean for full sample)	-0.245	-0.02	-0.042	-0.051	-0.176
Neighbourhood Component 6 (score with 0 mean for full sample)	-0.043	-0.01	-0.01	-0.01	-0.024
Neighbourhood Component 7 (score with 0 mean for full sample)	-0.083	-0.009	-0.02	-0.023	-0.084
Neighbourhood Component 8 (score with 0 mean for full sample)	0.078	-0.017	-0.007	0.01	0.108
Public Transport Accessibility Levels (0 = poor, 6 = good)	-0.019	0.009	-0.004	-0.005	-0.04
Number of employment centres with at least 100 jobs available by public transport/walk	0.083	0.025	0.008	0.027	0.054
Number of employment centres with at least 500 jobs available by public transport/walk	0.123#	-0.038#	0.02#	0.02#	0.268
Number of employment centres with at least 100 jobs available by cycle	-0.096	-0.017	-0.002*	-0.028	-0.098
Number of employment centres with at least 500 jobs available by cycle	0.005*#	0.039#	-0.0001*#	0.007*#	-0.007*
Index of job accessibility by car considering travel time and number of jobs (all job categories)	0.067	0.004	0.012	0.013#	0.054#
% homes with deficiency in access to nature in the ward	-0.001	-0.0002	-0.0001	-0.0002	-0.001
% open green space in land cover in the LSOA	0.002	-0.0001*	0.0002	0.0003	0.001*
% building in land cover in the LSOA	0.004	-0.001	0.0003	0.001	-0.004#
Annual average nox concentrations (ug/m3)	-0.001	-0.001	0.0001*	-0.0002*#	-0.003#
Annual average PM2.5 concentrations (ug/m3)	-0.012#	0.007*	-0.009#	0.004*#	0.01*#
Annual average road noise level (Lden)	-0.004	-0.0002*	-0.001	-0.001	0.001*
Annual average rail noise level (Lden)	-0.007	-0.002	-0.001	-0.002	-0.003*
Observations	85732	14610	33770	24471	12881
R ²	0.633	0.096	0.169	0.154	0.326
Adjusted R ²	0.633	0.095	0.169	0.153	0.325
Log likelihood	-39504.5	2049.8	21801.7	10399.8	-6514.46
Akaike info criterion	79061.0	-4047.5	-43551.4	-20747.6	13080.9
Schwarz criterion	79304.4	-3850.2	-43332.3	-20536.9	13275

* not significant at 0.05 level
 # 5 ≤ VIF < 10 (otherwise < 5)

3.3. Testing differences in model parameters between the submarkets

Differences in model parameters between the four submarkets were tested using Chow test. The test statistic is given by: RSS_c

$$F = \frac{RSS_c - RSS_i - RSS_j}{k} \times \frac{N_i + N_j - 2k}{RSS_i + RSS_j} \quad (1)$$

where RSS_i , RSS_j and RSS_c are the residual sum of squares of the models of Submarket i , Submarket j and the combined model respectively, N_i is the number of observations in Submarket i and N_j is the number of observations in Submarket j , and k is the number of model parameters.

Table 4 shows the Chow test results. All the F values are larger than the critical values, suggesting that significant differences in model parameters exist between all the four submarket.

The Chow test results were further confirmed by comparing the sum of the weighted standard errors of the submarket models to the standard error of the full-sample model. The sum of the weighted standard errors of the submarket models is calculated by:

$$SE_{sw} = \frac{N_1 - k}{\sum(N_j - k)} SE_1 + \frac{N_2 - k}{\sum(N_j - k)} SE_2 + \dots + \frac{N_j - k}{\sum(N_j - k)} SE_j \quad (2)$$

where N_j is the number of observations in Submarket j and there are j submarkets, and k is the number of model parameters.

The result shows a large reduction in standard error from 0.38 of the full-sample model to 0.19 with the four submarkets. Thus, there is clear evidence of the existence of submarkets defined by the four price bands, and that marginal prices of housing attributes are not constant between the four submarkets.

Table 4. Chow test results for the four submarkets

	Sub market 1	Sub market 2	Sub market 3
Sub market 2	2351.3949*		
Sub market 3	3683.5174*	3905.0982*	

Sub market 4	1442.7107*	3267.3927*	1541.6186*
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* Significant at 0.01 level

4. SPATIAL REGRESSION

Since spatial autocorrelation would normally be expected in house prices (Dubin, 1992; Pace & Gilley, 1997), diagnostics for spatial autocorrelation was conducted for each of the four submarket OLS regression models, as well as for the full-sample model. The Diagnostics was conducted in GeoDa (Anselin et al., 2006), and a distance-based spatial weight with a threshold distance of 200m was used.

The results show that for all the models, both the Lagrange multiplier tests for spatial error dependence and for spatial lag dependence were highly significant, suggesting existence of spatial autocorrelation. Since in our study, spatial autocorrelation was considered a nuisance, spatial error models were used as the alternative to OLS models to address the issue. Table 5 shows the spatial error models for the four submarkets and the full sample. As expected, the parameters do not differ remarkably from those of the counterpart OLS models in Table 3. However, the increased values of R² and log likelihood and the decreased values of Akaike info criterion and Schwarz criterion of the spatial error models indicate improvements in general model fit.

Table 5. Hedonic price models for the full sample and the four submarkets, accounting for spatial autocorrelation using spatial error regression.

	Full sample	Submarket 1	Submarket 2	Submarket 3	Submarket 4
Variable	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Constant	11.429	11.949	12.305	12.48	11.205
Whether detached house (1 = yes, 0 = no)	0.974	0.089	0.188	0.229	0.753
Whether semi-detached house (1 = yes, 0 = no)	0.698	0.161	0.15	0.152	0.604
Whether terraced house (1 = yes, 0 = no)	0.578	0.157	0.106	0.127	0.496
Whether new build (1 = yes, 0 = no)	0.15	0.066	0.054	0.032	0.133
Neighbourhood Component 1 (score with 0 mean for full sample)	-0.025	0.012	-0.006	-0.018	-0.081
Neighbourhood Component 2 (score with 0 mean for full sample)	-0.126	-0.018	-0.031	-0.035	-0.078
Neighbourhood Component 3 (score with 0 mean for full sample)	-0.079	-0.02	-0.025	-0.014	-0.03
Neighbourhood Component 4 (score with 0 mean for full sample)	0.059	0.011	0.009	0.018	-0.008*
Neighbourhood Component 5 (score with 0 mean for full sample)	-0.207	-0.019	-0.041	-0.05	-0.159
Neighbourhood Component 6 (score with 0 mean for full sample)	-0.033	-0.008	-0.009	-0.009	-0.02
Neighbourhood Component 7 (score with 0 mean for full sample)	-0.071	-0.009	-0.02	-0.022	-0.074
Neighbourhood Component 8 (score with 0 mean for full sample)	0.051	-0.016	-0.006	0.007	0.088
Public Transport Accessibility Levels (0 = poor, 6 = good)	-0.011	0.008	-0.004	-0.005	-0.03
Number of employment centres with at least 100 jobs available by public transport/walk	0.025	0.021*	0.006*	0.023	0.027*
Number of employment centres with at least 500 jobs available by public transport/walk	0.131	-0.037	0.024	0.026	0.258
Number of employment centres with at least 100 jobs available by cycle	-0.08	-0.015*	-0.002*	-0.021	-0.089
Number of employment centres with at least 500 jobs available by cycle	0.019	0.038	-0.001*	0.003*	-0.033*
Index of job accessibility by car considering travel time and number of jobs (all job categories)	0.069	0.005	0.012	0.013	0.055
% homes with deficiency in access to nature in the ward	-0.001	-0.0002	-0.0001	-0.0002	-0.001
% open green space in land cover in the LSOA	0.001	-0.0001*	0.0002	0.0004	0.001
% building in land cover in the LSOA	0.002	-0.001	0.0002*	0.001	-0.002
Annual average nox concentrations (ug/m3)	-0.002	-0.001	-0.00004*	-0.0003	-0.003
Annual average PM2.5 concentrations (ug/m3)	0.005*	0.005*	-0.008	0.005*	0.023*
Annual average road noise level (Lden)	-0.004	-0.0003*	-0.001	-0.001	0.002*
Annual average rail noise level (Lden)	-0.006	-0.002	-0.002	-0.001	-0.006
LAMBDA	0.617	0.246	0.289	0.301	0.463
Observations	85732	14610	33770	24471	12881
R ²	0.709	0.155	0.239	0.215	0.425
Log likelihood	-31561.0	2399.7	22937.1	11069.4	-5741.2
Akaike info criterion	63174.0	-4747.5	-45822.3	-22086.8	11534.5

Schwarz criterion	63417.4	-4550.1	-45603.2	-21876.1	11728.5
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*not significant at 0.05 level

5. COMPARING SUBMARKETS

5.1. Availabilities of job accessibility and environmental quality

Table 6 shows the means and standard deviations of the variables for the full sample and the four submarkets. For job accessibility, Public Transport Accessibility Level, number of employment centres with at least 500 jobs available by public transport/walk, number of employment centres with at least 500 jobs available by cycle, and index of job accessibility by car considering travel time and number of jobs all increased from Submarket 1 to Submarket 4, while number of employment centres with at least 100 jobs available by public transport/walk and number of employment centres with at least 100 jobs available by cycle remained largely the same across the four submarkets. The general increase in job accessibility from Submarket 1 to Submarket 4 is consistent with the spatial distributions of the four submarkets as shown in Figure 1. Properties became more centrally located in the higher price bands, and there were more public transport services and larger employment centres in the central areas.

Table 6. Descriptive statistics of the variables for the full sample and the four submarkets

Observations	Full sample		Submarket 1		Submarket 2		Submarket 3		Submarket 4	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Property price (thousand pounds)	420	494	153	29	251	35	424	75	1161	952
Natural logarithm of property price	12.69	0.63	11.92	0.22	12.42	0.14	12.94	0.17	13.81	0.49
Whether detached house (1 = yes, 0 = no)	0.05	0.22	0	0.05	0.02	0.13	0.08	0.27	0.15	0.36
Whether semi-detached house (1 = yes, 0 = no)	0.17	0.37	0.05	0.22	0.18	0.39	0.22	0.41	0.16	0.37
Whether terraced house (1 = yes, 0 = no)	0.3	0.46	0.21	0.41	0.34	0.47	0.26	0.44	0.36	0.48
Whether new build (1 = yes, 0 = no)	0.04	0.19	0.04	0.19	0.04	0.19	0.04	0.2	0.02	0.15
Neighbourhood Component 1 (score with 0 mean for full sample)	0	1	0.06	0.75	0.09	0.96	-0.06	1.14	-0.17	1.04
Neighbourhood Component 2 (score with 0 mean for full sample)	0	1	0.41	0.96	0.15	0.96	-0.2	0.98	-0.47	0.91
Neighbourhood Component 3 (score with 0 mean for full sample)	0	1	0.44	1.24	0.01	1.01	-0.2	0.83	-0.13	0.76
Neighbourhood Component 4 (score with 0 mean for full sample)	0	1	-0.04	1.1	-0.09	1.12	0.08	0.89	0.12	0.67
Neighbourhood Component 5 (score with 0 mean for full sample)	0	1	0.47	0.78	0.28	0.84	-0.18	0.93	-0.93	1.04
Neighbourhood Component 6 (score with 0 mean for full sample)	0	1	0.04	0.85	0.04	0.95	-0.03	1.06	-0.07	1.16
Neighbourhood Component 7 (score with 0 mean for full sample)	0	1	0.23	0.86	0.12	0.93	-0.2	1.05	-0.18	1.12
Neighbourhood Component 8 (score with 0 mean for full sample)	0	1	0.12	0.71	-0.1	0.72	-0.15	1.03	0.34	1.51
Public Transport Accessibility Levels (0 = poor, 6 = good)	3.9	1.6	3.5	1.4	3.6	1.5	4.1	1.7	4.6	1.9
Number of employment centres with at least 100 jobs available by public transport/walk	8.2	0.3	8.1	0.3	8.2	0.3	8.2	0.3	8.2	0.4
Number of employment centres with at least 500 jobs available by public transport/walk	7.8	0.5	7.6	0.5	7.7	0.5	7.8	0.5	8	0.5
Number of employment centres with at least 100 jobs available by cycle	6.2	0.3	6.2	0.4	6.2	0.3	6.2	0.3	6.2	0.3
Number of employment centres with at least 500 jobs available by cycle	5.7	0.7	5.5	0.7	5.6	0.7	5.8	0.6	6.1	0.5
Index of job accessibility by car considering travel time and number of jobs (all job categories)	8.9	3.5	7.4	2.7	8.2	3.2	9.6	3.7	11.2	3.6
% homes with deficiency in access to nature in the ward	24.8	29.6	27.1	30.7	26.2	29.8	23.7	28.9	21	28.7
% open green space in land cover in the LSOA	13.3	16.8	14.6	16.7	13.4	16.5	12.4	16.5	13.4	18.2
% building in land cover in the LSOA	21.1	9.7	18.5	7.5	19.6	8.4	22.3	10.3	25.7	11.9
Annual average nox concentrations (ug/m3)	57.7	16.1	53.4	13.3	55.3	14.4	59.7	17.3	65.1	17.8
Annual average PM2.5 concentrations (ug/m3)	15.9	0.8	15.6	0.7	15.7	0.7	16	0.9	16.3	0.9
Annual average road noise level (Lden)	51.7	4.4	52.1	4.8	51.9	4.6	51.5	4.2	51.3	3.9

Annual average rail noise level (Lden)	50.3	2	50.5	2.4	50.4	2.1	50.3	1.7	50.2	1.4
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For environmental quality, percentage of homes with deficiency in access to nature decreased from Submarket 1 to Submarket 4. Nevertheless, Submarket 1 has higher ratio of open green spaces and lower ratio of buildings in land cover than the other submarkets. Both annual average NO_x concentrations and PM2.5 concentrations increased from Submarket 1 to Submarket 4. Again, these environmental quality differences are linked to the more central distributions of properties in the higher price bands, as there were more built-up areas and higher air pollutions in the central areas but with a good coverage of Sites of Importance for Nature Conservation. Annual average road noise level and rail noise level were largely consistent across the four submarkets, as in each submarket only a small part of the properties with close proximity to major roads or railways were affected by the noise.

Figure 2 compares the trade-offs between availabilities of job accessibility and environmental quality in the four submarkets, using number of employment centres with at least 500 jobs available by public transport/walk and annual average NO_x concentrations as indices. It shows that in all the four submarkets, number of employment centres increased with NO_x concentrations, and the increasing rates were generally the same across the four submarkets. However, properties in the higher price bands were more likely to be in the high-accessibility-and-high-pollution end.

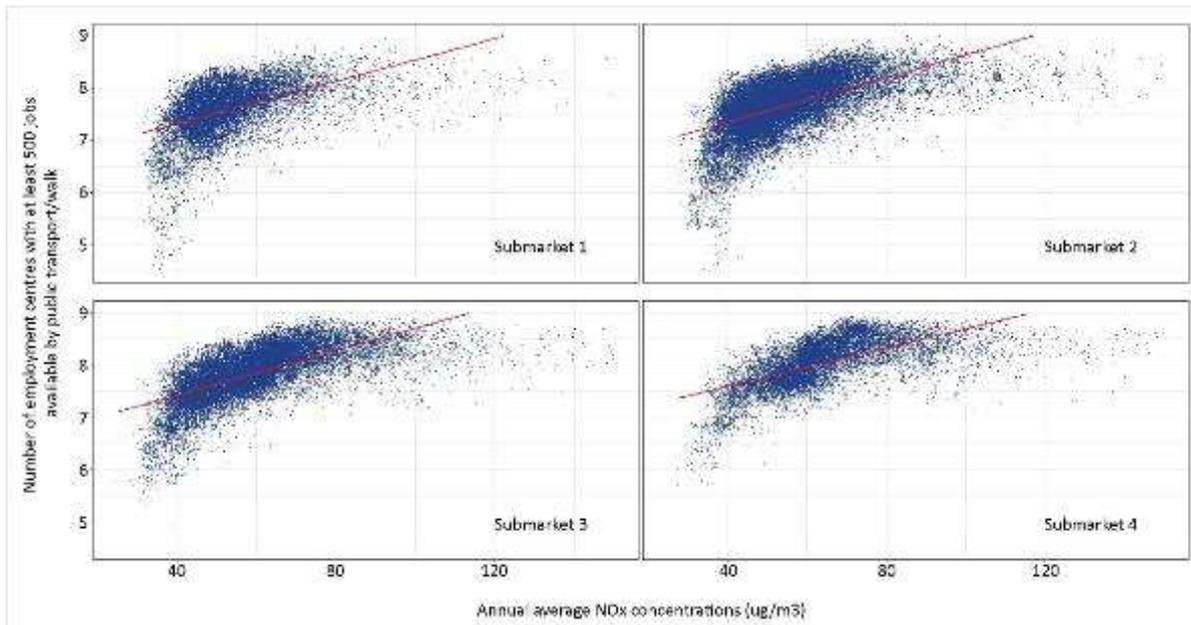


Figure 2. Trade-offs between availabilities of job accessibility and environmental quality in the four submarkets, using number of employment centres with at least 500 jobs available by public transport/walk and annual average NO_x concentrations as indices.

5.2. Marginal prices of job accessibility and environmental quality

Hedonic price models in Table 5 show that property type was the most important attribute affecting house price in all the four submarkets. Being a house instead of a flat could lead to around 10% to 20% increase in house price in Submarket 1, 2 and 3, and more than double the price in Submarket 4.

For job accessibility, one score increase in Public Transport Accessibility Levels led to 0.8% increase in house price in Submarket 1, but 0.4%, 0.5% and 3% decrease in Submarket 2, 3 and 4 respectively. This might be associated with the distribution of property type in each submarket. As shown in Figure 2, in Submarket 2, 3 and 4, properties in the central areas where Public Transport Accessibility Levels were higher were mostly flat, while in the outer areas properties were mostly terraced houses of which the prices were higher, and in the peripheries, properties were mostly detached and semi-detached houses of which the prices were the highest. Given that property type had stronger impacts on house price in these submarkets, it masked the positive impacts that Public Transport Accessibility Levels could have on house price. On the other hand, properties in Submarket 1 were dominantly flats so the impact of property type was much weaker.

Significances of the impacts of available employment centres varied across the four submarkets, as well as the signs of them. In general, it suggests that increase in medium employment centres available at a reasonable travel time by public transport slightly increased the house prices in Submarket 2 and 3, and largely increased the house prices in Submarket 4, but slightly decreased the house prices in Submarket 1. Whereas, increase in small employment centres available at a short distance slightly decreased the house prices in Submarket 3 and to a larger extent in Submarket 4.

The index of job accessibility by car considering travel time and number of jobs had a much clearer sign. One score increase in the index led to 0.5%, 1.2%, 1.3% and 5.5% increase in house price in Submarket 1, 2, 3 and 4 respectively, indicating higher marginal prices even in relative to the house prices in the higher price bands.

For environmental quality, increase in homes with deficiency in access to nature in the ward by 1% led to very slight decreases in house price in Submarket 1, 2, and 3 by around 0.01% to 0.02%, and slight decreases in house price in Submarket 4 by 0.1%. Similar sign was found in ratio of open green space in land cover, where 1% increase in open green

space in land cover led to 0.02% increase in house price in Submarket 2, 0.04% increase in Submarket 3, and a larger increase of 0.1% in Submarket 4. Thus, in general, marginal prices of nature and open green spaces were higher in the higher price bands even in relative to the house prices.

Significances of the impact of air pollution and noise varied across the four submarkets, but in general, negative relationships between house prices and them were indicated. Decrease in annual average NOX concentrations by 1 ug/m³ led to increase in house price by 0.1% in Submarket 1, 0.03% in Submarket 3, and 0.3% in Submarket 4. Decrease in annual average rail noise level by 1 Lden led to increase in house price by 0.2% in Submarket 1 and 2, 0.1% in Submarket 3, and 0.6% in Submarket 4. Thus it indicates that marginal prices of air quality and sound environment were highest in Submarket 4 even in relative to the house prices, and were slightly higher in Submarket 1 than in Submarket 2 and 3.

6. CONCLUSIONS

Using Greater London as the case metropolitan region, this study examined the existence of housing submarkets by price bands, and explored the differences in the availability, prices and trade-offs of job accessibility and environmental quality between the submarkets.

Four submarkets were identified, defined by price bands of below £190,000, £190,000 - £320,000, £320,000 - £595,000 and above £595,000. In general, job accessibility increased from submarkets of low price bands to high price brands, whereas, air quality and availability of open green spaces decreased by the price bands. Similar trade-offs between availabilities of job accessibility and environmental quality in the four submarkets were indicated. However, properties in the higher price bands were more likely to be in the high-accessibility-and-low-environmental-quality end.

In general, marginal prices of job accessibility were higher in the higher price bands even in relative to the house prices. Similar differences between the submarkets were found for marginal prices of nature and open green space. Marginal prices of air quality and sound environment were highest in the highest price band even in relative to the house prices, and were slightly higher in the lowest price bands than in the medium bands. Thus, there seemed to be no trade-off between marginal prices of job accessibility and environmental quality across the four submarkets, and generally both marginal prices of job accessibility and environmental quality were higher in the higher price bands.

Results of this study indicate that households with lower housing budgets in Greater London were more likely to have lower job accessibility but enjoy higher environmental quality. They were also more likely to pay less, in relative to the total house price, for both job accessibility and environmental quality.

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REFERENCES

- Allen, M.T., Springer, T.M. & Waller, N.G. (1995). Implicit pricing across residential rental submarkets. *The Journal of Real Estate Finance and Economics*, 11(2): 137-151.
- Anselin, L., Syabri, I. & Kho, Y. (2006). GeoDa: An Introduction to Spatial Data Analysis. *Geographical Analysis* 38(1): 5-22.
- Baranzini, A., Schaerer, C. & Thalmann, P. (2010). Using measured instead of perceived noise in hedonic models. *Transportation Research Part D: Transport and Environment*, 15(8): 473-482.
- Bourassa, S.C., Hamelink, F., Hoesli, M. & MacGregor, B.D. (1999). Defining housing submarkets. *Journal of Housing Economics*, 8(2): 160-183.
- Colwell, P.F., Gujral, S.S. & Coley, C. (1985). The impact of a shopping centre on the value of surrounding properties. *Real Estate Issues*, 10(1): 35-39.
- Crouse, D.L., Ross, N.A. & Goldberg, M.S. (2009). Double burden of deprivation and high concentrations of ambient air pollution at the neighbour- hood scale in Montreal, Canada. *Social Science & Medicine*, 69: 971-981.
- Day, B. (2003). Submarket identification in property markets: A hedonic housing price model for Glasgow. Working Paper No. 03-09. Centre for Social and Economic Research on the Global Environment, University of East Anglia, Norwich.
- Debrezion, G., Pels, E. & Rietveld, P. (2007). The impact of railway stations on residential and commercial property value: A meta-analysis. *Journal of Real Estate Finance and Economics*, 35(2): 161-180.
- Department for Environment, Food and Rural Affairs (2017). Open data: strategic noise mapping. Retrieved in May 2017 from: <https://www.gov.uk/government/publications/open-data-strategic-noise-mapping>
- Department for Transport (2017a). Travel time, destination and origin indicators to key sites and services, by Lower Super Output Area (LSOA) (ACS05). Retrieved in May 2017 from: <https://www.gov.uk/government/statistical-data-sets/acs05-travel-time-destination-and-origin-indicators-to-key-sites-and-services-by-lower-super-output-area-lsoa>
- Department for Transport (2017b). DXF noise exposure contours for Heathrow, Gatwick and Stansted airports. Retrieved in May 2017 from: <https://www.gov.uk/government/publications/dxf-noise-exposure-contours-for-specialist-user>
- Des Rosiers, F., Lagana, A., Thériault, M. & Beaudoin, M (1996). Shopping centres and house values: An empirical investigation. *Journal of Property Valuation and Investment*, 14(4): 41-62.
- Dubin, R.A. (1992). Spatial autocorrelation and neighbourhood quality. *Regional Science and Urban Economics*, 22(3): 433-452.
- Greater London Authority (2017). London Atmospheric Emissions Inventory (LAEI) 2013. Retrieved in May 2017 from: <https://data.london.gov.uk/dataset/london-atmospheric-emissions-inventory-2013>

- Greenspace Information for Greater London (2017a). Open Spaces. Retrieved in May 2017 from: <http://www.gigl.org.uk/open-spaces/>
- Greenspace Information for Greater London (2017b). Access to Public Open Space and Nature by Ward. Retrieved in May 2017 from: <https://data.london.gov.uk/dataset/access-public-open-space-and-nature-ward>
- Grengs, J. (2012). Equity and the social distribution of job accessibility in Detroit. *Environment and Planning B: Planning and Design*, 39(5): 785-800.
- Hansen, W.G. (1959). How accessibility shapes land use. *Journal of the American Institute of Planners*, 25(2): 73-76.
- Haurin, D.R. & Brasington, D. (1996). School Quality and Real House Prices: Inter- and Intrametropolitan Effects. *Journal of Housing Economics*, 5(4): 351-368.
- Hausman, J.A. & Wise, D.A. (1980). Discontinuous budget constraints and estimation - The demand for housing. *The Review of Economic Studies*, 47(1): 75-96.
- HM Land Registry (2017). Price Paid Data. Retrieved in May 2017 from: <https://www.gov.uk/government/collections/price-paid-data>
<https://data.london.gov.uk/dataset/public-transport-accessibility-levels>
- Jin, C., Cheng, J., Lu, Y., Huang, Z. & Cao, F. (2015). Spatial inequity in access to healthcare facilities at a county level in a developing country: a case study of Deqing County, Zhejiang, China. *International Journal for Equity in Health* 14(1): 67-87.
- Keskin, B. & Watkins, C. (2017). Defining spatial housing submarkets: Exploring the case for expert delineated boundaries. *Urban Studies*, 54(6): 1446-1462.
- Kim, S.G., Cho, S.H., Lambert, D.M. & Roberts, R.K. (2010). Measuring the value of air quality: application of the spatial hedonic model. *Air Quality, Atmosphere & Health*, 3(1): 41-51.
- Lake, I.R., Lovett, A.A., Bateman, I.J. & Langford, I.H. (1998). Modelling environmental influences on property prices in an urban environment. *Computers, Environment and Urban Systems*, 22(2): 121-136.
- Liebelt, V., Bartke, S. & Schwarz, N. (2018). Hedonic pricing analysis of the influence of urban green spaces onto residential prices: the case of Leipzig, Germany. *European Planning Studies*, 26(1): 133-157.
- Lucy, W. (1981). Equity and planning for local services. *Journal of the American Planning Association*, 47(4): 447-57.
- Maclennan, D. & Tu, Y. (1996). Economic perspectives on the structure of local housing systems. *Housing Studies*, 11(3): 387-406.
- Matsumoto, M., Ogawa, T., Kashima, S. & Takeuchi, K. (2012). The impact of rural hospital closures on equity of commuting time for haemodialysis patients: simulation analysis using the capacity-distance model. *International Journal of Health Geographics*, 11: 28-37.
- McLeod, P. (1984). The demand for local amenity: an hedonic price analysis. *Environment and Planning A: Economy and Space*, 16(3): 389-400.
- McMillan, M.L. (1979). Estimates of households' preferences for environmental quality and other housing characteristics from a system of demand equations. *The Scandinavian Journal of Economics*, 81(2): 174-187.
- Mitchell, G. 2005. Forecasting environmental equity: Air quality responses to road user charging in Leeds, UK. *Journal of Environmental Management*, 77(3): 212-226.
- Munro, M. (1986). Testing for segmentation in the private housing market in Glasgow. Discussion Paper No. 8. Centre for Housing Research, University of Glasgow, Glasgow.
- Office for National Statistics (2017a). 2011 Census. Retrieved in May 2017 from: <https://www.ons.gov.uk/census/2011census>
- Office for National Statistics (2017b). The National Statistics Socio-economic classification (NS-SEC). Retrieved in May 2017 from: <https://www.ons.gov.uk/methodology/classificationsandstandards/otherclassifications/thenationalstatisticsocioeconomicclassificationnssecrebasedonsoc2010>
- Ordnance Survey (2017). Ordnance Survey MasterMap. Retrieved in May 2017 from: <https://www.ordnancesurvey.co.uk/business-and-government/products/mastermap-products.html>
- Osland, L. & Thorsen, I. (2008). Effects on housing prices of urban attraction and labor-market accessibility. *Environment and Planning A: Economy and Space*, 40(10): 2490-2509.
- Ottensmann, J.R., Payton, S. & Man, J. (2008). Urban location and housing prices within a hedonic model. *Journal of Regional Analysis and Policy*, 38(1): 19-35.
- Pace, R.K., & Gilley, O.W. (1997). Using the Spatial Configuration of the Data to Improve Estimation. *The Journal of Real Estate Finance and Economics*, 14(3): 333-340.
- Padilla, C.M., Kihal-Talantikite, W., Vieira, V.M., Rossello, P., Le Nir, G., Zmirou-Navier, D. & Deguen, S. (2014). Air quality and social deprivation in four French metropolitan areas--a localized spatio-temporal environmental inequality analysis. *Environmental Research*, 134: 315-324.
- Riccardi, A., Xia, J. & Currie, G. (2015). Exploring public transport equity between separate disadvantage cohorts: a case study in Perth, Australia. *Journal of Transport Geography*, 43: 111-122.
- Rosen S. (1974), Hedonic prices and implicit markets: product differentiation in pure competition. *Journal of Political Economy*, 8: 34-55.
- Sah, V. & Conroy, S.J. (2016). Estimating School Proximity Effects on Housing Prices: the Importance of Robust Spatial Controls in Hedonic Estimations. *The Journal of Real Estate Finance and Economics*, 53(1): 50-76.
- Savage, M., Devine, F., Cunningham, N., Taylor, M., Li, Y., Hjelldrekke, J., Le Roux, B., Friedman, S. & Miles, A. (2013) A new model of social class? Findings from the BBC's Great British Class Survey experiment. *Sociology*, 47(2): 219-250.
- Schnare, A.B. & Struyk, R.J. (1976). Segmentation in urban housing markets. *Journal of Urban Economics*, 3(2): 146-166.
- Sister, C., Wolch, J. & Wilson, J. (2010). Got green? addressing environmental justice in park provision. *GeoJournal*, 75(3): 229-248.
- Smith, V.K. & Huang, J. (1995). Can markets value air quality? A meta-analysis of hedonic property value models. *Journal of Political Economy*, 103(1): 209-227.
- So, H.M, Tse, R.Y.C. & Ganesan, S. (1997). Estimating the influence of transport on house prices: evidence from Hong Kong. *Journal of Property Valuation and Investment*, 15(1): 40-47.
- Stone, M.E. (2006). What is housing affordability? The case for the residual income approach. *Housing Policy Debate*, 17(1): 151-184.
- Talen, E. (1997). The Social equity of urban service distribution: an exploration of park access in Pueblo, Colorado, and Macon, Georgia. *Urban Geography*, 18(6): 521-541.
- Talen, E. (1998). Visualizing fairness: Equity maps for planners. *Journal of the American Planning Association*, 64(1): 22-38.
- Transport for London (2017). Public Transport Accessibility Levels. Retrieved in May 2017 from:
- Watkins, C.A. (2001). The definition and identification of housing submarkets. *Environment and Planning A: Economy and Space*, 33(12): 2235-2253.

Wu, C. & Sharma, R. (2012). Housing submarket classification: The role of spatial contiguity. *Applied Geography*, 32(2): 746-756.
 Zeileis, A., Leisch, F., Hornik, K. & Kleiber, C. (2002). strucchange: An R Package for Testing for Structural Change in Linear Regression Models. *Journal of Statistical Software*, 7(2).

APPENDIX 1. HOUSING ATTRIBUTES USED IN THIS STUDY.

Housing attributes	Sources
Structural attributes	
Property type (flat, terraced house, semi-detached house, detached house)	HM Land Registry: Price Paid Data
whether new build	HM Land Registry: Price Paid Data
Tenure type (leasehold or freehold)	HM Land Registry: Price Paid Data
Neighbourhood attributes	
percentage of people aged 0-15 in the LSOA in 2011	ONS Mid-year estimates
percentage of people aged 16-29 in the LSOA in 2011	ONS Mid-year estimates
percentage of people aged 30-44 in the LSOA in 2011	ONS Mid-year estimates
percentage of people aged 45-64 in the LSOA in 2011	ONS Mid-year estimates
percentage of people aged 65+ in the LSOA in 2011	ONS Mid-year estimates
number of people per hectare in the LSOA in 2011	Census 2011
percentage of couple household with dependent children in the LSOA in 2011	Census 2011
percentage of couple household without dependent children in the LSOA in 2011	Census 2011
percentage of lone parent household in the LSOA in 2011	Census 2011
percentage of one person household in the LSOA in 2011	Census 2011
percentage of White people in the LSOA in 2011	Census 2011
percentage of people of mixed/multiple ethnic groups in the LSOA in 2011	Census 2011
percentage of Asian/Asian British in the LSOA in 2011	Census 2011
percentage of Black/African/Caribbean/Black British in the LSOA in 2011	Census 2011
percentage of UK-born people in the LSOA in 2011	Census 2011
percentage of properties owned outright in the LSOA in 2011	Census 2011
percentage of properties owned with a mortgage or loan in the LSOA in 2011	Census 2011
percentage of properties social rented in the LSOA in 2011	Census 2011
percentage of properties private rented in the LSOA in 2011	Census 2011
percentage of household spaces with no usual resident in the LSOA in 2011	Census 2011
percentage of detached whole houses or bungalows in the LSOA in 2011	Census 2011
percentage of semi-detached whole houses or bungalows in the LSOA in 2011	Census 2011
percentage of terraced houses or bungalows in the LSOA in 2011	Census 2011
percentage of flats, maisonettes or apartments in the LSOA in 2011	Census 2011
number of property sales per 100 properties in the LSOA in 2011	Census 2011
percentage of economically active people in the LSOA in 2011	Census 2011
percentage of economically active people as employees in the LSOA in 2011	Census 2011
percentage of economically active people as unemployed in the LSOA in 2011	Census 2011
employment rate in the LSOA in 2011	Census 2011
unemployment rate in the LSOA in 2011	Census 2011
percentage of people with no qualifications in the LSOA in 2011	Census 2011
percentage of people with Level 1 qualifications as the highest level of qualifications in the LSOA in 2011	Census 2011
percentage of people with Level 2 qualifications as the highest level of qualifications in the LSOA in 2011	Census 2011
percentage of people with apprenticeship as the highest level of qualifications in the LSOA in 2011	Census 2011
percentage of people with Level 3 qualifications as the highest level of qualifications in the LSOA in 2011	Census 2011
percentage of people with Level 4 qualifications as the highest level of qualifications in the LSOA in 2011	Census 2011
percentage of people with other qualifications as the highest level of qualifications in the LSOA in 2011	Census 2011
percentage of school children and full-time students age 18 and over in the LSOA in 2011	Census 2011
percentage of people with day-to-day activities limited a lot in the LSOA in 2011	Census 2011
percentage of people with day-to-day activities limited a little in the LSOA in 2011	Census 2011
percentage of people with day-to-day activities not limited in the LSOA in 2011	Census 2011
percentage of people with very good or good health in the LSOA in 2011	Census 2011
percentage of people with fair health in the LSOA in 2011	Census 2011
percentage of people with bad or very bad health in the LSOA in 2011	Census 2011
rate of crimes per thousand population in the ward in 2010/11 year	Safestats Query
average point score of pupils eligible for KS2 Assessment in the LSOA in 2011	Department for Education
average GCSE and equivalent point score per pupil in the LSOA in 2010/11	Department for Education

average Level 3 QCA point score per entry	Department for Education
weighted Ofsted primary school rating in the LSOA 2014	calculated using data from Ofsted
weighted Ofsted secondary school rating in the Ward 2014	calculated using data from Ofsted
percentage of household that has no car or van in the LSOA in 2011	Census 2011
percentage of household that has 1 car or van in the LSOA in 2011	Census 2011
percentage of household that has 2 or more cars or vans in the LSOA in 2011	Census 2011
number of cars per household in the LSOA in 2011	Census 2011
Accessibility attributes	
average score of Public Transport Accessibility Levels in the LSOA in 2014	Transport for London
percentage of people in Public Transport Accessibility Level 0-1 (poor access) in the LSOA in 2014	Transport for London
percentage of people in Public Transport Accessibility Level 2-3 (average access) in the LSOA in 2014	Transport for London
percentage of people in Public Transport Accessibility Level 4-6 (good access) in the LSOA in 2014	Transport for London
travel time to nearest employment centre by public transport/walk LSOA 2011	Department for Transport
travel time to nearest employment centre by cycle LSOA 2011	Department for Transport
travel time to nearest employment centre by car LSOA 2011	Department for Transport
number of employment centres with at least 100 jobs available by public transport/walk within a reasonable time LSOA 2011	Department for Transport
number of employment centres with at least 500 jobs available by public transport/walk within a reasonable time LSOA 2011	Department for Transport
number of employment centres with at least 5000 jobs available by public transport/walk within a reasonable time LSOA 2011	Department for Transport
number of employment centres with at least 100 jobs available by cycle within a reasonable time LSOA 2011	Department for Transport
number of employment centres with at least 500 jobs available by cycle within a reasonable time LSOA 2011	Department for Transport
number of employment centres with at least 5000 jobs available by cycle within a reasonable time LSOA 2011	Department for Transport
number of employment centres with at least 100 jobs available by car within a reasonable time LSOA 2011	Department for Transport
number of employment centres with at least 500 jobs available by car within a reasonable time LSOA 2011	Department for Transport
number of employment centres with at least 5000 jobs available by car within a reasonable time LSOA 2011	Department for Transport
percentage of of users with access to employment centres by public transport/walk LSOA 2011	Department for Transport
percentage of of users with access to employment centres by cycle LSOA 2011	Department for Transport
percentage of of users with access to employment centres by car LSOA 2011	Department for Transport
percentage of of users with access to employment centres by composite mode LSOA 2011	Department for Transport
job accessibility by car considering travel time and number of jobs (8am, jobs in all NS-SeC categories, LSOA, 2011)	calculated using data from Census 2011 and Department for Transport
job accessibility by car considering travel time and number of jobs (8am, jobs in all NS-SeC Category 1, LSOA, 2011)	calculated using data from Census 2011 and Department for Transport
job accessibility by car considering travel time and number of jobs (8am, jobs in all NS-SeC Category 2, LSOA, 2011)	calculated using data from Census 2011 and Department for Transport
job accessibility by car considering travel time and number of jobs (8am, jobs in all NS-SeC Category 3, LSOA, 2011)	calculated using data from Census 2011 and Department for Transport
job accessibility by car considering travel time and number of jobs (8am, jobs in all NS-SeC Category 4, LSOA, 2011)	calculated using data from Census 2011 and Department for Transport
job accessibility by car considering travel time and number of jobs (8am, jobs in all NS-SeC Category 5, LSOA, 2011)	calculated using data from Census 2011 and Department for Transport
job accessibility by car considering travel time and number of jobs (8am, jobs in all NS-SeC Category 6, LSOA, 2011)	calculated using data from Census 2011 and Department for Transport
job accessibility by car considering travel time and number of jobs (8am, jobs in all NS-SeC Category 7, LSOA, 2011)	calculated using data from Census 2011 and Department for Transport
Environmental attributes	
percentage of households with access to local parks in the ward in 2011/12	Greenspace Information for Greater London
percentage of households with access to district parks in the ward in 2011/12	Greenspace Information for Greater London
percentage of households with access to metropolitan parks in the ward in 2011/12	Greenspace Information for Greater London
percentage of households with access to reginal parks in the ward in 2011/12	Greenspace Information for Greater London
percentage of households with deficiency in access to nature in the ward in 2011/12	Greenspace Information for Greater London
percentage of open green space in land cover in the LSOA in 2011	calculated using data from Ordnance Survey and Greenspace Information for Greater London
percentage of water in land cover in the LSOA in 2011	calculated using data from Ordnance Survey

percentage of road in land cover in the LSOA in 2011	calculated using data from Ordnance Survey
percentage of railway in land cover in the LSOA in 2011	calculated using data from Ordnance Survey
percentage of building in land cover in the LSOA in 2011	calculated using data from Ordnance Survey
percentage of structure in land cover in the LSOA in 2011	calculated using data from Ordnance Survey
annual average NO ₂ concentrations in 2013 (ug/m ³)	Greater London Authority: London Atmospheric Emissions Inventory (LAEI) 2013
annual average NO _x concentrations in 2013 (ug/m ³)	Greater London Authority: London Atmospheric Emissions Inventory (LAEI) 2013
annual average PM ₁₀ concentrations in 2013 (ug/m ³)	Greater London Authority: London Atmospheric Emissions Inventory (LAEI) 2013
Number of days with a daily mean PM ₁₀ concentrations greater than 50 µg/m ³ in 2013	Greater London Authority: London Atmospheric Emissions Inventory (LAEI) 2013
annual average PM _{2.5} concentrations in 2013 (ug/m ³)	Greater London Authority: London Atmospheric Emissions Inventory (LAEI) 2013
annual average road noise level in 2012 (Lden)	Department for Environment, Food and Rural Affairs: strategic noise mapping
annual average rail noise level in 2012 (Lden)	Department for Environment, Food and Rural Affairs: strategic noise mapping
Heathrow Airport average 2011 summer day noise (Laeq)	Department for Transport: DXF noise exposure contours for Heathrow, Gatwick and Stansted airports

1319 MIDDLE INCOME HOUSING ISSUES IN INDIA WITH SPECIAL FOCUS ON NEW TOWNS

ABSTRACT

The post 1990s period in India is marked by a housing revolution, owing to the liberal approach of the government towards the economy, and the housing demands of the expanding middle income group (MIG). Much of this demand is attributed to factors like a rise in urban immigration, disintegration of the joint family structure, congested living conditions and higher expectation of the new middle class. The incapacity of the government to provide adequate living spaces for the increased urban population has led to the breakdown of infrastructure and crowding within cities. The outcome is the steady growth of informal settlements in the cities in the form of slums and squatters, evident from the statistics that shows that slum population in India rose from 75 million in 2001 to 93 million in 2011. The economic reform of the country after 1990 period marked the onset of the affluent middle income groups (MIG), often designated as the upper middle class, owing to the better paid jobs in the emerging service sector. Simultaneously with the onset of economic liberalization policies, the Indian market was flooded with newly available consumer items. The steady growth of income and credit-based consumption patterns augmented mass consumption among the MIG, who had previously been constrained by incomes and savings. This change largely transformed the housing market where demand for high end and luxurious housing eclipsed affordable housing. In this paper, based on case studies, we focus our attention on the housing issue of the middle income groups, in the context of two major cities of India, Mumbai and Kolkata. We further discuss on the role of new towns in solving the housing crisis in the existing mega cities, with special reference to Navi Mumbai and Rajarhat New township respectively. The inability to define the MIG throughout the country has hindered the formulation of a viable housing policy targeting them. Easy availability of loans and credit-based purchasing power has made MIG housing more profitable for the construction companies. However, current pricing patterns in the major metro cities still makes the available housing stocks beyond their reach. Though newer and comparatively cheaper housing stocks are being created in the new towns, due to the distant location from the major workplaces and the weaker economic pull of the newly formed townships, these housing stocks mostly remain less attractive for the buyers. Although allied to the two major metropolises of the country, Navi Mumbai and Rajarhat new towns have not satisfactorily achieved their expected growths as new developments.

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RS09.2. Real Estate and Housing

1363 DETERMINING THE IMPACT OF 'CURB APPEAL' ON THE PRICE OF SINGLE-FAMILY HOMES USING GOOGLE STREET VIEW AND SPATIAL HEDONIC REGRESSION

ABSTRACT

Price of a house is determined by several structural characteristics (number of bedrooms, number of bathrooms, floor material, roof material, availability of parking, heating and cooling facilities in the house, square footage, etc); locational characteristics (school districts, crime score, walk score, transit score) and environmental characteristics (air pollution, water pollution etc). Apart from these traditional factors contributing to the price of a house, the external appearance of a house or its 'curb appeal' plays an important role in determining its price. Thus, the objective of this study is to (i) quantify 'curb appeal' and determine its influence on the house price, (ii) determine the relation between curb appeal and the other characteristics of the house like the square footage, etc. The study is based on single-family homes sold in selected neighborhoods of Dorchester, Hyde Park, Jamaica Plain, Mattapan, Roslindale, Roxbury, West Roxbury in Boston, Massachusetts during 2015-2017. To quantify the 'curb appeal', images of the single-family homes in those selected neighborhoods were collected from Google Street View. A rubric was developed to classify the external appearance of the house based on the condition of the doors and windows; condition of the paint and roof of the house; condition of the lawns, garden, and landscaping; and overall aesthetics of the house (like painted fences, well-maintained driveways, walkways, etc). On the basis of the rubric, each house was given a score as 1=below average, 2=average, 3=good, 4=excellent. Zillow API was used to collect information on the house price, locational and structural characteristics of the house. A spatial hedonic regression model is developed to understand the impact of 'curb appeal' in the house price. Furthermore, the relationship between curb appeal and structural characteristics of the house, relation between the number of days a house is in the market and its curb appeal are shown in an exploratory data analysis framework. : Google Street View, Spatial Hedonic Regression, Curb Appeal

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1500 WHAT PROJECTS FOR AN URBAN INTEGRATION? URBAN MODELS AND ARCHITECTURAL PROJECTS ON REHOUSING PROGRAMS IN PORTUGAL

ABSTRACT

Spatial segmentation of the labour market of informal workers within the metropolitan is observed globally. In India it is not only compartmentalised on gender, caste, ethnic lines but also geographically segmented by the creation of spatially disjointed markets. The present paper argues that the labour market for informal workers is segmented into smaller labour markets separated by commuting (home-work) distance. Hence, the present paper has two objectives. The first is to map spatially fragmented labour market of smaller scale within a big metropolitan market. the second objective is to understand the determining factors (age, gender, social and religion groups, migration status, educational qualifications, employment types and residential locations) forhome-workplace distance. The present paper is based on case study of labour market in Kolkata. This paper is based on data collected from field survey of 1500 households located in 6 different slum clusters. The quantitative focus is on the variable like employment pattern, workers characteristics and human capital, commuting pattern (home-workplace distance) taken from the survey. For the present study, only workers with fixed workplaces are considered. This is only to reduce the complexity in conceptualising spatial labour market boundaries. In the study it is seen that the average commuting distance (home-workplace distance) of workers are much shorter than the metropolitan-wide scale. This is true for all the locations surveyed. Often the employment field around these 6 localities (residential areas) are non-overlapping. It is indicating towards the fact that the workers in the informal employment are spatially constrained. It creates small, segmented highly localised markets within the metropolitan city. Workers in central localities travel much shorter distance compared to non-central localities. It is seen that women’s spatial access is more constrained compared to men’s. Similarly, the self-employed workers have much spatially confined markets compared to regular and casual wage workers. The home-workplace distance increases with increasing level of education.

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1720 A MUNICIPALITY DSS - ASSESSING IMPACTS OF HOUSING POLICY DECISIONS**Marques, J.L. *, Borges, M., Wolf, J.**¹ Department of Social, Political and Territorial Sciences (DCSPT), Research Unit on Governance, Competitiveness and Public Policies (GOVCOPP)* E-mail: jjmarques@ua.pt, Tel +351 234 370200**ABSTRACT**

The aim of this paper is to present a conceptual Decision Support System (DSS) to model the drivers of urban transformation, with the main purpose of assessing the impact of policy decisions on the territory. This integrated tool encompasses six main drivers: two at the regional level (economy and demography) and four at the municipal level (location preferences, housing, general interest services and infrastructures). This paper is based on ongoing research and thus presents a prototype, which considers three interdependent key dimensions of the urban system: i) population – estimated at sub-municipal scale, using a cohort survival method; and ii) housing – analysed in terms of its characteristics (age of dwellings, type of occupation, etc.), using a life cycle approach. The development of these models is challenging, not only regarding the collection of primary data, but also methodologically, given that all the dimensions are dependent and interact in a complex set of territorial dynamics. These aspects are more relevant as we move towards a micro scale analysis. The estimation of the population is stimulating not only for less-developed countries, where, usually, there are problems related to the scarcity and quality of demographic data, but also for more-developed countries, mainly when a more disaggregate spatial level is considered. One of the major challenges is estimating net migrations, but there are more: heterogeneity of fertility across age groups; strong spatial dependence; time trends of fertility rates, which are heterogeneous in terms of space and age groups. These arguments justify the integration of other socio-economic components as a condition to perform accurate demographic estimations. The integrated methodology presented in this paper was applied to a Portuguese municipality, as an example of the importance of analysing and assessing territorial dynamics. This work is policy oriented and aims to support planning strategies in the context of the physical morphology, and socio-economic and environmental outcomes. In other words, it allows evaluating the consequences of certain policy decisions under certain restrictions and exogenous scenarios. The main outcomes of this work concerns the link between public policy decisions, individual choices and spatial configurations of the urban structures.

Keywords: DSS; demographic projections; housing; general interest services, public policy.**1. INTRODUCTION**

Urban systems are constantly changing, according to the rise of new patterns of mobility, transport or communication systems, cultural preferences or (spatial) social and economic relations. This constant change has led to increasingly complex and fragmented urban systems, where different patterns and rhythms coexist: in the EUA much of the urban growth has, for example, been done in undeveloped and low-density areas in ways that often favour the availability of space (urban sprawl), while in Europe sprawl coexist with dense and traditional urban centres (Cheshire et al., 1999).

The changes in urban system are also very dependent on the scale. At the broad scale, the urban system have been marked by a growing polarization, with an unproportioned share of growth occurring in large agglomerations which are increasingly decoupled from their regional context [a trend Stratmann (2011) has called the deregionalization of urban development], while many of the smaller urban areas are growing more slowly or even declining (Turok & Mykhnenko, 2007). At the urban scale, the main trend has been towards a diffuse development, dominated by sprawl, the rise of new centralities or a fragmented and, often chaotic, development (Antrop, 2004; Carvalho, 2013; Glaeser, 2011). Coexisting with sprawling land-use, many consolidated urban centres have been subject to a major gentrification push, influenced by tourism and the substitution of residential uses of space with economic ones (Pinkster & Boterman, 2017). Underlying these phenomena, are non-Euclidian and multidimensional spaces (Marques, 2012) where cultural preferences and lifestyle choices spread in a more networked and less predictable ways. Therefore, different territorial context cannot be analysed in a strictly hierarchical way, but must be understood as nodes in relational contexts, where the meaning and the composition of these relations define the relevant scale (Murdoch, 2006).

Notwithstanding this complexity, there has been constant attempts to understand these changes which have, typically, been focussed on two aspects: the intrinsic character of a given space (locality – meaning the analysis of patterns of spatial heterogeneity); the way in which it relates to the broader context (location – meaning the analysis of spatial dependency structures) (Marques, 2012, Bhattacharjee et al., 2012). Other approaches have focussed the broad structural changes which explain the different historical cycles: growth, suburbanization, decline and (eventually) reurbanization (van den Berg et al. 1982; Champion 2001; Hall 1971). The main drivers of urban change, assumed by these models, are economic, technological, demographic or environmental and their consequences are complex patterns.

From a planning perspective, the main challenge lies in understanding these trends, and the capacity to generate strategies and governance approaches that can influence them in a way that helps to achieve broad public policy goals such as quality of live, equity or sustainability. Given the complexity and multidimensionality of urban transformation, instruments for aiding urban policies are challenged to find methods that, on the one hand, are able to capture the logic of these spatial structures (heterogeneity and spatial interaction) and monitor their development and, on the other hand,

allow understanding the impact of different policy decisions. In this paper, the potential, limitations and requirements of a Decision Support System will be discussed, that aims to model the relations between the main drivers of urban transformation. This discussion will be based on the presentation of a prototype, that will allow to highlight some of the methodological and conceptual challenges from a practical perspective.

The paper is divided into four parts: the first one briefly reviews Decision Support Systems (DSS), its different approaches and assumptions; the second one discusses the use of DSSs for modelling urban systems; and the third presents a prototype of a DSS, that links housing and demography and that has been applied and, finally, the main challenges and further work is discussed.

2. DECISION SUPPORT SYSTEMS TYPES

Decision Support Systems (DSS) have been developed and implemented since the mid-1960s (Power, 2008). Over time, the concept has evolved very quickly, in order to integrate an increasing number of dimensions that interact and have multiple impacts [(in)direct, (in)tangible, (sub)objective, short- or medium-term] on urban development and, thus, on decision-making. The application has assumed the most diverse contexts, from the operational to strategic management (Arnott et al, 2005; Eom et al, 1990; McCosh et al, 2006). To comprehend a DSS there must be a complex debate about the main dimensions that should be part of such a system. Power (2008) and Hättenschwiler (2001) present an interesting and complementary work of what should be the design of a DSS. Power concentrates on the inputs that support a decision and shows these can be associated with: i) using ICTs to improve and accelerate the process; ii) information gathering through document analysis; iii) time series analysis to produce relevant indicators; iv) optimization and modelling to guide the definition of actions; and v) using specialized knowledge. Hättenschwiler, on the other hand, focuses on the decision-makers as a user of this information who may have multiple roles. As such, he defines three large groups of DSSs: i) passive, which use information to aid the process but have no influence on decision-making; ii) active, who are decisive in defining and choosing solutions; and iii) cooperative, whose decisions, based on structured information, are consecutively discussed until reaching a consensual definition of the most appropriate actions.

The context in which DSSs are applied explains the adopted approaches. It is broadly recognized that a DSS should follow an interdisciplinary perspective and an integrated structure able of dealing with: i) the available information; ii) the multidimensionality of the decision context; iii) the uncertainty of the evolution pattern of the main drivers of the decision; iv) the need to combine objective and subjective issues; and v) the perceptions, expectations and preferences of decision makers and overall community.

The assumption of such integrated dynamic suggests DSSs play a decisive role in the way information is collected, analysed and interpreted. Among the challenges, besides data collection (documentary, statistical sources, or surveys) and the development of formal analytical models, are the implementation of strategies or methodologies that deal with cognitive and dispersed knowledge accumulated by different agents, by giving meaning and transforming it into decision inputs. As a proposal to link the various contributions in terms of decision support, a classification of categories of DSSs is presented. This proposal is structured in three types or levels that depend on the information used and the type of outputs: i) situational (diagnosis); ii) forecasting (prognosis); and iii) interactive (prospective).

The Situational or diagnostic DSSs (*DSS Level 1*) have a strong analytic dimension. They aim to gather and systematize a set of variables that can be transformed into monitoring indicators of the territorial dynamics and the overall strategy, in order to measure the deviations from established goals. The level 2 (*DSS Level 2*) consists in predictive or prognostic DSSs which are supported in forecasts that allow to anticipate decisions that respond to the evolution of an expected future. The models developed here are based on rigorous analytical formalisms and depend on the availability of time series, under the assumption that they are sufficiently representative of the reality. It is also assumed that there are no exogenous variables capable of producing meaningful changes on the time series of the forecast (Marques et al 2016). At the Level 3 (*DSS Level 3*), interactive or prospective DSSs are considered. They have a more complex and interdisciplinary nature. The models developed here provide a systematic mechanism to deal with the complexity, interdependence and subjectivity of information, thus contributing to the formulation of policies where the integration of multidisciplinary activities is of vital importance (Martin and Irvine, 1989, Borges, 2012).

Even though adjusted to decision contexts, ideally a DSS should consider each of the abovementioned levels. In many cases, the development of a DSS is already the outcome of an integrated approach. When dealing with the specific challenges of urban transformation, for example, the different levels that are considered by a DSS allow a broad understanding of the relevant phenomena, therefore improving the decisions-making process. This includes: i) monitoring - levels 1 and 3; (ii) *ex-ante* evaluation - for levels 2 and 3; and, finally, the strategic definition, where all three levels complement each other to assess development strategies, policy options and their impacts.

3. DECISION SUPPORT SYSTEMS FOR MODELING URBAN TRANSFORMATION PROCESSES

In this section, a conceptual approach of a DSS is presented, that is being developed for assessing the impact of a sectoral policy considering key factors in urban transformation processes (figure 1). This approach intends to highlight the challenges in modelling six fundamental urban subsystems: 1. economy, 2. demography, 3. location preferences, 4. housing, 5. general interest services, and 6. infrastructures. The various dimensions are considered in a hierarchical way. In practice, this implies analysing sectoral policies showing, afterwards, the impacts induced on the other dimensions of the urban system. Considering, for example, the case of an active rehabilitation policy, which increases the available housing in certain market segments. This policy, combined with the preferences and economic resources of the

population, will bring changes at many levels. It will, namely, alter the distribution of the population which, in turn, will impact on the provision of infrastructures or general interest services. These changes can be expected to exert a direct influence on the valuation of different areas of the city.

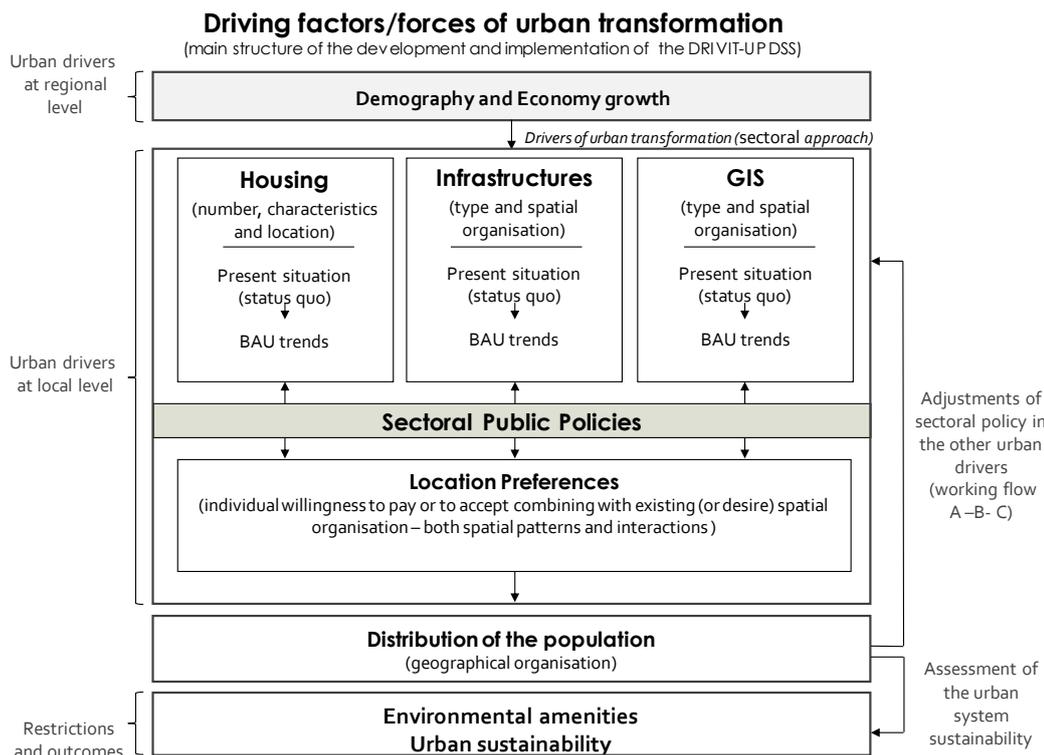
In an operative sense, some subsystems are considered at a more macro (regional) level (1. economy and 2. demography), while others are considered at the micro (municipal) level (3. location preferences, 4 5. services of general interest and 6. infrastructures).

Methodologically, this DSS combines two different types of models: i) formal mathematical and analytical tools, such as econometric models, demographic projections, Bayesian estimation methods, optimization and genetic algorithms; ii) informal approaches for dealing with opinions, individual preferences (e.g. using multi-criteria analysis) and guiding action towards possible future (through foresight methods and techniques). The development of this type of model is challenging, not only concerning data collection, but also methodologically. The design of a DSS has to incorporate the complex set of territorial dynamics, which reflect in the way each dimension interacts and relates (Bhattacharjee et al, 2012). These aspects are even more relevant and critical as we assume a more localized scale of analysis, in the concrete case at the municipal and urban scales.

Generally, the proposed methodology assumed the challenge of developing a decision support tool able to model the main drivers of urban transformations at the local level and therefore to provide a sound and effective decision-making. Recognizing that territorial attractiveness is largely defined by the ability of territories to provide adequate living conditions according to the interests and expectations of the population, it is relevant to understand how public policies and strategic options lead to different territorial configurations and demands. The housing dimension refers both to its physical characteristics and quality and to housing prices, as key dimensions of demand, as preferences are combined with the willingness of households to pay for and support all charges associated with housing. Regarding general interest services (namely public services, health and education facilities) they are expected to answer to the population’s needs, according to the age structure, qualifications and individual preferences. The infrastructure network must also evolve accordingly to supply basic services (accessibility, public water supply and sewage system).

At another level, the economic dimension plays a central role in turning territories more attractive. The demographic component arises as an additional (and complementary) layer, explained either by the importance of the working age population that influences the demand and supply of employment, or by the younger (or older) population, which explains different mortality and fertility rates. In particular, employment issues have a special meaning at the local level, as people also tend to choose their place of residence, in addition to the local amenities, according to employment opportunities. The demographic projections, which at the local level is stimulating and demanding, are the basis of this system modelling. Small-scale estimations (Castro et al. 2015) are relevant for less developed countries, where, often, there are problems related to the scarcity and quality of micro demographic data (mortality, fecundity and migratory flows), but also to more developed countries, as is the case of Portugal, especially when considering such a disaggregated level of spatial analysis. As the natural balance is a component with a low micro-spatial impact, it is the migratory component (in particular, immigration) that challenges the demographic modelling and forecasting at the municipal or urban scales.

Figure 1 – DSS conceptual approach



Analysing in more detail each of the subsystems:

1. **Demography and economic development** – despite its application at local (municipal) scale, this DSS considers that these two drivers act at the regional level. The modelling of these two subsystems is based on macroeconomic scenarios (DSS - Levels 2 and 3) in order to assess their impacts on employment dynamics and consequently the direct implications on migrations, especially in the working aged population. Thus, the estimated population, by age group, considers the economic dimension as a key component of the net migration; and the natural growth variables (mortality and fecundity) are estimated according to past trends – forecast models (DSS Level 2). For the integration of these components, a cohort survival method is used (Wolf, 2013; Castro et al, 2015; Gomes et al, 2016).
2. The modelling of **housing** subsystem consists of understanding the evolution of the housing stock, based on: the a life cycle of a dwelling (DSS level 2) and on the new houses that appear in the market, through rehabilitation or new construction. This will imply to understand the impact of rehabilitation and construction rates on the number and location of new houses that emerge in the market (DSS level 3) (Marques *et al*, 2016).
3. Many dimensions (communication routes, water supply services, waste collection etc.) can be considered within the **infrastructures**. Thus, the analysis of this section involves the identification of the most important infrastructures in development of an integrated urban system (DSS level 3) and assessing its Load-Carrying capacity (DSS level 2 and 3).
4. **General Interest Services** are analyzed in order to define optimal locations and location preferences that satisfy a set of criteria and requirements that determine the organization of this service network (SAD level 2 and 3). Gravitational models and genetic algorithms are used to analyse the coherence of the integrated network, ie, the balance of adjustment between the supply to and the future demand (Marques et al 2011)
5. The expectations of the population, in particular the **preferences** for housing, General Interest Services (school, sports, cultural, etc.) and infrastructure are decisive for the choice of any solution or alternative. In this context, revealed or declared preferences methodologies are used: hedonic analyzes and multicriteria – SAD level 1 and 3 analyzes (Marques et al., 2012).

4. A DSS PROTOTYPE PROPOSAL

The DSS presented below was developed as a prototype of the conceptual approach suggested in figure 1, focusing on the drivers of housing and demography. Here, the challenge concerns the assessment of the impact housing policy options (at the municipal level) might have on the territory. This DSS reflects the effort in developing an integrated model and suggests the need to broaden the sectoral perspective, moving forward with an interactive logic as described in section 4.

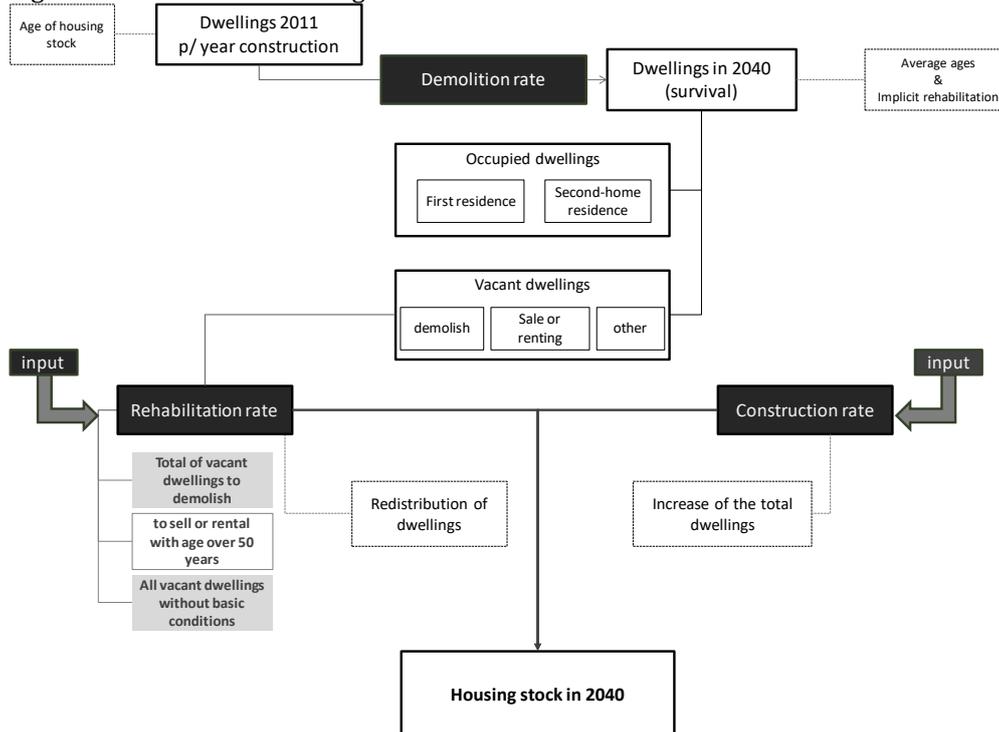
For modelling purposes, it is assumed that future policy options have to be informed by prospective dynamics. It was this consensual notion that led to a research work that took as its starting point the analysis of socio-economic dynamics (DSS level 1) and its expected evolution over a time horizon of 20 years (DSS level 2). With a focus on the second dimension, the analysis considers the behaviour of economic and demographic variables, by modelling the interaction of employment, fertility rates and migrations (as a linking element between economy and demography). But if, at a macro scale, population estimates can be defined by employment patterns and by migrations that adjust to macroeconomic scenarios, at the local level, for distributing population and migratory flows complementary information is needed. Thus, understanding the impact of sectoral policies becomes crucial, as population flows are determined by their preferences and expectations regarding employment opportunities, living conditions and the opportunity to access to a wide range of urban amenities.

After a first territorial analysis which provided a broad understanding on the demographic evolution, as well as on the economic dynamic (DSS level 1), it was decided to analyse the feasibility of housing policy options, by adjusting construction and rehabilitation rates to the different demographic scenarios. The housing driver assumed a prognostic approach (DSS level 2), where the past trends of the housing stock and its physical characteristic patterns were extrapolated for the same 20-year time horizon. For this purpose a DSS interface (figures 3 to 7) was developed, showing the balance between demand (defined by the expected population) and supply (obtained by the dynamics of the housing stock).

This DSS is an innovative public policy tool that focuses on understanding the territorial configurations resulting from impacts associated with strategic options. More than a research work, which allowed the development of an integrated model, this DSS is an opportunity to produce relevant and structured information for the decision-making process, even though it has been developed for a specific sectoral area. The methodological options for linking demography and housing resulted from a deep debate about housing strategies able to overcome expected needs, which are influenced by: a) the decrease of the average size of the families (in line with the last three decades trend) or b) the maintenance of the average size of families verified in 2011 (last Census). Regarding housing characteristics, two situations were considered as follows. One, considering only first residence dwellings, to discuss if the maintenance of the distribution structure of the dwellings according to the form of occupation (occupied, vacant, ruined *in* Census 2011), it would be possible to overcome the demand for housing in each of the demographic scenarios. The second hypothesis concerns to the assumption that first residence dwellings do not satisfy the demand, and therefore it leads to a broad discussion of the incentives that change the sale and/or rental market.

The scheme presented below illustrates the methodology.

Figure 2 – Flows of the housing urban transformation driver



The housing stock in 2011 was the basis to define the number of existing dwellings in 2040, according to three conditions. One relative to the age of the housing stock, given by the buildings' year of construction. Another illustrative of the dynamics of conservation and construction of the housing stock, defined by demolition rates (associated with the longevity of dwellings, and an average age of 53 years), and by rehabilitation and construction rates. Another concerns the occupancy structure of the housing stock as defined by the Portuguese National Statistical Institute (occupied for first and second-home residence and vacant dwellings, which are available in the housing market for sale or renting, or other situations such as dwellings to demolish or without basic living conditions).

Additional assumptions made possible the adjustment of the life cycle of the housing stock, defining the total of housing that would be subject to rehabilitation interventions. After applying the mortality rate, the dwellings subject to rehabilitation include those in the 'to demolish' category, those which not satisfy basic living conditions, and dwellings available on the housing market built before 1990 (which by 2040 require structural intervention). The number of vacant dwellings is influenced by the construction rate, which increases the number of total dwellings, while keeping the distribution of the different forms of occupation.

The conditions for comparing the results derived from the application of rehabilitation and construction rates, according to the local strategy, are established. The application of the rehabilitation rate has an effect on i) the maintenance of total housing quantity; ii) the reduction of vacant dwellings to demolish or without basic living conditions; and iii) the increase in occupied dwellings, maintaining the proportion observed in 2011. The application of the construction rate increases i) the total number of dwellings; ii) the number of occupied dwellings, considering the proportion verified in 2011; and iii) the number of vacant dwellings available in the market, considering the total weight that the "vacant" category assumes in 2011.

Thus, in order to determine the housing needs, the population expected for 2040 and the size of the households are confronted, which enables the definition of the number of occupied dwellings that overcome the expected demand. It is the difference between the number of necessary occupied dwellings and the number of first residence dwellings existing in 2040 that defines the number of total housing needs.

Notwithstanding the contribution of this tool and the related debates to support the decision-making process, other specific considerations on the territorial context territorial have to be added. Furthermore, the assumptions for modelling the housing life cycle can be subject to other approaches, namely those explained in DSSs level 3. As an example, the housing average age and the mortality rate could be adjusted to comprise local dynamics. Corrections at this level may be explained by the impacts derived from certain policies, such as recent opportunities for financing rehabilitation. To deal with this challenge, as there is no information available, it is required to meet experts in the field, or territorial agents with a high local knowledge, through structured meetings, expert panels, or Delphi questionnaires. Regarding the demographic component, some adjustments can also be made to distribute population at the microscale. An example of this is the methodology implemented in the DONUT research project, where demographic projections served as a point of reference for a group of experts who, for extreme scenarios, adjusted this distribution according to future individual preferences. The use of DSSs level 3 allow for dealing with needs, expectations and preferences, which no other way are considered.

To conclude, it is referred the advantages of combining different logics of DSSs, namely as a way to bridge the lack or inconsistency of data to model the urban transformation phenomena. In some cases, the way data is collected may carry doubts and misinterpretations. An example is the available data of the housing stock related with conservation, which depends on the way surveys are implemented. Also, on the occupation structure, for example, what is considered in the category of second homes or seasonal residence and vacant housing available for sale and renting, there might be biases arising from the interpretation of the respondent. In other cases, the modelling can depend on the use of information that does not publically exist but is possible to obtain through alternative mechanisms.

In summary, analysing the prototype model presented there is room for improvement. DSSs level 1 provide the systematization of available information, which, assuming a diagnostic logic, also contributes for monitoring and defining relevant indicators and data to be used on DSSs level 2 and 3. In a more informal but structured nature, DSSs level 3 help the decision maker to position itself in a long-term context, which is highly uncertain. At the same time, it allows for adjusting dimensions worked on DSSs level 1 and 2. Thus, DSSs level 2 have a link function between level 1 and level 3, as it is through combination, that in a complex multidimensional system, the information is integrated and operationalized.

In the figures that follow (from 3 to 7) the tool interface is shown. Through population estimates for 2040, and their territorial distribution, it is possible to assess how many dwellings will be needed (supply) to meet the future expected demand, either by new dwellings or through rehabilitation interventions.

Figure 3, presents the expected housing stock for 2040, considering the typical life cycles of a dwelling. Figure 4 presents the layout of the expected population in 2040, where it is possible to see that the places (parishes) where this dynamic is more favourable (yellow) or more unfavourable (red). At the intersection of the two previous information we have an assessment of the needs (figure 5) where it is possible to verify that assuming null construction and rehabilitation rates, there are housing needs (so the map is represented in red). In order to simulate the construction and rehabilitation rates that meet expected demand, two simulations are shown in Figure 6 and Figure 7. In the first, a rehabilitation rate of 5% per year would not overcome the needs – in the whole municipality, only one parish (represented in red) would have a housing stock in sufficient quantity for the people, which are believed to exist there. In a second simulation (Figure 7) the construction rates are changed in order to respond to the needs.

Figure 3- Housing stock



Figure 4- Population distribution

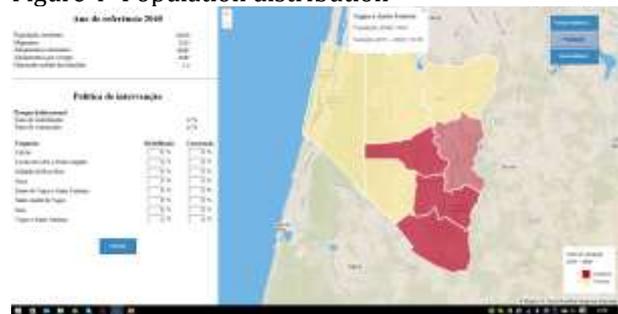


Figure 5- Housing stock needs

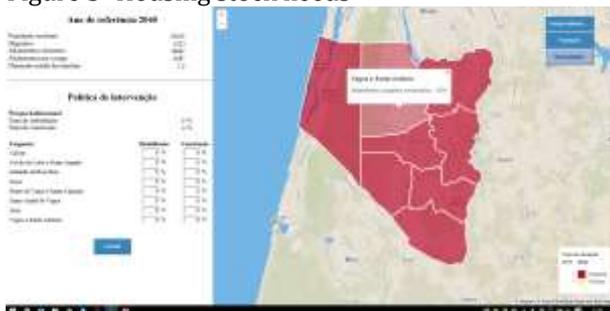


Figure 6- Simulation of rehabilitation rates

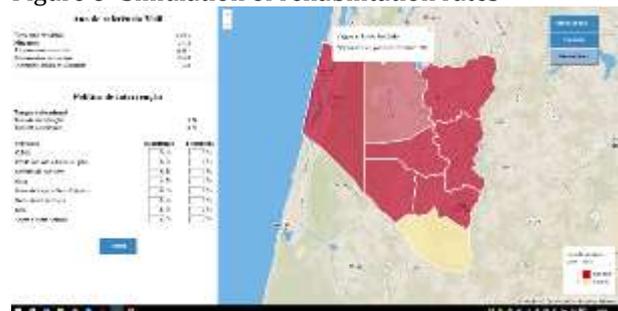
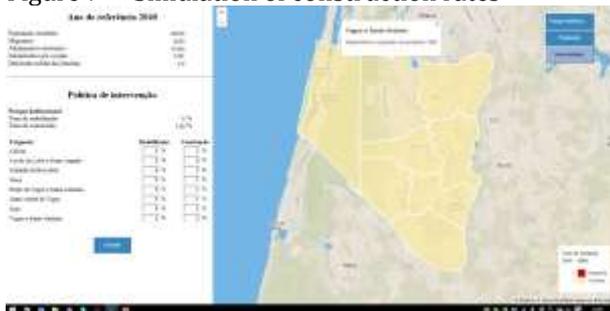


Figure 7 - Simulation of construction rates



5. CONCLUSIONS

This paper presents the challenges in analysing and understanding the processes of urban transformation, which have been defined by contradictory trends and great complexity, namely on the identification of the main factors of this transformation, that assume multiple configurations over time and space (scale of analysis). The unpredictability of these factors and the way they interact justify the development of methodologies able to deal with this complexity as well as with the high amount of information and ICT capacity that currently exists. In planning, the DSSs assume greater importance by enabling the systematization of useful and necessary information, and therefore promoting informed, transparent and consequent decision-making.

However, acknowledging the potentialities of these tools does not imply a blind reliance on such instruments. On the one hand, DSSs are not substitutes of political decision-making as the nature of the problems does not allow (or advises) limiting these options to purely objective, universal, inflexible or definitive criteria. On the other hand, simulating decision-making in complex contexts implies the assumption of fundamental premises about the models to be used, the dimensions to be considered and the way in which they are related. That is, the application of a DSS has implicit a broad set of theoretical-conceptual assumptions and frameworks that are not detached to the outputs.

The utility of the DSSs therefore depends on their ability to provide the adequate tools for assessing different development strategies (territorial or sectorial) according to criteria whose definition and assigned weights depends on technical/scientific knowledge, as well as on political concerns.

This paper aims to contribute with a methodological and conceptual framework, with an empirical application that, without neglecting the complexity of urban transformation processes, evidences the need to advance with an integrated, structured and interrelated approach. In particular, the proposed DSS logic assumes a combined analysis of a set of aspects for understanding an urban phenomenon: the assumption that the urban patterns results from individual choices (in the housing market) combined with legal-administrative decisions (with impact on, e.g., the configuration of services and facilities and construction options); and the integration of different techniques and methodological approaches.

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REFERENCES

- Antrop, M. (2004). Landscape change and the urbanization process in Europe. *Landscape and Urban Planning*, 67(1-4), 9-26.
- Arnott, D. & Pervan, G. (2005). A critical analysis of decision support systems research. *Journal of Information Technology*, 20(2) 67-87.
- Bhattacharjee, A., Castro, A., & Marques, J. (2012). Spatial Interactions in Hedonic Pricing Models: The Urban Housing Market of Aveiro, Portugal. *Spatial Economic Analysis Journal*, (1), 133-167.
- Borges, M. (2012). *Análise prospetiva - O Caso do Mercado da Habitação*, Tese de Mestrado, Universidade de Aveiro.
- Carvalho, J. (2013). *Custos e benefícios, à escala local, de uma ocupação dispersa*. Direção-Geral do Território.
- Castro, E., Martins, J. & Silva, C. (2015). *A Demografia e o País: previsões cristalinas sem bola de cristal*. Gradiva.
- Champion, T. (2001). Urbanization, suburbanization, counterurbanization and reurbanization. In R. Paddison (Ed.), *Handbook of urban studies* (pp. 143-161). London: Sage Publications.
- Cheshire, P., Summers, A. and Lanfranco, S. (1999). *Urban Change in the United States and Western Europe: Comparative Analysis and Policy*. Washington, D.C., Urban Institute Press.
- Eom, S. & Lee, S. (1990). DSS Applications Development Research: Leading Institutions and Most Frequent Contributors (1971-April 1988). *Decision Support Systems* (6)3, 1990a, 269-275.
- Glaeser, E. (2011). *Triumph of the City*. London: The Penguin Press.
- Gomes, M., Silva, C., Castro, E. & Marques, J. (2016). *Evolução da fecundidade em Portugal: uma perspetiva sobre a diversidade regional*. *Análise Social*. LI (1.º) (n.º 219), 36-70.
- Hättenschwiler, P. (2001). *Neues anwenderfreundliches Konzept der Entscheidungsunterstützung*. In: *Absturz im freien Fall - Anlauf zu neuen Höhenflügen*. (Mey, H., Pollheimer, D. L.), pp. 189-208. vdf Hochschulverlag AG, Zurich. 2001.
- Marques, J., Castro, E. & Borges, M. (2016). *A análise prospetiva: uma abordagem metodológica exploratória aplicada ao mercado da habitação*; *Boletim regional e urbano e ambiental*; 14; Instituto de Pesquisa Econômica Aplicada - IPEA.
- Marques, J., Castro, E. & Bhattacharjee, A. (2012b). *Methods and models for analysis of the urban housing market*. In *Emerging Challenges for Regional Development and Evolving Infrastructure Networks and Space*. (Eds.) Capello, R. and Dentinho, T.; Edward Elgar. p. 149-180.
- Marques, J., Santos, R. & Castro, E. (2011). *Construção de uma política educativa municipal: uma metodologia de abordagem centrada na demografia*. In *Casos de Desenvolvimento Regional* (Eds.) Baleiras R. Principia; Cascais.
- Marques, J.; (2012). *The notion of space in urban housing markets: PhD thesis in Social Sciences*, University of Aveiro
- Martin, B., Irvine, J. (1989). *Research Foresight: Priority Setting in Science*. Londres: Pinter Publications.
- McCosh, A. & Correa-Perez, B. (2006). *The Optimization of What?* in Gupta, J. G. Forgionne, and M. Mora, *Intelligent Decision-making Support Systems: Foundations, Applications and Challenges*, Springer-Verlag, 2006, 475-494.

- Murdoch, J. (2006). *Post-Structuralist Geography: A Guide to Relational Space*. London, SAGE Publication
- Pinkster, F. M., & Boterman, W. R. (2017). "When the spell is broken: gentrification, urban tourism and privileged discontent in the Amsterdam canal district." *Cultural Geographies*, 24(3), pp.457-472.
- Power, D. (2008). Decision support systems: a historical overview. In *Handbook on Decision Support Systems 1*, 121-140. Springer.
- Stratmann, B. (2011). Megacities: Globalization, Metropolization, and Sustainability. *Journal of Developing Societies*, 27(3-4), 229-259.
- Turok, I., & Mykhnenko, V. (2007). "The trajectories of European cities, 1960-2005." *Cities*, 24(3), pp.165-182.
- Wolf, J. (2013). *Desafios Demográficos no Interior do País*, Tese de Mestrado, Universidade de Aveiro.

1616 HOUSING PROGRAMS AND THE LABOR SUPPLY: EVIDENCE FROM A HOUSING LOTTERY IN BRAZIL

ABSTRACT

Housing policies to increase the quality of life of the poor have been implemented for a long time. In developing countries, urbanization has increased the number of slums and people living in poor conditions throughout the last decades, causing the countries to respond with housing programs that aim to build houses for poor families. That's the case of Brazil and the Minha Casa Minha Vida program (My House My Life), that has provided a record number of 3.5 million houses to families in Brazil since 2009. Despite that, a lot of studies have pointed out that the houses are built in poor locations, far from job opportunities and infrastructure, raising questions about the policy's true impact. To estimate the impact of the program, we use the fact that three separate lotteries randomly selected a total of 23,467 individuals to participate in the program in 2011 in the city of Rio de Janeiro. We observe significant non-compliance, with only 30.2%, 20.6% and 12% accepting the offer to participate in the program in the first, second and third lottery, respectively. We combine data from the lotteries with administrative data of the formal labor market (RAIS dataset) and the register on low-income families of Brazil (Cadastro Único). We show that accepting a position in the program decreases the probability of being employed (formally) in subsequent years and increases the probability of participating in Bolsa Família, Brazil's biggest conditional cash transfer program. In this paper, we provide one of the first evidences from Brazil's biggest housing program, contributing also to the literature on housing programs of developing countries.

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RS10.1. Regional and Urban Policy and Governance

1051 REGIONAL PATTERN OF RURAL LIVELIHOOD OPPORTUNITIES AND CAPITAL IN SUB-HIMALAYAN WEST BENGAL, INDIA**Manoranjan Ghosh¹, Somnath Ghosal²**1. Doctoral fellow (UGC-JRF), ghoshmanoranjan.99@gmail.com2. Assistant Professor, somnath@iitkgp.ac.in, Rural Development Centre, Indian Institute of Technology Kharagpur, Kharagpur-712302, India**ABSTRACT**

Understanding the complex rural multidimensional livelihood issues at the micro level is important for implementing the sustainable development goal. In recent livelihood research, measuring regional variations of livelihood capital and opportunities is the burning theme of investigation. In this paper, thirteen community development blocks have been taken as regional identity under Jalpaiguri and Alipurduar districts of the state of West Bengal as case study area. The entire region is dominated rural in character. Five thematic maps have been put in order to understand the five separate dimensions of rural capitals, such as natural, physical, financial, social, and human. Here, total eighteen variables have been considered for analysing these five capitals. While, the traditional method of livelihood analysis includes only socio-economic variables, but here environmental dimension of rural livelihood generation in the form of natural capital has also been considered. Data analysis shows that region, where natural capital base are quite rich, financial and human capital base, are weak and vice versa. In terms of rural livelihood opportunities, it is noticed that rural workforce participation rate of this region decreased since 1951 till 2011, it is because of high population growth. The measured livelihood opportunity shows that Alipurduar 1 and 2, Falakata, Maynaguri has less chance of work compared to Kalchini, Madarihat-Birpara, and Matili. The reasons are high population density as well as high growth rate. Region, where, the agricultural work opportunity is low household cottage and small-scale industry worker percentage is higher and vice versa. After all, these regional variations of livelihood capitals and opportunities help in decision-making for the design of suitable policies for transforming the rural standard of living.

Keywords: Multidimensional livelihood index, Thematic map, Livelihood capital, Livelihood opportunity, Rural workforce.

1. INTRODUCTION

It is essential to understand livelihood opportunities in context to build sense that how the rural people have engaged in different economic activities with their special ecological setting. Different geographical and ecological environment project distinctive diversified livelihoods with respect to particular society itself (Asselin and Ki, 2009). People often utilize the natural and human resources in an optimum way following their traditional social practice and strategies. Livelihood strategy is a combination of different aspects such as accessibility of human and natural resource, availability of technologies, existing infrastructure and value system in respect of societal existing problems (Donohue and Biggs, 2015). The term 'livelihood' has widely used in contemporary literature of poverty, rural development and community planning, where livelihood may be defined as comprises of the assets, (natural, physical, financial, social, human) activities, and access to those (mediated by institution and social norms) that together determine the living strategies undertaken by household to provide a means for living (Ellis, 1998). However, in Himalayan foothills of West Bengal, villages having special characters like remoteness, marginality, environmental complexity with diversified race, cast and societal issue, which affect the rural economic activities and daily livelihood (Dutta, 2015; Jha, 2010; B. P. Roy, 2014; S. Roy, 2011). The economy of this region describes as mixed agriculture in a fragmented land with inadequate irrigation system but the dependency of agriculture and forest sectors are much higher compared to others (Hussain, Rasul, Mahapatra, and Tuladhar, 2016). Rural farm activities are the prime source of livelihood opportunities, that is why measure and appraise of the livelihood opportunities is crucial for building sustainability. In addition of understanding the opportunities, incorporating of livelihood capital is also important. Before the establishment of the concept of sustainable development and human development during the last decade of the twentieth century, we had only monetary approach to measure the human livelihood, capital, and overall welfare. This monetary approach was only economic scrutiny in character. However, after the long critical analysis, human development index has received a multidimensional outlook considering the income, health, and educational aspects (Donohue and Biggs, 2015; Liu and Xu, 2016). As we know that scientific paradigm is always changing for effective understanding. Recently, a new multi-dimensional livelihood index or capital index has developed considering the five dimensions of rural lives, such as natural, physical, financial, social, and human. It because of earlier methodologies did not consider the environmental factor for measuring or quantifying the rural livelihoods (Erenstein, Hellin, and Chandna, 2010). Scholars have already proven that there is a strong correlation between natural environment or resource with livelihood opportunities, particularly in rural areas (Ghosal, 2014; Nath and Inoue, 2009). The heterogeneous nature of rural livelihoods is difficult to measure by using any particular analytical tool because it is related to the spatio-temporal pattern of resource availability, uses, and changing behaviour of rural people (Davis, 2003; Donohue and Biggs, 2015; Rahman and Davis, 2005). Presently, livelihood capital approach that is multidimensional in character is a major focus for spatial demarcation of rural poverty (Liu and Xu, 2016). In this paper, the rural livelihood opportunities and capitals have been critically quantify and analyses the regional pattern in the sub-Himalayan West Bengal, India.

The rest of paper organized as follows. The first section deals details about livelihood opportunities and capital approach and their importance. The second section of the research frames location, demographic changes. In the third part, the

details about research methodology have explained. The fourth part is the result and discussion, according to our methodology this part have divided into two sections. The first section is the livelihood opportunities and second section is the livelihood capital. The last section is the conclusion part, where the present situation of rural Sub-Himalayan West Bengal regarding livelihoods capitals has been elaborated.

2. OVERVIEW OF RURAL LIVELIHOOD OPPORTUNITIES AND CAPITAL

A rural area may consider as simply where agriculture and forestry are the dominant forms of economic activities (Whitby and Willis, 2017). In rural areas, distribution of natural resources produces services and opportunities, which meets the basic needs of local people. Creation of optimum livelihood opportunity for all section of people is now the prime strategy for the developing countries to address the three broad domains of sustainable development, namely economic growth, social justice, and environmental sustainability (Levine, 2014). Environmental and socio-economic inter linked potential factors strongly affecting the basis of rural livelihood opportunities and capital of a particular region. Suitable livelihood opportunity is fundamental of a good life, so the standard of living for rural people depends on the diversified opportunities, such as agriculture, forestry, animal husbandry, wage-labouring, handloom industry, weaving, and so on.

The Capital approach of livelihood helps us to understand the rural lives more clearly than the traditional method. There are five dimensions of rural livelihood capital. The natural capitals, such as forest, fertile soil, are important as a source for income of people living in the villages. In general, there are opposite relationship between the availability of natural capital and village economic vulnerability. Rural natural capital base plays a essential role in livelihood strategy. It also helps in case of infrastructure development, for example, the plain topography is always suitable for development of road network compare to undulating land. On the other hand, human capital helps rural people to achieve or pursuit the different kind of livelihoods. The formation of social capita is also very crucial for community development. After all, the livelihoods capital approach has recognized as a tool for the understanding development of any region. In India, fewer amounts of studies have been done based on livelihood capital approach. Although, the founding work of Erstein (2009) on the spatial mapping of rural poverty in Indo-Gangetic plains based on the multi-dimensional livelihood capital is the pioneering work and very much vivid to understand the rural poverty. India is facing severe catastrophe of quality of rural livelihood sector, such as 70% agricultural household cannot meet there basic consumption needs (Basole, 2017). In the Indian state of West Bengal, the rural standard of living is not well distributed, most of the district still lacking behind due to various reason. Spatial heterogeneity in rural livelihood is the result of geographical and others socio-economic factors such as natural resource distribution, agricultural accessibility, lack of education, health and others deterministic reason. Some scholars believe that there is a strong co-relation between outcomes of rural livelihood and environmental condition such as distribution of good quality soil, forest, and plain topography (Adjei, Buor, and Addrach, 2017; Bhandari, 2013; Dula Etana, 2011; Wang, Felbermeier, Kateb, and Mosandl, 2015). It is necessary to examine inter block level spatial pattern of multi-dimensional livelihood of each district of the country. The sustainable multidimensional capital approach has applied in this paper because more than 70% of rural people of India depend on natural resource (Srivastava et al., 2004).

3. THE STUDY AREA

Geographically, the study area is comprised of the district of Jalpaiguri and Alipurduar of West Bengal, lies between latitude 27°00' N to 26°16' N and longitude 89°53'E to 88°25'E which is part of Himalayan foothills also known as Dooars.²⁶⁹ As indeed, this region makes the connectivity with Bhutan, Nepal, and whole northeastern part of the country. The Northern part of the study area is characterized by undulating terrain covered by tea garden and jungles, relatively less populous compared to the southern part. On the other hand, the southern part of the region is agriculture dominated (Jha, 2012). The whole study area has been aptly named as the land of tea, timber, and tourism. However, the region is relatively backward compared to rest of the state as well as the country. The presence of vast hilly tracts covered with dense forests, and sparkling streams flowing through them attracts tourists. Forest covers about 27.8 percent of the total geographical areas, forest fringe are home to world thirty indigenous communities. The majority of the people are engaged in agriculture and plantation activities. Table 1 shows the scenario of growth of rural population and work participation rate over the time.

²⁶⁹ Dooars or Duars is the distinctive geographic identity in north-eastern India that lies south of the Himalaya and north bank of the Brahmaputra River basin. This region is about 30 km wide and stretches about 350 km from the Teesta River in West Bengal to Assam.

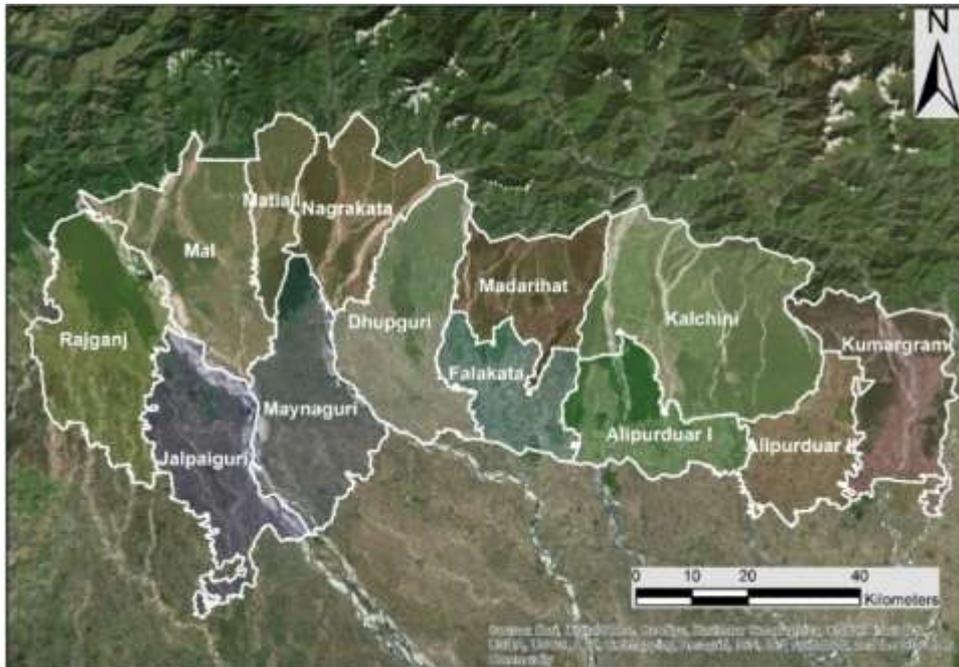


Fig: 1 Map of the study area

Table 1: Scenario of Population of the Region (1951-2011)

Year	1951	1961	1971	1981	1991	2001	2011
Total	914538	1359292	1750159	2214871	2800543	3401173	3872846
Rural	848393	1235478	1582079	1903650	2342296	2794291	2812495
RWPR*	43.7	39.3	31.5	34.5	34.6	39.6	39.9

Source: Census of India, 2011 *RWPR=Rural Work Participate Rate

4. METHODOLOGY AND DATA

The study has been conducted based on secondary data availed from different sources like Census of India, District Statistical Handbook of Jalpaiguri, Livestock Atlas of West Bengal, District Official Information. The main aims and objectives of the study are to determine the nature of livelihood opportunity and livelihood capital and the regional occupational structure at the block level in Sub-Himalayan West Bengal. Livelihood opportunity status depends on the availability of income or earning of the people from a different source such as forestry, animal husbandry, handloom, weaving, daily wage labouring etc. The fundamental statistical formula to measure the livelihood opportunity index is-

$$LO = \frac{P_1 + P_2 + P_3}{3}$$

Where, LO represent livelihoods opportunity

The formula giving one-third weight age to each of the components that have been used here. The first component is the ratio between total worker to total population (P_1) that is workforce participation rate indicating economic well-being and reflect strength, nature of income scenario. Second is the ratio between main workers to total workers (P_2) where main the worker denotes the worker who gets a job at least 180 days in a year. Its show the nature and quality of employment. Whereas the third component is the ratio between other workers among main worker, (P_3) reflects engagement of people in various nonfarm activities. On the other hand, livelihood capital index which is the most important and decision-making tools to examine the status of livelihood. Under this index, variables categories into five component, such as natural capital (forest land, water body, double cropland, and area under social forestry), physical capital (net sown area, irrigated land, metal road) human capital (literacy, female literacy, sex ratio), social capital (household density, the density of rural drinking water sources, cultivation land), financial capital (female cross breed cattle, female Indigenous cattle, % of rural people served by banking facility, % of rural people served by medical amenities). However, as per as variables are concerned, there are a large number of variables in all categories. In this study, only those variables have taken for statistical analysis which has an impact on regional socio-economic condition of this study region. In this study, Livelihood Capital Index (LCI) quantified considering the 17 appropriate variables covering different aspect human well-being on 13 community development block of sub-Himalayan Bengal. During the selection of variables existing scientific literature related to the particular field have also been referred. To calculate each of the individual variables scores of Livelihood Capital Index (LCI) from raw data, standard normalized method has been used. This is done to make raw data unit free and to get the relative position of each block in respect of variables. The formula is used to obtain normalized values is-

$$N_v = \frac{ActualX_{ij} - MinimumX_{ij}}{MaximumX_{ij} - Minimum_{ij}}$$

Where; N_v represent the normalized values of each variables, $i= i^{\text{th}}$ observation and $j =j^{\text{th}}$ district.

The standard normalized values always lie 0 to 1. Five different components of Livelihood Capital Index (LCI) have been calculated by given equal importance to each variable. The statistical formula of calculation each component of Livelihood Capital Index(LCI) is-

$$C_{LCI} = \frac{\sum N_v}{n}$$

Finally, the Livelihood Capital Index (LCI) has calculated by adding the all five component-

$$LCI = \sum C_{LCI}$$

Running the SPSS software package, descriptive statistics and correlation coefficient among the variables have been examined. The reason behind the selection of variables as follows-

- (1) Rural literacy rate, female literacy gap, sex ratio are the importance variables which reflect the strength human capital of any region. Balance sex ratio and high rural female literacy showing the sustainability in society as well as help to reduced rural poverty. These variables had been considered for calculating the human capital.
- (2) For justifying the social capital three important parameters have been considered. These were the density of rural drinking water sources, household density, and per capita cultivated land. The reason behind the selection of per capita cultivated land was its shows the pressure over arable land and strength of the household economy. Density of rural drinking water sources represents the infrastructure base of safe drinking water to the rural people.
- (3) Rural livestock in form of the total cross breed and indigenous cattle, the percentage of rural people served by banking facility and medical amenities are considered as financial capital because these financial services always have a favourable impact on livelihood consequence or well-being of the rural people. The lack of particular type of infrastructure considers as core dimension of poverty (Solesbury, 2003).
- (4) Any kind of rural infrastructure has been taken as essential criteria for judging human well-being. For calculating the physical capital, percentage of irrigated land to total cultivated land, net sown area, percentage of rural people served by metal road have considered. It is because of that the irrigated land and net sown area one of the fundamental foundation for rural agricultural production. Others variables are rural road facility which provides the easy accessibility of all sector of rural life (Carney, 1999; Donohue and Biggs, 2015).
- (5) For quantifying the natural capital, we consider the spatial coverage of forest land, water bodies, double crop land (considered as a proxy of good soil), and area under social forestry of each community development block.

Table 2: Descriptive Statistics of Selected Seventeen Variables Using in Livelihood Capital Index

Capitals	Variables of different capital	Minimum	Maximum	Mean	Std. Deviation	C.V.
Human capital	% of literacy	53.10	66.58	60.68	3.76	6.21
	Rural sex ratio	923.00	1005.00	957.53	25.12	2.62
	Rural female literacy	51.93	69.11	61.29	5.23	8.54
Social capital	Per capita cultivated land	.082	.775	.27	.34	123.61
	Household density (hectare)	.66	1.64	1.15	.36	30.66
	Density of rural drinking water sources	0181	.1369	.07	.03	45.31
Financial capital	Female cross breed cattle	239.00	10246.00	2979.23	2874.89	96.50
	Female Indigenous cattle	8420.00	38182.00	22404.00	7555.82	33.73
	% of rural people served by banking facility	3.70	48.81	20.18	13.58	67.30
	% of rural people served by medical amenities	59.57	99.02	85.54	10.94	12.80
Physical capital	% of net sown area	27.17	88.73	51.45	17.66	34.33
	% of irrigation area	3.32	24.71	14.28	6.17	43.24
	% of rural people served by metal road	37.35	91.10	66.69	15.39	23.07
Natural capital	% of forest land	.37	65.10	16.55	21.79	131.74
	Area under double crop (hector)	.00	29212.45	9505.59	9853.85	103.66
	Area under water body (hector)	.00	210.19	39.58	65.57	165.68
	Area under social forestry (hector)	.00	14580.75	1228.95	4021.25	327.21

Source: Data derived from following agency (1) Census of India, 2011 (2) State Forest Report, 2012 (3)18th all India Livestock Survey,

2015 (4) District Statistical Handbook of Jalpaiguri, 2014 (6) National Rural Drinking Water Program, 2017.

The findings (table:2) show that major inequality found in terms of selected variables in different blocks. For example, rural people served by banking facility is lowest in Alipurduar-1 only 3.70%, whereas highest is 48.81% in Jalpaiguri. Irrigation land to the total net sown area was minimum in Dhupguri only 3.32% and maximum in Alipurduar-1 was 24.70%. In terms of rural sex ratio, Raiganj possesses the lowermost position (923) and Kalchini at the better position (1005).

5. RESULT AND DISCUSSION

The major advantage of comparative evaluation of livelihood capital and opportunity is that it can provide a clear picture of rural poverty in the particular region. In India, regional variation of rural level of livings and poverty pattern is very complex; there is huge spatial disparity within and across the state, district, and block. Identifying the livelihoods capital score at community development block level (very important hierarchal administrative unit of India) helps policy maker to plan or building strategy for better human welfare.

5.1. The Scenario of Livelihood Opportunity

The table:1 suggests that the rural workforce participation rate of this region decreased since 1951 until 2011. One of the reasons is high population growth. However, after 2001 work participation rate is raising. One important study based on National Sample Survey data by Jatav, and Sen (2013) shown that 85% male and 94.1% female rural non-farm sector workers employed within the rural area. So it is clear that most of the rural people of India engaged in different economic activities based on locally available rural resources and opportunities.

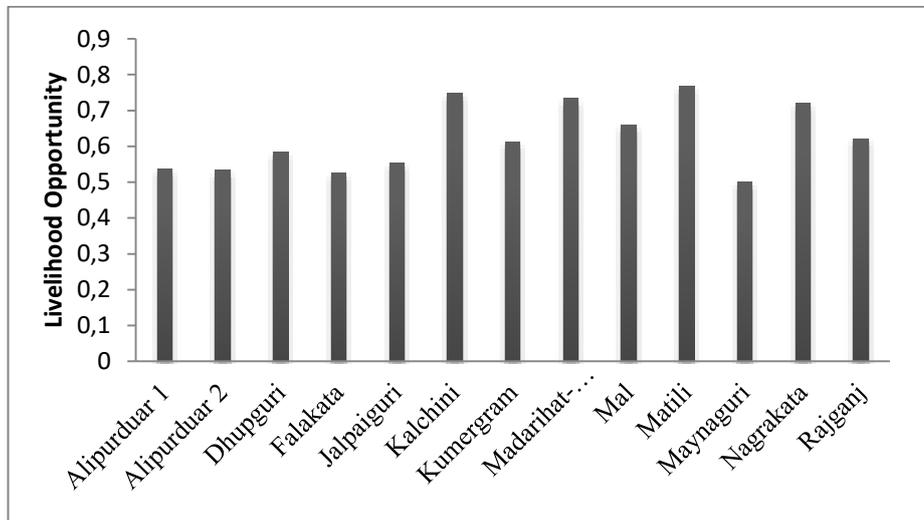


Fig 2: Blockwise Livelihood Opportunity Distribution

Our measured livelihood opportunity shows Alipurduar 1 and 2, Falakata, Maynaguri has less work opportunities compare to Kalchini, Madarihat-Birpara, and Matili. Here high population density as well as growth rate is an important reason for the low possibility of work (fig:2). The Maynaguri block has the lowest work opportunities. Table: 3 showing that blocks where agricultural work opportunity is low at same time house hold worker rate is high. Alipurduar-1 has the highest concentration of agricultural labour and Kalchini has the lowest. Jalpaiguri has lowest amount of household industry worker. Only 4% people are engaged with cultivation in Matili. The overall opportunity is high in those block where the cultivation and agricultural labour engagement is low or others worker involvement is high (fig:1and table:3).

Table: 3 Patter of Rural Livelihood Opportunity (values in %)

Name of the Block	Cultivator	Agricultural labour	Household Industry worker	Others Worker
Alipurduar 1	23.33	42.35	1.24	33.08
Alipurduar 2	23.01	39.19	2.78	35.03
Dhupguri	18.16	35.65	1.43	44.75
Falakata	23.38	43.17	1.57	31.88
Jalpaiguri	23.62	38.57	0.95	36.89
Kalchini	8.56	9.75	2.08	79.61
Kumergram	16.79	28.8	3.16	51.26
Madarihat-Birpara	9.09	12.26	1.59	77.07
Mal	12.92	21.86	1.68	63.55
Matili	4.92	11.56	1.39	82.1
Maynaguri	32.96	38.3	1.62	27.12
Nagrakata	8.5	13.99	1.68	75.1
Raiganj	17.85	25.29	2.45	54.42

Source: Calculated from District Census Handbook Jalpaiguri, 2011.

5.2. The Scenario of Livelihood Capital

Livelihood capital index have five separate dimensions of capital. As we have shown, the particular dimensions of livelihoods capital based on precise variables (table: 2). Scholar stated that spatial representation is a very helpful technique for targeting the investment sector (Donohue and Biggs, 2015; Misra, Sundaram, and Prakasa Rao, 1974). The fig:3 shows the dissemination of human capital. The highest concentration of human capital was in Alipurduar-2 block followed by Jalpaiguri and Maynaguri. More investment is needed on the human capital sector in Matili, Mal, and Nagrakata block which have lower amount of human capital. The reasons behind the backwardness in term of human capital in Matili and Nagrakata are habitats are mostly marginal migrated and concentration of tribal population is high (Census of India, 2011; Department of Planning and Programme Monitoring, 2018). A large number immigrant came from Bhutan has been settling in Matiali and Nagrakata (Field observation, 2016).

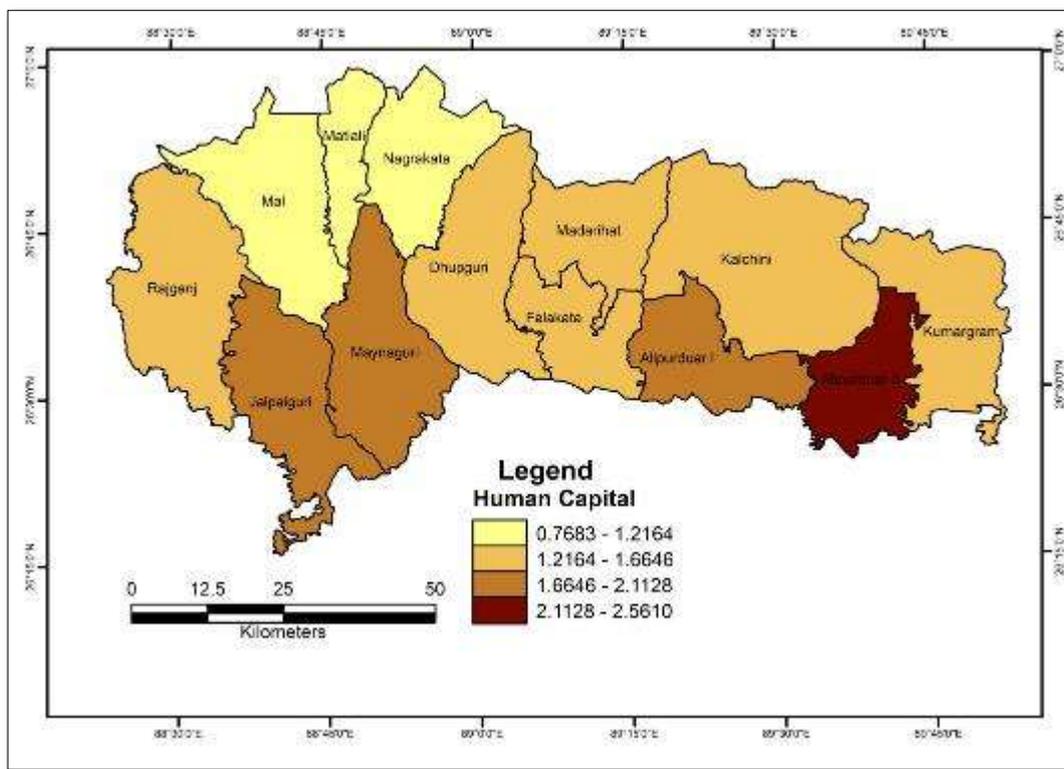


Fig. 3: Human Capital Distribution of Community Development Blocks

Fig.4 representing the social capital among the community development blocks of Himalayan foothills in West Bengal. Here, the slope of a social capital is towards eastern direction except, Alipurduar-2. However, the Kalchini and Kumergram are extremely poor blocks in the eastern part. The reason behind could be low per capita cultivated land and inadequate rural drinking water facility etc. The Western portion of the region enjoys the more benefits of social assets. Therefore, the development policy should be required a specific strategy for the northeastern stretch of the region in terms of social development.

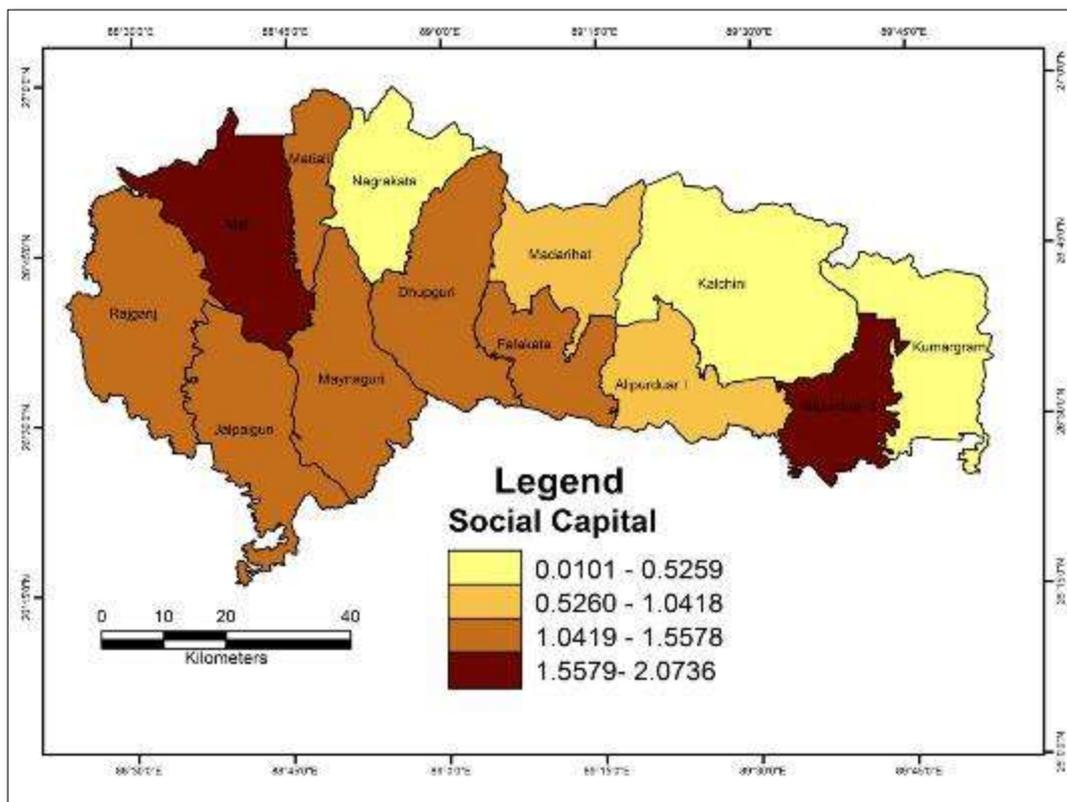


Fig 4: Social Capital Distribution of Community Development Blocks

The highest amount of financial capital (Fig.5) of the region concentrated in Jalpaiguri followed by Rajganj. The block Dhupguri, Falakata, Maynaguri has the medium concentration of financial capital. The above mentioned blocks have the higher number of crossbred and indigenous cattle as household livestock. Rural people served by the banking and medical facility is highest in Jalpaiguri and Falakata block. Matiali, Nagrakata, and Alipurduar-1 and 2 have a low financial capital base which is a vulnerable indication of rural livelihood.

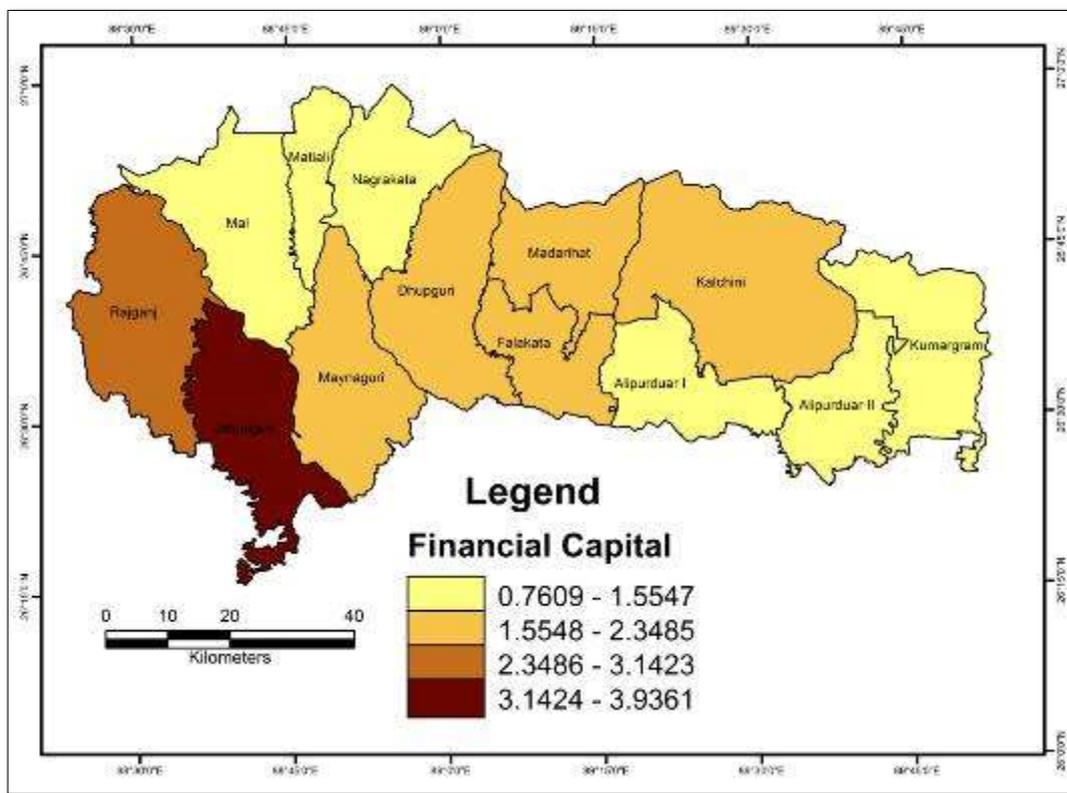


Fig 5: Financial Capital Distribution of Community Development Blocks

Rural physical infrastructure base is the main driving force of rural holistic development. Physical capital is the strength of future prospect. In the developing world, rural physical infrastructure is proportionally related to high wage rate and more opportunity in the non-farm sector (Dula Etana, 2011). Rural roads, irrigation infrastructure, electricity, and others

development indicators are significant determinants for the rural physical capital base (Borooah and Dubey, 2007). Here, the three important variables like net sown area, irrigated land, and rural metal road have been considered for measuring the physical capital in this study. The result (Fig.6) shows the entire western part and Falakata block of the Himalayan foothills West Bengal is more affluent in terms of physical capital base. Jalpaiguri, Mal, and Matiali have the maximum concentration of physical capital followed by Alipurduar-1 and 2, Raiganj. The block Dhupguri is potentially prosperous in terms of agricultural, but only 3.32% of net sown area is under irrigation. Therefore, more investment is required for irrigation sector in the above block. In the Madharihat and Kalchini block also needs investment and proper planning in the rural metal road and irrigation sector.

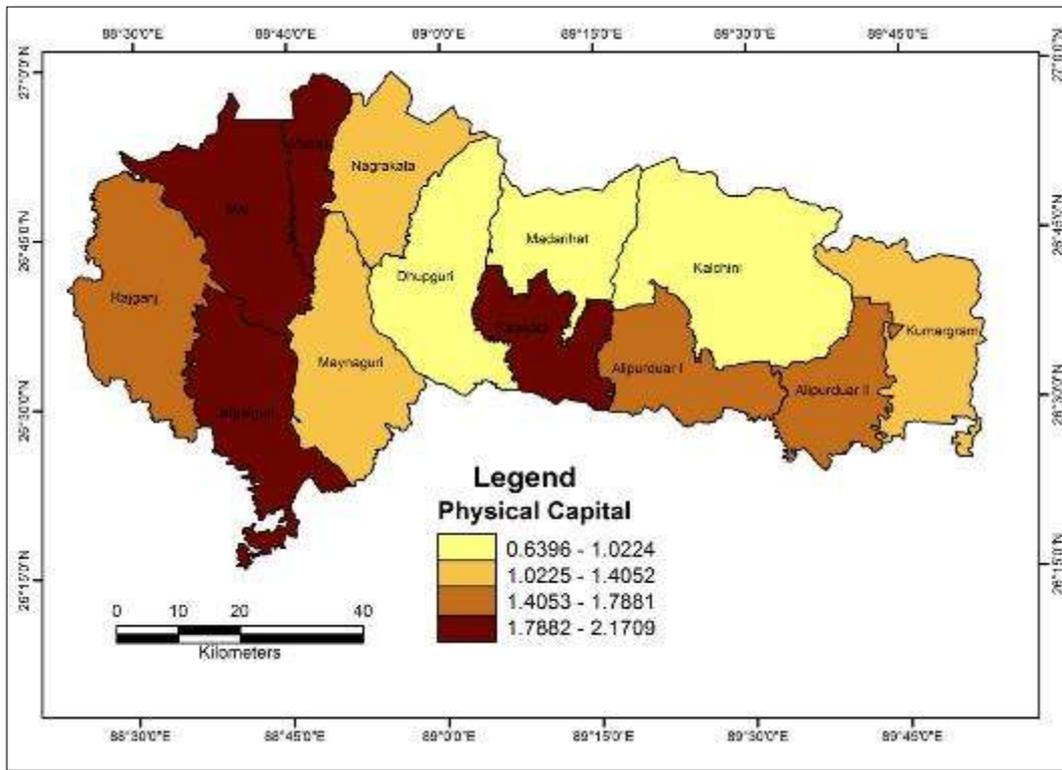


Fig.6: Physical Capital Distribution of Community Development Blocks

Experts' defined rural livelihood in different ways, according to Chamber (1983) rural livelihoods is the combination of ecological richness, social, political and temporal aspect of any rural society or region. From the above framework of rural livelihoods it is clear that the ecological services or natural resource as importance foundation of rural economic life. Forest resources, land under social forestry and double crop producing land (proxy of good soil), water body have taken as computing the natural resource base capital. In the fig:7, Mataili appear as a lowest natural capital base community block. The Western part is displaying good natural capital base due to fertile quality soil and the eastern part is showing strong in the natural capital base for forest resource.

The livelihood capital approach of measuring or understanding the overall rural livelihoods of any region is multidimensional in character; this approach is also preferred to measure the composite status of livelihood capital (Donohue & Biggs, 2015; Erenstein, Hellin, & Chandna, P. 2009). The main argument behind the calculating the overall status of livelihoods is that the essence of rural well-being is not purely economic, but also an amalgamation of social and environmental dimension.

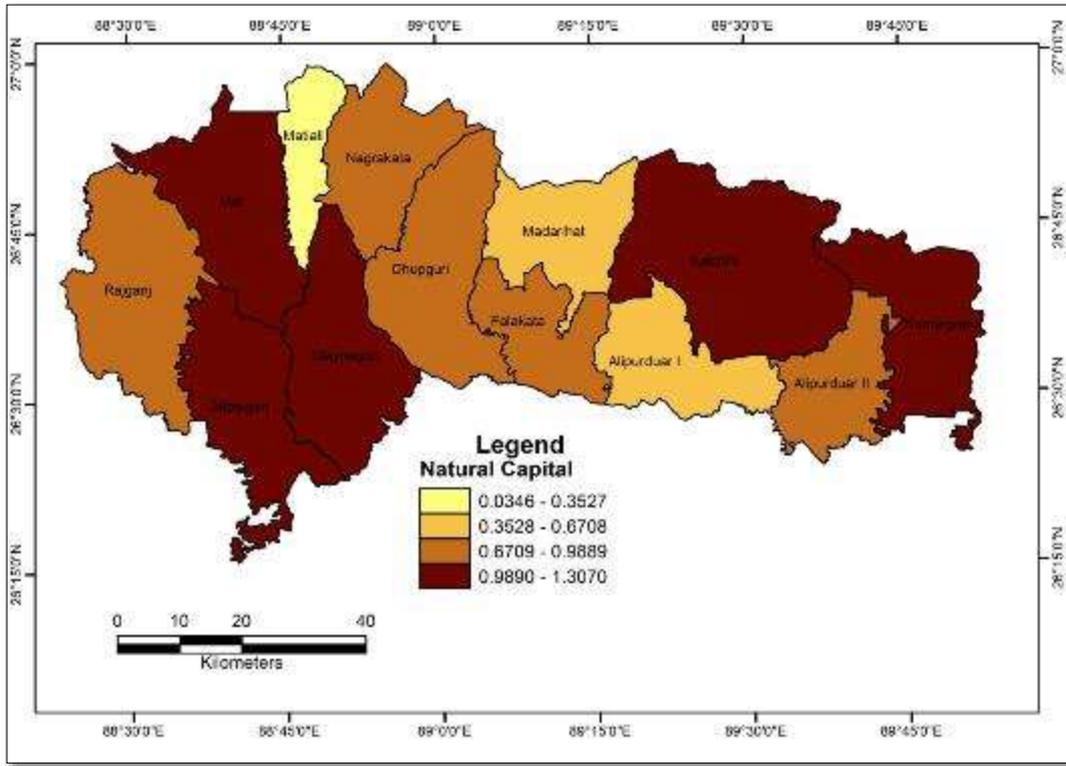


Fig.7: Natural Capital Score of Community Development Blocks

From an inter block level rural composite livelihoods capital analysis of the Himalayan foothills of West Bengal is very important in present time, specially, in post-reform period. After economic reforms (1991), there is a certain level of improvement in the standard of living of rural people but a high degree of disparity among the district and state still exist (Chaudhuri and Gupta, 2009; Deaton and Drèze, 2005). The fig: 8 which shows the pattern of overall livelihood capitals of block of the study region. It is noticed that Kalchini, Nagrakata, Matiali, and Madarihat are in a vulnerable situation, where the concentration of livelihood capitals are low. In terms of all livelihood capitals dimensions, Jalpaiguri is better position followed by Rajganj and Falakata. The western part of the sub-Himalayan west Bengal is comparatively better than eastern part in terms of livelihoods capital concentration. Similarly, the southern part is better than northern part. The rearward block like Nagrakata, Matiali are situated in northern part and the forward block like Jalpaiguri and Falakata in southern part.

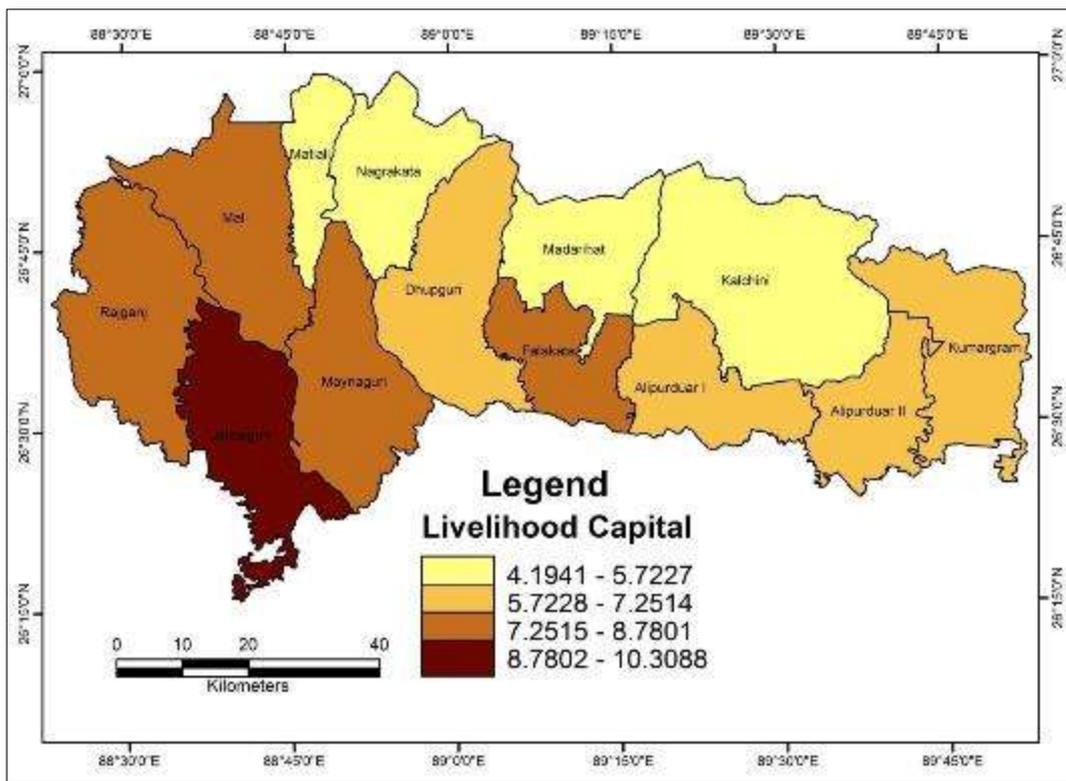


Fig.8: Composite Livelihood Capital Score of Community Development Blocks

We have applied hierarchical clustering analysis technique for more robust understanding of livelihood typology of the community development blocks based on same variables used in livelihood capital approach. The hierarchical clustering analysis technique is very relevance for the comparative analysis of composite livelihood capital score and the result of hierarchical clustering for better interpretation. The proximity matrix of squared Euclidian distance based on our specified variables as used in hierarchical clustering analysis shows the lowest distance of the matrix is 8.819, which is between Kalchini and Nagrakata block (Appendix:1 for distance co-efficient). Thus, these two blocks are most similar. Others way the block Kalchini, Nagrakata and Kumergram, Madarihat-Birpara appeared relatively similar to each other's in terms of composite rural livelihood capitals, followed by Matili and Alipurduar to certain extent. Dhuppuri, Jalpaiguri, Raiganj, and Mal have the similar pattern of livelihood, which is support for the hierarchical clustering analysis (fig: 8, 9 and Appendix:1).

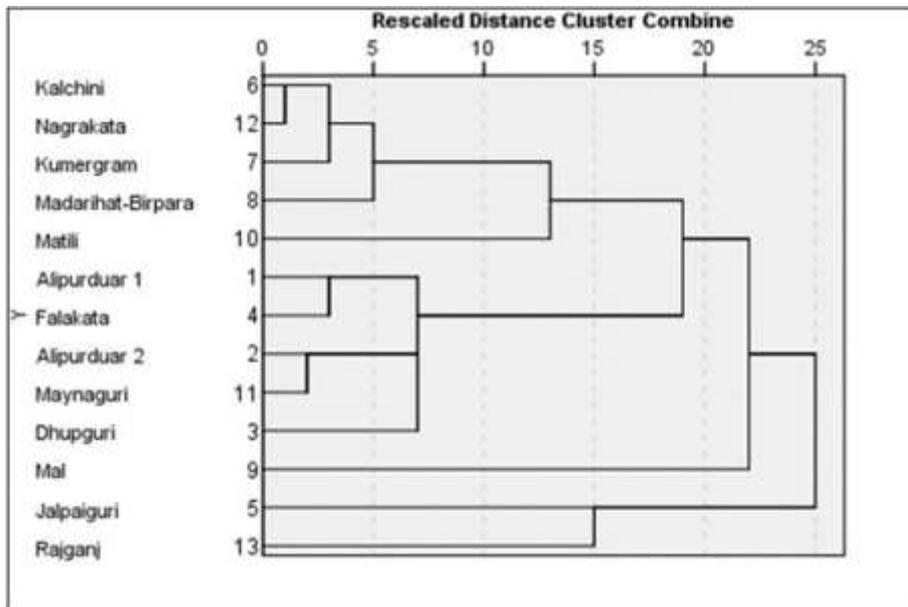


Fig: 9 Dendrogram between Groups of Community Block

6. CONCLUSION

The paper focused on two broad and integral aspect of rural livelihood, such as opportunity and capital. Except few blocks, like Dhuppuri, Falakata, and Maynaguri, agricultural workforce opportunity is very limited all over the region. Rural people are more engaged in non-farm activities in the blocks like Mal, Matili, and Madarihat. The result of livelihood capital shows that there are enormous disparities within community development block of sub-Himalayan West Bengal. Special development strategy is being need for backwards block like Nagrakata and Matiali. The block where the natural capital base is high the human capital base is low and vice versa. However, as per as methodology is the concern, there are many methods developed by geographer, economist, and others social scientist to quantifying the domain of rural livelihood. Every method has few merit and demerit. The multidimensional rural livelihood capital approaches now more acceptable at the present time. Rural poverty being more dominated in some region due to inverse natural environment condition or scarcity of natural resource (Misra, Sundaram, and Prakasa Rao, 1974). Therefore, the livelihood capital approach is relevant in sub-Himalayan regional context because it include the natural environmental dimension to quantifying the overall livelihoods status of rural lives. To preparing a development plan for this region it is very much crucial to consider the socio-economic, environmental and historical aspects at the same time. The problem of rural poverty in the Indian state of West Bengal is old and massive, therefore to deal with rural poverty it needs professional enquire and multipronged strategy.

REFERENCES

- Adjei, P. O. W., Buor, D., and Addrach, P. (2017). Ecological health effects of rural livelihood and poverty reduction strategies in the Lake Bosomtwe basin of Ghana. *GeoJournal*, 82(3), 609–625.
- Asselin, L., and Ki, J. (2009). *Analysis of multidimensional poverty: Theory and case studies*, Springer International Publishing.
- Banerjee, A. V, and Duflo, E. (2007). The Economic Lives of the Poor. *Journal of Economic Perspectives*, 21(1), 141–167.
- Basole, A. (2017). Analysis of the Promises for Rural India. *Economic and Political Weekly*.
- Bhandari, P. B. (2013). Rural livelihood change? Household capital, community resources and livelihood transition. *Journal of Rural Studies*, 32, 126–136.
- Borooh, V. K., and Dubey, A. (2007). Measuring Regional Backwardness. *Margin: The Journal of Applied Economic Research*, 1(4), 403–440.
- Carney, D. (1999). *Key Sheets for Sustainable Livelihoods*. Department for International Development(DFID). Department for International Development, Natural Resources Policy and Advisory Department, UK.
- Census of India. (2011). *West Bengal Census Handbook*.
- Chaudhuri, S., and Gupta, N. (2009). Levels of living and poverty patterns: a District-Wise analysis for india. *Economic and Political Weekly*.
- Davis, J. R. (2003). *The rural non-farm economy , livelihoods and their diversification: Issue and options*. Natura Resource Institute, UK.

Deaton, A., & Drèze, J. (2005). Poverty and inequality in India: A re-examination. *Reflections on the Right to Development*, 243–275. Department of Planning, Statistics, and Programme Monitoring. (2018). *Economic Review 2017-18*, Govt. of West Bengal.

Donohue, C., & Biggs, E. (2015). Monitoring socio-environmental change for sustainable development: Developing a Multidimensional Livelihoods Index (MLI). *Applied Geography*, 62, 391–403.

Dula Etana. (2011). *Household Demographics , Asset, and Sustainable Rural livelihood: A case Study from Rain-Endowed South Western Ethiopia*. Editor A. H. C. Teller, Springer International Publishing.

Dutta, P. (2015). Locating the Historical Past of the Women Tea Workers of North Bengal. *The Institute for Social and Economic Change, Bangaluru*.

Ellis, F. (1998). Household strategies and rural livelihood diversification. *Journal of Development Studies*, 35(1), 1–38.

Erenstein, O., Hellin, J., and Chandna, P. (2010). Poverty mapping based on livelihood assets: A meso-level application in the Indo-Gangetic Plains, India. *Applied Geography*, 30(1), 112–125.

Ghosal, S. (2014). The Significance of the Non-Timber Forest Products Policy for Forest Ecology Management: A Case Study in West Bengal, India. *Environmental Policy and Governance*, 24(2), 108–121.

Hussain, A., Rasul, G., Mahapatra, B., & Tuladhar, S. (2016). Household food security in the face of climate change in the Hindu-Kush Himalayan region. *Food Security*, 921–937.

Jha, S. (2010). The struggle for democratizing forests: The forest rights movement in North Bengal, India. *Social Movement Studies*, 9(4), 469–474.

Jha, S. (2012). Radical Politics and Environmentalism against Taungya in Dooars. *Economic and Political Weekly*, XLVII(1), 112–118.

Levine, S. (2014). How to study livelihoods: bringing a sustainable livelihoods framework to life.

Liu, Y., and Xu, Y. (2016). A geographic identification of multidimensional poverty in rural China under the framework of sustainable livelihoods analysis. *Applied Geography*, 73, 62–76.

Misra, R. P., Sundaram, K. V., and Prakasa Rao, V. L. S. (1974). *Regional development planning in India : a new strategy*. Vikas Publishing House, Delhi.

Nath, T. ., & Inoue, M. (2009). Forest-based settlement project and its impacts on community livelihood in the Chittagong Hill Tracts, Bangladesh. *International Forestry Review*, 11(3), 394–407.

Rahman, S., and Davis, J. (2005). A survey of rural livelihood and enterprise development opportunities in the Chars , Bangladesh. *National Resources Institute*, 44(0), 36.

Roy, B. P. (2014). Crop Concentration and Diversification in Jalpaiguri District of West Bengal: a Case Study. *International Journal of Food*, 4(3), 5–9.

Roy, S. (2011). *Flood Hazards in Jalpaiguri District*. Unpublished Ph.D thesis, Department of Applied Geography, University of North Bengal, Siliguri.

Solesbury, W. (2003). *Sustainable Livelihoods: A Case Study of the Evolution of DFID Policy - ODI Working Papers 217*, UK.

Srivastava, S. K., Dutt, C. B. S., Nagaraja, R., Bandyopadhyay, S., Meena Rani, H. C., Hegde, V. S., and Jayaraman, V. (2004). Strategies for rural poverty alleviation in India: A perspective based on remote sensing and GIS-based nationwide wasteland mapping. *Current Science*, 87(7), 954–959.

Wang, X., Felbermeier, B., Kateb, H. El, & Mosandl, R. (2015). Household Forests and Their Role in Rural Livelihood: A Case Study in Shangnan County, Northern China. *Small-Scale Forestry*, 287–300.

Whitby, M., & Willis, K. (2017). *Rural Resource Development: an Economic Approach*. Routledge.

APPENDIX: 1

1. We applied hierarchical clustering analysis technique for comparative analysis with composite livelihood capital score for better understanding. The Agglomeration Schedule table is below.

Agglomeration Schedule

Stage	Cluster Combined		Coefficients	Stage Cluster First Appears		Next Stage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	6	12	8.819	0	0	4
2	2	11	10.692	0	0	6
3	1	4	11.811	0	0	7
4	6	7	12.665	1	0	5
5	6	8	15.281	4	0	8
6	2	3	17.544	2	0	7
7	1	2	18.626	3	6	10
8	6	10	26.656	5	0	10
9	5	13	29.244	0	0	12
10	1	6	35.036	7	8	11
11	1	9	40.075	10	0	12
12	1	5	45.006	11	9	0

1197 PREDICTING DEPRIVATIONS IN HOUSING AND BASIC SERVICES FROM SPACE IN THE SLUMS OF DHAKA**Amit Patel, Christian Borja-Vega, Luisa Mimmi, Tomas Soukup, Jan Kolomaznik, Tanushree Bhan, Marcia Mundt, Hyun Jung Lee**Amit.Patel@umb.edu, cborjavega@worldbank.org, lmimmi@worldbank.org, tomas.soukup@gisat.cz, jan.kolomaznik@gisat.cz, Tanushree.Bhan001@umb.edu, Marcia.Mundt001@umb.edu, HyunJung.Lee001@umb.edu**ABSTRACT**

This study adopts a novel approach to targeting poverty interventions in slums by using image-based spatial data to predict housing and basic services deprivation from space. It offers a conceptual framework to explore and compare deprivation within and across cities. With half the world's population currently living in urban areas, and close to one billion living in slums or informal settlements, cities have been struggling to deal with the pressures that rising populations pose on infrastructure, basic services, land, and housing—not to mention the environment. Moreover, megacities in developing countries have been growing at a faster pace than ever, mostly in an unplanned manner resulting in the proliferation of slums. Against this backdrop, one of the key challenges to effectively targeting interventions is the lack of data on the dynamics of urbanization in general and slums in particular. Another problem relates to moving beyond the slum/non-slum dichotomy to identify the most deprived slums and ensure interventions target the most underserved households. In a pilot of our framework and methodology in Dhaka, Bangladesh, geospatial variables such as morphology, proximity to services, accessibility, and building density were used to predict multidimensional deprivation. Specifically, distance to the central business district, arterial roads, major road junctions, railroads, average dwelling size, and street type within slums were found to increase the relative risk of overall deprivation. To the contrary, proximity to heavy industry and shoreline, building density, winding index for informal streets, low-level node connectivity ratio and proximity to various social amenities were found to decrease the relative risk of overall deprivation. The results from these models indicate their potential to predict the location and scale of current deprivation and future changes, which could support the creation of inclusive policies and targeted planning interventions to help marginalized, poor and vulnerable populations.

Keywords: Aid Targeting, Slum Upgradation, Urban Poverty, Earth Observation Data, Bangladesh

HIGHLIGHTS

- Methodology integrates household survey and Earth Observation data in an innovative model for measuring housing and basic service deprivation.
- Distance to business center, proximity to roads and industry, density and land use and land cover were notable predictors of deprivation.
- Model results from Dhaka, Bangladesh indicate the opportunity to further develop the model with additional characteristics and in new contexts.

1. INTRODUCTION

With the global population of slum dwellers exceeding one billion today and discouraging projections for the coming decades, our rapidly urbanizing world needs to address the challenges facing slums in a much more effective way than ever before. Close to 52 percent of the world's population lives in urban areas, about a quarter of which lives in slums, mostly in less developed countries UN-Habitat, 2012; 2015. . There is an urgent need for slum improvements to move beyond a few isolated success stories and adopt a programmatic approach to the challenges facing slums. Furthermore, cities need to be proactive in providing affordable housing and basic services to avoid the formation of new slums.

Designing effective projects and policies requires information on slums and the cities in which they are embedded. However, international development agencies as well as national and municipal governments rarely have access to up-to-date, reliable information on the number and characteristics of slums in a given city Lucci *et al.*, 2018, . Such evidence is critical for cities to formulate effective interventions, programs, and policies. For example, a recent study by Briggs 2018, explored whether aid from the World Bank and the African Development Bank accurately targeted poor populations across Africa, concluding that aid tends to flow to the relatively more affluent using gridded spatial analysis. This finding highlights the need for information that could help identify the most deprived slum populations in a reliable and timely manner to prioritize interventions in resource scarce settings such as those found in developing countries. Thus, a framework that could provide rapid data and information with minimal cost is essential for targeting limited resources in a more effective way.

This study proposes an analytical tool to identify, prioritize and target slums for interventions. Building on the potential of Very High Resolution VHR, remote-sensing data and advanced image processing, this approach provides a holistic strategy for understanding the needs of slum-dwellers based on the geography and spatial dynamics of each area. Remote-sensing RS, is already being used to map the number and extent of slums and a multiplicity of extraction methods for slum mapping have been developed in the last fifteen years ranging from classical visual image interpretation to Object-Based Image Analysis OBIA, to machine learning, or a combination of methods Kuffer *et al.*, 2016, . The main challenge remains how to translate a relevant set of slum characteristics into robust indicators e.g. developing a slum ontology, for image-based slum mapping that would ultimately allow for developing a global slum inventory Kuffer *et*

al., 2016, p.5. Furthermore, it is important to identify the worst conditions among slums for prioritization purposes since different slums face different levels of housing deprivation Patel *et al.*, 2014, .

Based on the premise that integrating multi-source, spatial data with locally collected data has the potential to improve the design and targeting of slum infrastructure upgrading policies, this methodology builds on two main considerations: i, the growing potential in the increasing availability, quality, and accessibility of spatial data being collected formally and empirically on slums, and ii, the growing number of household surveys collecting GPS coordinates, and the advances in mobile telecommunication and social media generating data from communities on a regular basis.

Collecting and integrating multidimensional data that can be spatially overlaid and intuitively visualized in web-maps can provide an invaluable tool for planning with more transparency and accountability. With the proliferation of open source software for crowd sourced data collection, cloud-based storage, and free software for spatial data analysis, the urban poor are organizing themselves to seek solutions to their own needs. Further, new grassroots technologies are enabling many communities to express their aspirations and needs as well as engage in slum upgrading initiatives. As a result, Geographic Information Systems GIS, tools have been created to represent previously unmapped areas. Integrating these data further leverages the complementarity of insights obtained from sophisticated Earth Observation EO, data image processing algorithms linked to the invaluable knowledge that can only be captured in close interaction with local residents of slums. Finally, identifying contextual slum typologies is an important research direction and integrating image-based spatial data with socioeconomic characteristics can help respond to this need.

The methodology outlined in this study aims to support the policy design stage by providing a comprehensive and objective framework for prioritizing and sequencing slum rehabilitation work. Moreover, this framework offers an alternative approach for engaging stakeholders—namely slum-dwellers, developers, civil society, and local governments—in evidence-based policy discussions instead of entering politically charged territory.

The article is divided into six sections. The next section provides a comprehensive review of literature related to spatial analysis of slums. Section 3 provides background and context on Dhaka, the case study city. Section 4 describes the data and methodology employed in the study. Section 5 illustrates the results of the analysis and the study limitations. We conclude in Section 6 with planning and policy implications drawn from the case study analysis and recommendations for further exploration of this novel methodology.

2. LITERATURE

Slums are a major part of the urban housing stock and an important part of the urban economy in many cities of the global South yet these areas also have a high concentration of urban poor Sliuzas & Kuffer, 2008, . UN-Habitat 2012, defines slums as areas with households that are deprived of access to safe water, acceptable sanitation, durable housing structures, adequate living space, and secured land tenure. It is estimated that most of the urban population growth over the next three decades will occur in cities of less developed countries, which means the pressure on sub-national governments to deliver basic services like water and sanitation will continue to rise UN-Habitat, 2012, . However, identifying the most deprived slums and strategies for targeting interventions is a challenging endeavor. Even defining and detecting a “slum” can be quite challenging, and the nature and severity of the deprivation endured by residents is highly heterogeneous within cities Kohli *et al.*, 2012, . The reality of fast-growing slums and unplanned urban pockets calls for improved data collection methods that are more agile and rapidly updated.

As EO data became more widely available at the turn of the century, practitioners and scholars began exploring how geospatial data could be used to map the location, extent, and various types of deprivations within urban areas, particularly slum settlements. For example, in preparation for the first World Bank ‘Geospatial Day’ held in 2016, the Geospatial Community of Practice compiled a list of over 140 projects to showcase how the World Bank and its partners leverage geospatial analytics. Practitioner reports involved RS and applications spanned all possible sectors, including: climate change; fragility, conflict, and violence; transport; urban development; and water, to name a few. Within scholarship related to this topic, a subset of studies focus on simply finding slums and informal settlements by identifying changes in Land Use / Land Cover LULC, to highlight the value and applicability of these early techniques and findings to this study. Scholarship has also been devoted to mapping the extent and growth of informal settlements; a topic with relevance to the present case regarding the vulnerability of slums due to their inhabitants’ transitory nature. Finally, various researchers have taken an interest in mapping the more nuanced changes in levels of deprivation and socio-economic characteristics within slums. Only three studies, however, have explored the use of RS data for this purpose so far. This technique is applied to the current case study using new data and modeling techniques to further advance this area of knowledge.

One of the earliest studies using geospatial data to map land use in cities established a standardized classification of LULC. Rashed *et al.* 2001, argued that land use planning at local within-city, or regional between-cities, levels requires a standardized classification. RS imagery can only record land cover, which describes the physical state of features in urban lands e.g. vegetation types, water bodies, . Thus, land cover is a more objective measure than land use, which cannot directly be linked to RS data and is prone to interpretation error because different users will have different perspectives on the classification procedure Rashed *et al.*, 2001, p.6, . They found the Spectral Mixture Analysis SMA, fractions of vegetation, impervious surface, bare-soil, and water/shade end members provided a measure of the physical properties of the dominant classes in the urban landscape, helping to reveal the morphological patterns of the Cairo metropolitan area and its surroundings. The baseline classification system developed in this study has since been further refined by many subsequent studies.

Various forms of geospatial mapping and classification have now been applied to identify urban areas from space. Shi *et al.* 2014, pp.359, used the Visible Infrared Imaging Radiometer Suite VIIRS, day-night band DNB, carried by the Suomi National Polar Orbiting Partnership Suomi NPP, satellite to extract the location of built-up areas in 12 cities of China. They argued that since the built-up areas are illuminated artificially at night, their corresponding pixels in nighttime light images have larger digital number DN, or radiance values than the surrounding dark areas. Antos *et al.* 2016, produced and analyzed land cover maps derived from high-resolution satellite imagery for five primarily African cities. While satellite imagery had been used to measure the footprints of cities, distinguishing urban vs non-urban areas, the high-resolution satellite imagery dug deeper to measure the various land cover types within the city, including the 'irregular' residential land cover type that serves as a proxy for slum areas. A similar project was conducted in Central America Augustin *et al.*, 2017, . Again, high-resolution imagery was used to create detailed land cover maps and road networks.

More relevant still, researchers have isolated slums and informal settlements within those urban areas Kuffer *et al.*, 2016. Tigny 2016, used VHR satellite imagery extracted over in four points in time to reveal some trends and patterns in slums formation, enabling a highly accurate mapping of the 2500 informal settlements in Manila. Rhinane *et al.* 2011, used an object-oriented classification approach to map slums in Casablanca, Morocco in two steps: segmentation and classification. Segmentation involved subdividing an image in the visible range into homogeneous regions. The researchers then grouped objects and assigned them a probability or degree of belonging to a given class from the robust rules of region recognition Rhinane *et al.*, 2011, p.220, . The binary image resulting from the classification was then exported to ArcGIS, and slums in the city of Casablanca were mapped with an accuracy of 85%.

Several RS approaches have also been utilized to obtain up-to-date and faster access to information on the location and growth of slums. For example, Kit *et al.* 2012, proposed using a lacunarity method to extract slum pockets from QuickBird satellite images for the case of Hyderabad, India. Lacunarity analysis is a multi-scaled method of determining the texture associated with patterns of spatial dispersion. The lacunarity algorithm is capable of identifying the core of a slum; the areas with very dense housing that are particularly vulnerable to natural and socio-economic hazards Kit *et al.*, 2012, p. 666, . Amorim *et al.* 2014, offered an approach integrating lacunarity and texture based analysis to better understand complex intra-urban socio-spatial patterns for urban planning and land-use management. This method allowed them to describe the spatial arrangement of surfaces and built materials on Very High Resolution satellite images.

There is growing interest among researchers to devise methods for time- and cost-efficient collection of social and spatial indicators to help policymakers and practitioners measure the extent of poverty and locate the hotspots of deprivation for targeted investments. Researchers like Duque *et al.* 2015, and Hofmann 2001, argue that poverty measures like individual level income and consumption require a heavy investment of time and money to conduct large-scale surveys. Thus, they often fail to capture intra-urban variation in deprivation among slums, a gap that can be fulfilled by spatial mapping of slums. In order to advance geospatial mapping techniques to the level at which they are operational for this purpose, GIS data must be integrated with statistical databases of socio-economic indicators and field surveys to evaluate the environmental and related socio-economic impacts of informal settlements.

For example, in a study integrating statistical databases with geospatial data conducted within 10 districts in the Brazilian city of Cuiaba Zeilhofer & Topanotti, 2008, , the authors extracted and scored, 35 indicators of environmental degradation pertaining to vegetation cover, street network, land ownership, and water and sanitation infrastructure from government statistical databases, field surveys, and GIS. The highest indicator scores were observed for vegetation cover and water supply. The former was impacted by the growth of informal occupation, while water pollution of urban streams was characterized by accumulation of solid waste and raw sewage. The latter points to the poor coverage of sanitation infrastructure in sampled areas Zeilhofer & Topanotti, 2008, p.10, . Higher degrees of degradation were seen in younger settlements due to a lack of infrastructure and public services. Settlements in districts with elevated declivity suffered from erosion processes due to vegetation clearing or inadequate orientation of street network. The World Bank 2016, geo-referenced household surveys built on an analysis conducted on satellite data to collect key information about living standards in cities. The use of satellite imageries for sampling design and field work increased representativeness within cities, allowing the research team to appreciate differences between regular and 'irregular' settlements often excluded or poorly represented, . Using night-time images, Zhuo *et al.* 2009, have shown that the distribution of light intensity can be used to further estimate the density of energy consumption, greenhouse gas emissions, and economic activity.

Some innovative statistical approaches to slum mapping and deprivation variability have combined RS imagery with mobile phone usage data to provide a more up-to-date measure of poverty compared to census data, in low- and middle-income countries. Steele *et al.* 2017, conducted such a study for mapping spatial distribution of poverty in rural and urban Bangladesh. Night-time lights and transportation time to the closest urban settlement were important variables to predict poverty in both rural and urban areas. Higher cell phone usage, generally, was associated with lower poverty rates in both rural and urban areas. The combination of spatial data and more frequent cell phone usage data may distinguish the transitory poor from the chronically poor Steele *et al.*, 2017, p.8. This integrated approach offers the potential for a fuller characterization of the spatial distribution of poverty and the findings and lessons learned from this research could be applied for mapping electricity deprivation in slums and informal settlements in less developed countries.

Spatial mapping of slum morphology has the benefit of identifying locational characteristics like proximity to landfill sites and the presence or type of sanitation infrastructure that may have consequences for health and social outcomes of residents living in such communities. Rahman & Alam 2015, p.4, found that 76.4% of children in three Bangladeshi slums were suffering from diseases because of poor hygiene resulting from inadequate sanitation services. In conjunction with

poor access to nutritious food, these children had high rates of morbidity that can have grave consequences for future cognitive development and socio-economic mobility. The absence or inadequate levels of other basic services in slums and informal settlements, like water supply, also have an adverse impact on school completion rates among children. In a study of 33 public schools in Delhi, India, Chugh 2013, p. 17, found that children living in slums and resettlement colonies were at a higher risk of dropping out before reaching secondary level. One of the major factors underlying this educational outcome was poor infrastructure in these communities.

In order to spatially target policy interventions to address deprivation in slums, disaggregated contextual spatial information such as access to roads, neighborhood density, building structures, and proximity to hazardous zones is needed. Such data can provide a multidimensional assessment of the challenges and needs of the urban poor. Baud *et al.* 2010, p. 360, highlight the potential of remote-sensing methods for mapping multiple deprivations by analyzing spatial variation within Delhi such as patterns of green spaces, the structure of building layouts, density of built-up areas, and urban structure i.e. arrangement of land cover, . RS can play a key role in analyzing space-time dynamics such as monitoring densification and expansion of settlements or assisting with the implementation of slum improvement policies Patino & Duque, 2013, .

A number of VHR RS products such as IKONOS, QuickBird or Pleiades, from numerous satellite data providers are now readily available to the public. New emerging missions e.g. Planet, make image data even more accessible and actionable. All of these resources can be employed more frequently for extracting information about physical deprivations across different residential areas. This urban morphology data can be then linked with socio-economic parameters e.g. access to potable water supply, sanitation, household size, and tenure status, obtained from census or household surveys to design urban development plans for a city or region. Recently, a few researchers have attempted to predict outcome indicators obtained from a pre-existing census or survey as a function of remote-sensing-derived variables Stoler *et al.*, 2012; Taubenböck *et al.*, 2014; Duque *et al.*, 2015, . In both Duque *et al.* 2015, and Stoler *et al.* 2012, , the authors model a Slum Index computed from survey and census data respectively, that measures various degrees of household deprivation. Conversely, Taubenböck *et al.* 2014, are mostly interested in how to delineate and define slum areas from a morphological point of view using remotely sensed data with a selection of explanatory variables. This study builds on these works to develop a model that could be used to predict deprivations at household and slum levels.

In sum, spatial imagery is a powerful tool to evaluate the extent and variability of deprivation in slum settlements but has thus far been rarely used for that purpose. Early attempts have focused on LULC mapping and change with respect to informal settlements. Beyond mapping slums, researchers make the case for identification of contextual slum typologies—integrating image-based information with socioeconomic characteristics—which may ultimately lead to better targeting of pro-poor policy interventions Kuffer *et al.*, 2016, . However, only a few studies have used EO data to predict access and quality of basic services such as water and sanitation in slums. This study attempts to devise a methodology for this purpose, to support planners and policymakers in the decision-making and implementation process.

3. BACKGROUND ON SLUMS IN DHAKA, BANGLADESH

The capital city of Bangladesh, Dhaka, was selected for our case study based on three criteria. First, we sought to leverage existing data collection efforts within the World Bank in cities in which rapid urbanization is accompanied by poverty in tandem with inadequate and spatially uneven housing, water supply, and sanitation services. Dhaka's recent history has witnessed an overwhelming growth of its population, chiefly through migration Lipu, Jamal, & Miah, 2013. Dhaka's current population is estimated at around 15 million residents and maintains a growth rate of four percent per year. Due to the city's topography and constrained land management, Dhaka's population growth has resulted in unplanned urban expansion and the proliferation of slums and squatter settlements. Unauthorized shanty housing has developed on abandoned private or government land, along the highway or on the side of railway tracks and industrial belts. As a result of the government increasing its guardianship over public lands, private property squatting has become more prevalent CUS *et al.*, 2006, p. 21. The Bangladesh Bureau of Statistics BBS, conducted a slum census in the Dhaka City in 1985, followed by another, extended, Census of Slum Areas and Floating Populations in 1997 in all cities and municipalities of the country. The most recent census BBS, 2014, estimates that over 2.2 million Bangladeshis or 592,998 households, live in 13,938 slums across the country. Among them, over 1.6 million reside in Dhaka City Corporation slums. Dhaka continues to experience substantial urbanization with population growth at a rate of more than four percent a year.

Despite a significant reduction of poverty over the past years, Bangladesh remains one of the poorest countries in Asia. Per the latest data from the 2010 Household Income Expenditure Survey HIES, Bangladesh has a national poverty headcount rate of 31.5% and an extreme poverty headcount rate of 18.5%. While in absolute terms, the bulk of the poor still live in rural areas, rapid urbanization is increasing the number of poor in urban areas, commonly referred to as urbanization of poverty. As of 2011, only 29.4% of the population is classified as urban. However, based on UN population projections, Bangladesh is expected to be over 50% urban by 2047 Islam *et al.*, 2013. Although national statistics show the urban population is better off than their rural counterparts, slum populations are often worse off. Because of the pressure from rapid and poorly managed urbanization, Dhaka faces many challenges in terms of its livability. The Economist Intelligence Unit's EIU, liveability ranking that examines cities in terms of population density, housing, pollution, affordability, and basic services placed Dhaka among the least livable cities, 137 out of 140 EIU, 2016, . This lower ranking of Dhaka was mostly due to the poor quality of its infrastructure. Urban populations face heterogeneous

living conditions and slum environments are an example of extreme intra-city inequality in terms of access to housing and basic services.

Most Bangladeshis have access to Tier 1 and 2 water services, improved and basic water respectively, and close to 98% of the population now has access to some kind of technologically improved water source World Bank Group, 2017, p. 26, . The Millenium Development Goal MDG, water target to halve the proportion of people using unimproved water sources by 2015 was achieved in Bangladesh. Still, higher tiers remain elusive for most; for instance, of the people classified as having access to improved water, about a quarter must still go off-premise to collect it. Moreover, having access to improved water sources does not ensure that water is clean. When considering *E. coli* and arsenic contamination, only 52% of the population has access to a clean and improved water source World Bank Group, 2017, p. 26, . Though many gains were made in water in the new millennia, Bangladesh failed to achieve the MDG sanitation target due to the high level of sharing between households. However, both urban and rural areas have witnessed significant improvements over time. Between 2006 and 2014, access in urban areas improved from 59 to 84 percent and doubled in rural areas from 32 to 64 percent World Bank Group, 2017, p. 39, .

A second important criterion—especially in view of future uses of the analytical tool by policy makers—was to focus on locations in which there was an existing mandate and/or openness to collaboration of city officials serving urban slums and informal areas. In this respect, The Government of Bangladesh GoB, has demonstrated its commitment to the Sustainable Development Goals SDGs, , including SDG 6 – ensuring availability and sustainable access to water and sanitation for all. The SDGs were taken into consideration while developing the country’s seventh Five-Year Plan for the period of 2016-2020. In addition, the Dhaka Water Supply and Sewerage Authority DWASA, has shown a significant commitment to accommodate this rapid pace of urbanization and is now capable of providing water to all of 15 million residents under its jurisdiction.

Third, the choice of pilot study site was driven by the availability of spatial data. Extensive research was conducted by cross-checking available sites with the aim of finding existing and readily available census or survey data covering the pilot city’s informal areas and slums which proved difficult, . Two timely and relevant data sources were available for Dhaka: first, the Bangladesh Urban Informal Settlements Baseline Survey BUISBS, slum survey; and second, spatial data for the VHR RS imagery and slum characterization analysis. The characteristics of these datasets and their applicability to this study will be further detailed in the following section.

4. DATA AND METHODOLOGY

Two types of data were utilized for this study: household survey data and Earth Observation data. Household survey and EO data form the dependent and independent variables respectively for the regression model. Each survey will be discussed in detail below before we discuss how the data was used in our novel methodology for analysis.

The household survey data we relied upon is from an existing dataset, the Bangladesh Urban Informal Settlements Baseline Survey, collected for the Bangladesh WASH Poverty Diagnostic in May 2016. The survey included questions on access and quality of water and sanitation services, adequate living space, type of housing structure, security of tenure, and access to electricity. The survey was designed to collect data from 600 slum households across 63 slum communities in the DCC.

The sampling was done in two stages. In the first stage, slums were selected as the Primary Sampling Unit PSU, using probability proportion to size PPS, and in the second stage households were selected from those slums using systematic equal probability sampling. The sampling frame for the first stage was generated from the 2014 BBS Census of Slums and Floating Population, which consisted of 3,360 slums. The BBS Census classified slum communities into three strata: 1, small slums 5-10 households, ; 2, medium slums 11-200 households, ; and 3, large slums more than 200 households, . The survey team decided to sample five households from each small slum strata 1, , and 10 households from each medium strata 2, and large strata 3, slum. The team also decided 50% of all household samples would come from large slums and the remaining 50% from small and medium slums combined. Table 1 provides the details for the sampling frame from the BBS Slum Census 2014 and BUISBS sample.

Stratum		BBS Slums Census				BUISBS sample		
		Slums		Households		Number		
ID	No. households	Number*	Share	Number*	Share	Slums	Households**	Cluster size
1	5-10	1,006	29.9%	7,801	4.4%	6	30	5
2	11-200	2,206	65.7%	70,481	40.1%	27	270	10
3	201-plus	148	4.4%	97,610	55.5%	30	300	10
Total:		3,360	100.0%	175,892	100.0%	63	600	-

Table 1. Sampling frame and sample for BUISBS

The BUISBS survey consisted of five modules: i, roster and individual level characteristics; ii, household characteristics; iii, housing conditions; iv, water and sanitation; and v, consumption of food, non-food, and durables. Data were collected over a period of 16 days between May 12 and May 28, 2016 with 30 teams of two interviewers. Teams were assigned slum communities based on practical considerations e.g. distance to informal settlements. The completed survey was representative of all slums in the DCC and the final sample included a total of 588 slum households 98 percent response

rate. The sample distribution included 30 households from small slums, 259 households from medium slums and 299 households from large slums.

The original dataset did not include the geographic locations of the surveyed households required to link household survey data with the EO data. These data were collected separately in June 2017 for all 63 slums. However, it was no longer possible to collect household level locations due to time and resource constraints. Consequently, most of the analysis relies on aggregate measures at the slum level for this pilot study. Relevant data were extracted from the first four modules to construct housing deprivation measures and indices which will be described in more detail below.

Table 2 summarizes the profile of slum households and residents. A typical slum household has 4.3 members, household heads are on average 39 years old and have been living in the slum for around 8.6 years, suggesting housing deprivation is rather permanent. Most adult members in the household are income-earners, with some gender imbalance in work participation with 89% of males and 50% of females engaging in economic activities.

Characteristic	Small	Medium	Large	Total
Number of slum residents	167,488	2,907,968	4,140,496	7,215,952
Number of slum households	37,947	686,637	959,623	1,684,207
Monetary poverty				
Distribution of sampled slum households %,	2.3	40.7	57.0	100
Monthly per capita expenditure in Taka,	3,956	4,723	4,208	4,410
Demographics and human capital				
Household size	4.3	4.2	4.3	4.3
Dependency ratio %,	80.8	76.1	68.9	72.1
Age of household head in years,	45.2	38.1	39.2	39.0
Female household head %,	0.0	4.6	4.7	4.5
Duration of residence household head years,	7.5	5.7	10.7	8.6
Literacy rate for adults %,	65.3	46.9	46.6	47.2
Completed primary school for adults %,	29.3	16.5	17.8	17.5
School attendance children 7-12 years %,	94.1	81.4	82.1	82.0
Household received relief program %,	3.4	3.8	5.0	4.5
Labor markets				
Share of male adults who are earners %,	94.4	89.9	88.2	89.0
Share of female adults who are earners %,	40.9	52.8	48.7	50.1
Main source of income from industry %,	6.9	4.2	15.1	10.5
Main source of income from services %,	93.1	95.8	84.9	89.5
Housing				
Per capita rooms	0.32	0.32	0.33	0.33
Room size in sq. meters,	12.1	11.8	11.7	11.8
Share of renters %,	96.6	82.2	61.2	70.6
Monthly rent in Taka,	2,849	2,692	2,390	2,548
Has separate kitchen %,	55.2	87.9	63.4	73.2
Government owned land %,	17.2	25.5	88.0	60.9
Non-government owned land %,	-	1.15	1.7	1.4
Private owned land %,	82.8	71.8	7.0	35.1
Other owned land %,	-	-	0.3	0.2
Do not know land ownership %,	-	1.6	3.0	2.4
Fear of eviction %,	17.2	21.8	71.6	50.1
Permanent dwelling structure %,	24.1	12.0	11.4	11.9
Semi-permanent dwelling structure %,	37.9	36.7	22.8	28.8
Tin-shed dwelling structure %,	34.5	51.2	65.8	59.2
Jhupri dwelling structure %,	3.4	0.0	0.0	0.1
Access to basic services				
Access to improved drinking water %,	100.0	95.4	98.3	97.2
Access to improved sanitation %,	100.0	93.9	80.5	86.4
Electricity is main source of light %,	100.0	99.2	93.6	96.1

Table 2: Basic profile of slum households and slum residents Source: unpublished manuscript titled “The Informal Markets for Water and Sanitation Services in Urban Slums: A case study of the Dhaka City Corporation in Bangladesh” by Arias-Granada, Y., Haque, S., Joseph, G., Yanez-Pagans, M., .

Overcrowding, poor housing conditions, and fear of eviction are salient features of lives in slums. One room is normally shared by three people and rooms are on average 12 square meters in area. Housing structures are largely constructed using low quality materials including tin-sheds 59% of housing structures, and semi-pucca 29% of housing structures, . Only 12% of housing units are constructed with permanent construction materials. Over half of slum residents live under fear of eviction. Slums are also dynamic rental housing markets with more than 70% of slum residents reporting renting their dwelling. Around 61% of slums in Dhaka are located on land reported to be government owned, while 35% are

located on privately owned land. Interestingly, access to public services such as water and sanitation in slums is very high.

The remote-sensing part of the study was completed under the EO4SD-Urban program 2016, and showcased one of the products provided by the EO4SD-Urban consortium called “Extent and Type of Informal Settlements/Slum Areas.” This analytical product targets the spatial location, extent, characteristics and spatial-temporal development of building agglomerations that can be classified as informal settlement/slum areas. These areas share a number of physical and morphological characteristics, patterns and contextual parameters compactness, patch size, density and size housing structures, land cover share, proximity to infrastructure, etc., that allow their discrimination from other residential areas using VHR satellite imagery. Considering these areas are often found in specific locations like river banks, close to transport networks or next to industrial or commercial units, this analysis is based on the premise that the physical appearance of a human settlement consistently reflects certain socioeconomic and demographic characteristics.

Informal settlement features in Dhaka were obtained via an expert analysis of very high-resolution multispectral satellite images acquired at two points in time 2006 and 2017. All variables have been derived from EO or open source data OpenStreetMap, on a semi-automated basis. Analysis utilized knowledge-based labelling of classes by classification and interpretation similar to procedures utilized for LULC urban mapping production workflow. Key characteristics of informal settlements such as growth in terms of location and area, and type such as established/permanent or new developments, were the primary physical patterns emphasized. Spatial metrics and indicators such as compactness, patch size and density of buildings, spatial patterns such as built-up density and proximity to infrastructure assisted in definition and delineation of these settlements. The spatial context of the settlement with respect to hazard and risks such as flood risk, derived EO imagery or spatial analysis of additional geospatial products that typically support risk reduction and mitigation measures. Metrics and typologies attributing detected slum patches provided the means to define custom thematic classes either from individual variables or by combination of multiple variables. As these informal settlements are in a dynamic environment with frequent population fluctuations, temporally and spatially, the data also tracked the evolution of changing locations and attributes of informal settlements.

The study area corresponds to the administrative boundary of the Dhaka Metropolitan Area, which is a police jurisdiction area that comprises forty-one “*Thanas*” the lowest among four administrative tiers in Bangladesh, with an area of about 300 km² and a population of 8,906,039 BBS Census, 2011, p. xi. EO data were obtained via analysis of Very High Resolution with pixel spacing in the range of 0.5 – 0.6 m, multispectral satellite images acquired for two reference years 2006 and 2017. In addition to EO data, open data spatial datasets, such as OpenStreetMap, were also used.

The initial slum identification and delineation step was facilitated using historical datasets obtained and shared by a research consortium led by Columbia University see Gruebner *et al.*, 2014. The final shapefiles polygons, show all the slum neighborhoods and patches the researchers detected in Dhaka in either 2006 or 2010. Once the slum polygons were identified and delineated, several dimensions related to housing that could be extracted from EO data that may explain variation in housing deprivation in slums were derived. These dimensions included measures on locational aspects e.g. proximity/distance to central business district, , access e.g. proximity/distance to arterial road, , hazard susceptibility e.g. terrain slope, , morphology e.g. built-up area’s homogeneity, , relational measures about space e.g. built-up density, , and structural measures e.g. dwelling size, . Several measures within each of these categories were used as explanatory variables for the statistical models. These measures were extracted for the 63 slum communities for which location was available.

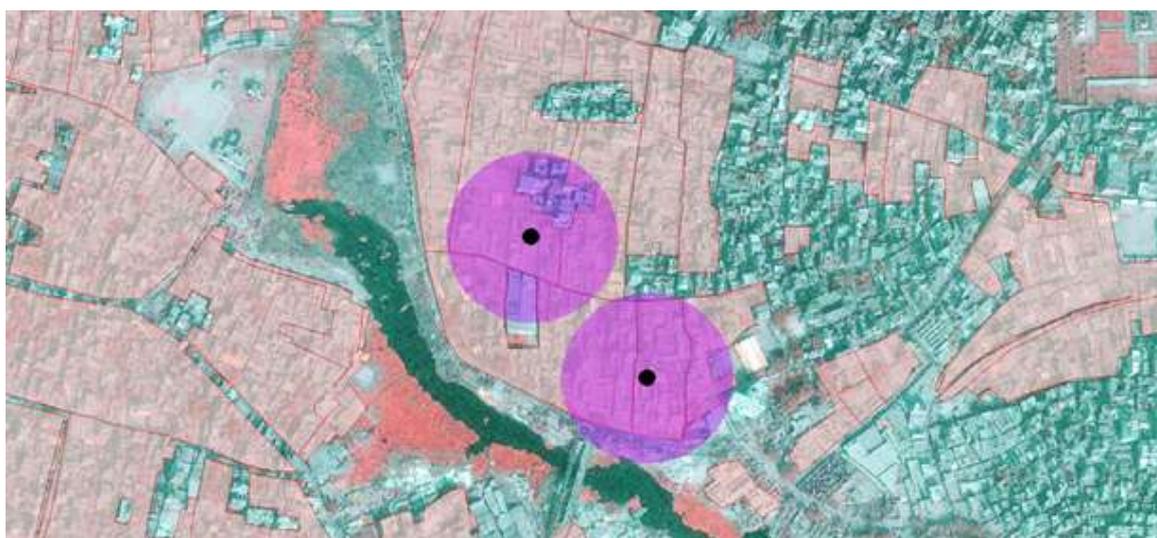


Figure 1. Example of location of slum communities as derived from WASH-POV. Slum areas in pink, and buffers around slum communities in purple, .



Figure 2. Example of LU/LC classification within slum and surrounding areas used for LULC structure indicators



Figure 3. Example of quad-tree segmentation within built-up mask used for an estimation of area homogeneity indicator



Figure 4. Example of mean dwelling size derived comparing units with different size settings

The goal of our statistical model is to predict housing and basic services deprivation in slums using EO data requiring measures of housing and basic deprivation. To do so, we constructed a comprehensive measure of overall deprivation that combines multiple indicators into a single index, the Slum Severity Index SSI, first developed by Patel *et al.* 2014. Six variables from the household survey were used to derive measures of housing deprivation: i, access to drinking water, ii, access to sanitation, iii, adequate living space, iv, permanent structure, v, security of tenure, and vi, access to electricity. All the outcome variables were negatively coded and dichotomized: 1 for lack of access, and 0 otherwise. Table 3 provides summary statistics for each of the measures included in the SSI for the sampled households in Dhaka. Lack of adequate space is the most prevalent problem in slums whereas access to water and electricity seems almost universal. These decomposed measures provide a better understanding of housing deprivations compared to a simple slum/non-slum dichotomy for urban planners and policymakers. In addition, they provide readily useful inter- and intra-slum information for policymakers by rapidly identifying which dimension of housing and basic services requires attention.

Housing Deprivation	% Households
Lack of Access to Water	3.6%
Lack of access to sanitation	12.8%
Lack of adequate space	74.5%
Lack of Durable House Structure	58.2%
Lack of secure tenure	46.6%
Lack of Access to Electricity	3.6%

Table 3. Types of Housing Deprivation in Dhaka slums Source: BUISBS, 2016.

The six binary variables of housing deprivation described above were used to construct a the SSI to derive an aggregate measure of housing deprivation. The original index is an aggregate measure of housing deprivation across five aspects of housing as proposed by the UN-Habitat’s 2010, definition of slums. In this project access to electricity has been included as the sixth housing dimension to construct a more comprehensive SSI. The SSI ranges from 0 to 6; a score of 0 indicates the household is not deprived of the measures described above, and a score of 6 indicates the household is deprived of all six elements.

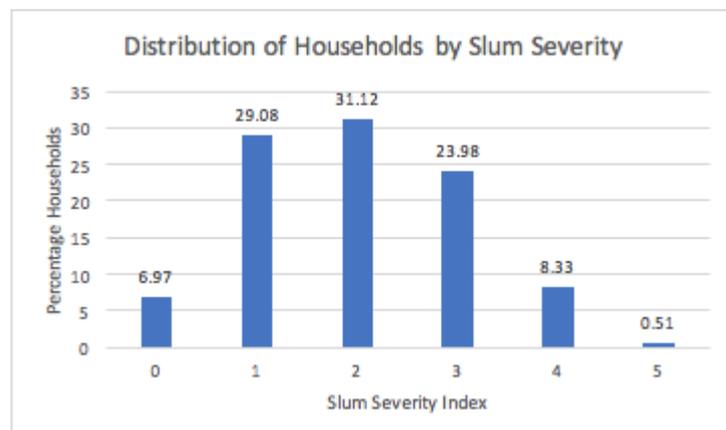


Figure 5: Distribution of Households by Slum Severity in Dhaka Source: BUISBS, 2016.

Figure 5 provides the distribution of households by slum severity. While no households in the surveyed sample lack all six elements of housing and basic services, one quarter are deprived in three or more areas. Interestingly, seven percent of households are not deprived in any of the six areas despite being located in official a slum neighborhoods. This exemplifies how this comprehensive measure could help policymakers identify the most deprived slums in the city.

Individual measures of deprivation as well as the SSI are flexible in the sense they could be aggregated at slum level. Slum level measures of housing deprivation were created by calculating the percentage for each slum e.g. percent of households deprived of water, . Similarly, household level SSI was aggregated at the slum level by taking a simply averaging the household scores within a given slum.

The BWPD classification of levels of access and quality of water and sanitation services was used and access and quality were divided into four tiers each. A four-level variable, measuring service levels in addition to the simple binary variable described in section 6a, was also created. The SSI could potentially be created using these measures. Such an index would provide more nuanced measures of deprivation and capture the heterogeneity across slums in a greater detail.

Access and quality of water in the slums of Dhaka, Bangladesh is reported in Table 4. It is important to note that while only 3.6 percent of households had a complete lack of access to improved water, when considering tier 4 which represents piped water supply on premise, , 37.2 percent of households are deprived. A tiered approach adds quality to the simple binary access measurement and hence is important for policymaking that aims to focus on improving quality of service.

Levels of Access and Quality of Water	% Households	BWPD classification
Total Unimproved T0,	3.6	Unprotected springs, unprotected dug wells, cart with small tank/drum, tanker-trunk, surface water, bottled water
Total improved T1,	96.4	Piped water to yard/plot, public taps or standpipes, tube wells or boreholes, protected springs, rainwater
Improved + 30 min T2,	92.4	Satisfies JMP “Improved” technology and w/in 30 min round trip collection improved and proximal,
Improved on premises T3,	70.1	Satisfies JMP “Improved” on premise
Piped on premises T4,	62.8	Satisfies JMP “piped water” on premise

Table 4. Access and quality of water in slums of Dhaka, Bangladesh.

Access and quality of sanitation is reported in Table 5. The vast majority of households 92.6%, have not achieved the highest level of access and quality, tier 3 which represents private sewer connection and private unshared sanitation facility, .

Levels of Access and Quality of Sanitation	% Households	BWPD classification
Open Defecation	2.9	
Unimproved T0,	12.8	No facilities/bush or field use of bucket, hanging toilet/hanging latrine, flush/pour to elsewhere
Improved including shared, T1,	78.7	Shared “improved” facilities including flush toilet to piped sewer system, septic tank, or pit latrine; ventilated improved pit latrine VIP, , pit latrine with slab, composting toilet
Improved excluding shared, T2,	8.5	Unshared “improved” facilities
Private Sewer connection T3,	3.4	Unshared improved sanitation facility that is connected to sewer

Table 5. Access and Quality of Sanitation in slums of Dhaka, Bangladesh.

A similar approach to that described above but using additional dimensions was used to assess the SDGs Table 6, . Similar trends were observed in SDG indicators; lack of access to water and sanitation were high and comparable to the highest tier of services. Since SDG focuses on both quality and access of these services, it is worthwhile to note that Dhaka is far from providing services to meet these goals for slum-dwellers.

SDG Indicator	% Households
Lack of Access to Water	35.5
Lack of Access to Sanitation	78.7

Table 6. Access and Quality of Water and Sanitation by SDG definition in slums of Dhaka, Bangladesh.

After identifying and classifying “slum-like” neighborhoods, a list of indicators Table 7, was compiled to characterize informal settlements/slum areas at neighborhood and/or household level. These are based primarily on VHR imagery, interpreted EO-based products e.g. EO4SD LULC, EO4SD Flood, or other open data e.g. OSM, or these any of these datasets combined.

Indicator Group / Indicator	Indicator type	Input Data
Neighborhood locational		
Location type	Qualitative	Imagery, LULC
Distance to paved road	Quantitative	OSM, LULC
Distance to railroad	Quantitative	OSM, LULC
Distance to center/CBD	Quantitative	LULC
Distance to nearest important connectivity node	Quantitative	OSM, LULC
Distance to heavy, industry	Quantitative	LULC
Distance to shoreline river, canal, lake or sea,	Quantitative	LULC
Distance to any user provided feature set water distribution points, sewage, etc.,	Quantitative	Field survey / GPS
Neighborhood accessibility		
Distance to arterial capacity, road	Quantitative	OSM, LULC
Distance to selected, public services	Quantitative	OSM / GPS
Occurrence of feature within X meters	Qualitative	OSM, LULC
Road network "winding index"	Quantitative	OSM
Density of road network	Quantitative	OSM
Structure of road network typology	Qualitative	OSM
Road connectivity - end point nodes	Quantitative	OSM
Road connectivity - junction point node weights	Quantitative	OSM
Road connectivity - junction point nodes	Quantitative	OSM
Neighborhood vulnerability to environmental hazards		
Terrain slope	Quantitative	DEM
Geomorphology of terrain	Qualitative	DEM
Landslide risk	Qualitative	DEM, soils
Flood inundation risk river, tsunami, storm surge,	Qualitative	EO4SD Flood product
Distance to technological hazards	Quantitative	LULC, GPS
Open sewers	Qualitative	GPS
On dump and hole garbage filling	Qualitative	GPS
Neighborhood shape morphological characteristics		
Area	Quantitative	GIS
Perimeter	Quantitative	GIS
Shape compactness	Quantitative	GIS
Neighborhood LULC proportional characteristics		
LULC structure in surroundings	Quantitative	GIS
Neighborhood internal structure		
Built-up homogeneity	Quantitative	OBIA
Built-up density	Quantitative	OBIA
Open spaces density	Quantitative	OBIA
Greenness density	Quantitative	OBIA
Neighborhood dwelling characteristics		
Mean dwelling size	Quantitative	Imagery
Main direction	Quantitative	Imagery
Compactness	Qualitative	Imagery
Mean dwelling separation	Quantitative	Imagery
Mean estimated dwelling height	Quantitative	Imagery
Roof heterogeneity	Quantitative	Imagery
Roof & masonry material	Qualitative	Imagery
Estimated dwelling age	Qualitative	LULC
Lacunarity of housing structures	Quantitative	Imagery

Table 7. List of candidate characteristics indicators, derivable for informal settlements/slum areas

Slum level models were created using aggregate dependent household survey, variables. Since most aggregate measures can be treated as count variables e.g. total number of households lacking a housing element in a slum, Poisson regression modeling was applied. In the case of overcrowding, assumptions for Poisson regression did not hold hence an Ordinary Least Square OLS, regression model was constructed using the percent of households deprived as an outcome measures. There are seven models in total six for each of the measures of deprivation in housing and basic services, and the seventh for the aggregate SSI, ; six of them used Poisson regression and one of them overcrowding, used OLS regression.

Equation 1 presents a generic equation for all six Poisson regression models.

$$Y = e^{\ln E + \beta X} \quad 1,$$

where Y represents the expected count of deprivation in a slum. X represents explanatory variables derived from EO data e.g. locational aspects, access, hazard susceptibility, morphology, relational measures about space, and structural measures, and E represents the number of household surveys.

Equation 2 presents the equation for the OLS regression model.

$$Y = \beta_0 + \beta X + \varepsilon \quad 2,$$

where Y represents a dependent variable overcrowding, in slums and X represents the explanatory variables derived from EO data.

Explanatory variables were selected using the standard stepwise regression procedure that involved selecting the variables that minimize the model's AIC value through progressive steps, wherein improvements are made to the fitness of the model as each variable is included forward option, or excluded backward option, from the initial model. All stepwise regressions were run using Stata 15 software. Over-dispersion in count data was verified and the likelihood ratio test of alpha used to check if Poisson regression was appropriate or if negative binomial regression should be considered to tackle potential over-dispersion.

The percent of households with a lack of access to a particular housing element in each slum could have been calculated and used as dependent variables. Similarly, the average SSI for each slum could have been calculated. Since both percentages and average SSI could be treated as continuous variables, Ordinary Least Square OLS, regressions may have worked for each of the indicators. However, estimations from percentages and averages based on a sample of only five to ten households per slum would have likely suffered as a result of the small sample size.

In addition, the survey dataset includes a relatively small sample of 63 slums, which provides limited statistical power for estimating a model. This is especially true for a count model such as Poisson regression that usually requires a larger sample size. Different model specifications OLS, Poisson and Negative Binomial as well as inclusion or exclusion of certain variables, produced very different results in terms of coefficients, directions, and significance for some of the explanatory variables. Therefore, this project seeks only to demonstrate the approach and models have been constructed primarily for illustrative purposes. This is not to say the results will not hold with a larger sample as intended in second phase of this project, , however, given the limited statistical power due to small sample size they should be interpreted with caution. The approach will nonetheless remain the same for larger sample sizes, which are expected to improve estimations.

As noted earlier, the goal is to provide a framework that serves as a basis for designing appropriate policies for slums and targeting interventions in the most efficient manner possible. For example, some slums may require improved sanitation while others may need interventions to improve the quality of water services. For specific slum policies such as in-situ slum upgrading, it may be important for policymakers to identify slums where secured tenure may be a challenge since it is generally the first step for in-situ upgrading. Even if slum upgrading may not be a possibility, a map indicating various levels of services could benefit local governments and utilities to identify areas where they could find opportunities to provide new services or improve existing services such as for water and electricity. However, estimating these needs in a timely manner and in a cost-effective way is not an easy task.

As outlined in Figure 6 below, evidence for the entire city could be developed with a comparatively small number of data points from existing households surveys by integrating those data with data obtained from satellite images and employing regression analysis. Using the resulting regression models, deprivation measures could be predicted for all the slums in the same city. Ultimately, a series of maps could be generated to provide an overall picture of slum severity in the study city.

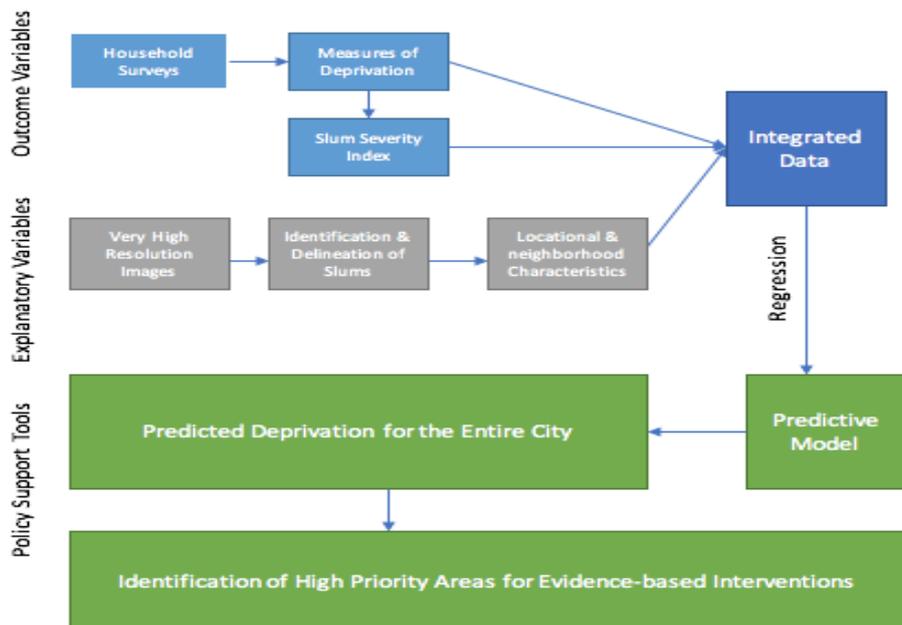


Figure 6. A framework for evidence-based slum policy-making.

This paper does not advocate modeling for the sake of modeling. Nor that models and procedures must be advanced and complex to be of value. Rather, a lot could be gained by simply combining existing datasets in the proposed analytical framework at a much lower cost with minimal time to inform policy making as well as to conceive new interventions.

5. RESULTS

The regression modeling with housing and basic service deprivation measures as a function of EO based variables revealed important relationships as originally hypothesized. Table 8 provides a summary of each of the seven multiple regressions.

Earth Observation Variables	Outcome Variables						
	SSI	Water	Sanitation	Overcrowding	Structure	Tenure	Electricity
Locational Characteristics							
Distance to Central Business District (in km)	↑	↑		↑	↓		↑
Distance to Paved Road (in km)		↓	↓	↑	↓		
Distance to Arterial Capacity Road (in km)	↑	↑		↑		↓	↑
Distance to Railroad (in km)	↑		↑	↑	↑		
Distance to Heavy Industry (in km)	↓	↓		↓	↑		
Distance to Shore Line (in km)	↓		↓	↓	↓		
Distance to Major Road Junction (in km)	↑		↑	↑		↑	
Neighborhood Characteristics within Slums							
Percentage Built-up Area	↓	↓		↓	↑	↑	
Mean Dwelling Size (in sq m)	↑			↑	↓	↑	
Mean Dwelling Separation				↑	↑	↑	
Built-up Homogeneity			↑	↓	↑	↑	
Accessibility and Connectivity Characteristics							
Distance to the Nearest Hospital	↑		↓	↓	↓	↑	
Distance to the Nearest Place of Worship	↓		↑	↓		↓	↓
Distance to the Nearest School	↓			↓	↓	↓	
Distance to the Nearest University	↓			↓	↑		
Land Use Land Cover Characteristics within Slums							
Percentage High Density Continuous Residential Urban Fabric	↓				↓	↓	
Percentage Commercial and Industrial Non-residential Urban Fabric	↓		↓	↑	↓	↓	
Percentage Urban Green Space and Sports Facilities			↑	↑			
Percentage Water Bodies	↓		↑	↓	↓		
Street Pattern Characteristics within Slums							
Low-level Connectivity Node Ratio 100 m buffer	↓		↑	↓		↓	↓
Road connectivity - junction point node weights						↑	
Total Number of Junction Nodes				↑	↑	↑	
Total Number of End Point Nodes			↑	↓	↑	↑	
Percentage Road Typology – Informal Roads	↑			↓	↓	↓	
Percentage Road Typology – Local Roads	↑			↑	↑	↓	
Percentage Road Typology – Primary Roads	↑			↑	↑	↓	
Percentage Road Typology – Secondary Roads	↑			↑	↓	↓	
Percentage Road Typology – Tertiary Roads	↑			↑	↓	↓	
Road Winding Index – Informal Roads	↓			↓	↓	↓	
Road Winding Index – Local Roads						↑	
Road Winding Index – Primary Roads					↓		
Road Winding Index – Secondary Roads				↓			
Road Winding Index – Tertiary Roads				↓			
Road Network Density – Informal Roads				↓			
Road Network Density – Local Roads				↓	↑		
Road Network Density – Primary Roads				↓			
Road Network Density – Tertiary Roads				↓			

Table 8. Multivariate Regression Results Summary for Deprivation measures as a function of EO data

Many of the locational characteristics of slums derived from EO data were statistically significant predictors of housing and basic services deprivation. Of note is the distance to Central Business District CBD. With increasing distance, slums were more deprived of services water and electricity, whereas it had no association with sanitation, overcrowding, or structure. With the exception of sanitation, this finding concurs with what is generally referred as “peripheralization of slums”, indicating decreasing access to services as new slums form in the peripheries of a city.

Another interesting set of indicators was related to proximity to transportation networks and employment opportunities such as heavy industries. Generally, deprivation in slums was lower for slums close to roads, in particular water and electricity services improved for those who were closer to arterial roads. Interestingly, as slums moved farther away from railroads or major road junctions, their housing deprivation increased. Proximity to heavy industry also resulted in higher housing and services deprivation indicating a potential trade-off between residing near a workplace at the cost of lower quality housing, a phenomenon that is generally observed.

All indicators of density were associated with an increase in housing and basic services deprivation. Average dwelling size and average distance between two dwellings essentially measure housing density. In addition, percentage of built-up area in any slum neighborhood is another direct measure of overall density. Effectively, the more crowded the slums were, the more deprived they were. This is not surprising since residential density is often a signature manifestation of living conditions in slums.

Distance to social amenities such as schools, universities, hospitals, and places of worship could be important predictors of housing conditions. The hypothesis here was that proximity to social amenities is a desirable characteristic that might be associated with improved housing conditions yet the results were mixed. As the distance from amenities increased, some housing conditions improved while others worsened. The relationship between distance to amenities and housing conditions might not be straightforward and may require additional data to make plausible sense of these findings.

Various land use and land cover characteristics were significant predictors of housing and service deprivations in expected directions. For example, as the percentage of high-density residential urban fabric increased for a slum, housing deprivation decreased. Similarly, commercial and industrial land use and percentage of water bodies also reduced housing and basic service deprivation. Finally, housing deprivation also decreased with increasing percentage of green space. Several measures of street patterns within slums were associated with housing and basic services deprivation. As expected, higher percentages of informal roads and winding roads were associated with higher service deprivations. Slums with road networks that had lower level accessibility were also more deprived in terms of services. There were some mixed results in this category that may require further investigation with larger datasets.

While the results presented here are very promising, there are some limitations in this pilot analysis that are worth noting. Most of these arose from the lack of an enhanced dataset limiting the benefits that could be derived from the proposed framework. Four particular limitations should be highlighted at this stage of our framework's development. First, while the original sample was a sizeable 588 households, location data were only available at the slum level, which reduced the aggregated sample to 63 slums. In addition, only five to ten households had been surveyed in each slum and aggregate measures e.g. percentage of households with water deprivation, suffered from generalizations as a result of the small sample size. As a result of the aggregation and subsequent smaller sample size Poisson regression was employed. However, any regression specification that is meant for count data such as Poisson regression requires a much larger sample size. While the results may not be inaccurate with a sample size of 63, they will be much more robust with a sample size greater than 100. In fact, a sample size over 500 is desirable for Poisson regressions. Furthermore, policy responses differ based on the type of deprivation Nandi and Gamkhar, 2013. Often, household level data are aggregated to the neighborhood level, resulting in a loss of heterogeneity among households. While such aggregations are useful for community level interventions and city level comparisons, they are less useful for household level interventions.

Second, the actual deprivation indicated in our models may be underrepresented owing to narrow definitions and inherent assumptions used when measuring deprivation. The UN-Habitat 2010, definition of slums upon which this model was based is conservative in the sense that it underestimates the deprivation of slum households. This is primarily because the definition is restricted to the physical and legal characteristics of slums and eschews the social dimensions e.g. concentrated poverty, that are often difficult to measure Davis, 2006, . Nonetheless, we can expect that the underestimation is partially corrected as physical deprivation is highly correlated to social and economic marginalization Arimah, 2001; Begum & Moinuddin, 2010, . In addition, when a slum dweller responds, "yes" to a water availability question, it may not accurately capture access to water since the question does not focus on quantity or quality, time spent collecting water, etc.

Third, we had limited local expertise and low quality geo-referencing data that may increase the uncertainty of our slum identification strategy. RS identifies *probable* informal settlements by localizing areas with visible physical characteristics typical of slums in the area and is capable of recognizing patterns of deprivation in areas that have yet to be formally identified. However, local expertise and/or field validation are needed to confirm the results. Further, the accuracy of matching EO-derived characteristics with household survey data depends on the quality of geo-referencing data. While buffer zones can help limit these uncertainties, ideally household surveys should strive to include high quality geo-referencing data at the outset.

Fourth, we did not analyze the impact of vertical infrastructure growth on slum deprivation in detail. The morphological patterns of some slums especially in Eastern Dhaka and Southern Dhaka near the river, underwent transformation from an originally quite homogeneous state to a more complex state. For example, a substantial proportion of mostly multi-story high-rise buildings was erected within the original slum neighborhoods, mostly in a scattered, spatially inconsistent, and organic manner. Rather than reflecting a change in soil sealing imperviousness, or structural patterns which could be reflected by standard variables derived from optical EO data, , this process is attributed to a change in 3D zoning—the average height of building blocks increased over time. Still, the prevailing major proportion of built-up retains

its slum character. For the time being, the image analysis used for this report does not fully reflect this internal process in slum areas.

Moving forward, regression models will be constructed using household level data increasing the sample size and the statistical power significantly. The second round of BUISBS has already been concluded and includes household level GPS locations for all 600 households surveyed. Future model specifications will be logit and probit for binary deprivation measures e.g. a household's access to water, and ordered logit for the SSI that will range from 0 to 6 for each household. This approach will overcome the aggregation bias, which is inevitable in slum level analysis using household survey data and allow planners and policy makers to design and implement more targeted slum policies. In a second phase of this project, we will also utilize a multi-tiered approach to capture various aspects of access and quality for water and sanitation. The details for each measure captured e.g. levels of access and quality for electricity, will be used to construct nuanced versions of the dependent variables including an enhanced SSI.

Despite several limitations of sample size and data, these models demonstrated a high degree of goodness of fit and indicators derived from EO data successfully predicted housing and basic service deprivation at the aggregate level e.g. SSI, as well as the decomposed level e.g. individual elements such as water and sanitation. This promising approach could provide useful insights for planning and policymaking. Further, using only a small subset of data, these models could predict deprivation as a function of EO data for the entire city.

6. CONCLUSIONS

Kuffer *et al.* 2016, conducted a review of 15 years 2000-2015, of slum mapping using RS information. One of the main contributing aspects highlighted from this review is the need to identify the “contextual slum typologies as an important research direction” in addition to slum identification. They argued, combining “image-based information with socio economic characteristics may ultimately lead to a better targeting of pro-poor policy interventions” p. 474.

Policy makers and city planners need the appropriate tools and evidence to provide full standards of basic services in changing environments of urban settings. Current planning and policy approaches rely on household surveys to estimate demand for urban services such as water and sanitation. However, these surveys are often expensive and time-consuming. Consequently, they are not conducted on a regular basis. On the other hand, resolution, availability, and affordability of EO data have improved drastically in the last two decades. This model provides a pathway to estimate demands for urban services by leveraging this readily available EO data. This approach also provides almost real-time estimates that could be especially useful given slums in the developing world are rapidly growing and constantly changing.

For national governments, this methodology provides an efficient and cost-effective way to estimate household deprivation and demand for city services nationwide. Given that RS images are available for entire nations simultaneously, there is far less time lag between data acquisition and use in decision-making than traditional survey-based methods of data collection and analysis. Additionally, due to the growing availability of technologies like OpenStreetMap that allow residents to contribute data, geospatial analysis can also take place in real-time using updated information. The possibilities of targeting public expenditure and development on the communities and regions that most need assistance is close at hand. International development organizations, likewise, can now use this methodology to inform both national and global interventions. By estimating global housing deprivation in real-time, without conducting large-scale surveys, funding can be directed to the nations with the most pressing need for infrastructure development.

Additionally, although this study covered a single city, Dhaka, the approach is applicable to other cities in developing countries since similar surveys are routinely collected around the world and remote sensing data are increasingly become available for all these cities. While a survey alone cannot support citywide program implementation, this approach provides a framework that could be applied to predict citywide deprivation once a model is constructed. It is clear that decision-making should be neither driven by data availability nor by statistical techniques. It is important to first develop a clear model. Data on deprivation could be collected and statistical techniques applied only after a clear model is established. To this end, this study contributes to the development of such a model in the context of measuring housing and basic services deprivation from space, which could precede data collection on deprivation at the household level for future surveys and censuses in any city where slums are prevalent.

In an era of increasing urbanization, this study and the use of EO data for exploring housing deprivation have particular relevance and life-changing implications for residents of slums and informal settlements. Given it has been traditionally challenging to chart even the location and growth of slums due to their transient nature, this method will greatly increase the efficiency in designing and implementing, prioritizing or even expanding, basic services in impoverished informal settlements. The success of upgrading services in slums is directly linked to how well the project is planned and executed and how well the interventions are operated and maintained. The process of implementing a slum upgrading project or expansion of basic services, like water supply and sanitation, depends on the quality of information supporting the activities, the analysis of factors that impede households to access services, and the analysis of all possible options of the intervention, prioritization, and sequencing. All of these aspects have been addressed in this report for the case of Dhaka, Bangladesh. Still, there are more possibilities of exploiting the model to identify characteristics that contribute to determine specific parameters for planning and rolling out interventions in an effective way.

These types of approaches ultimately contribute to increased knowledge transfer capabilities amongst countries and sector's institutions to further strengthen urban monitoring systems and the evidence presented. They should not be

seen only as a slum mapping exercise but rather as slum characterization, which is useful to identify pockets of poverty, spaces where development is lagging and areas with scarce provision of basic services. EO data offer a distinctive source of commensurable information that can be further combined with administrative, social and economic information at multiple scales for in-depth policy analysis. Continued investment in the advancement of this technology and research using this methodology will, in the long-term, open new doors to improving the quality of life for over a quarter of the world's urban population that live in slums today.

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REFERENCES

- Amorim, L. M. E., Filho, M. N. M. B., & Cruz, D. 2014. Urban texture and space configuration: An essay on integrating socio-spatial analytical techniques. *Cities*, 36, 58-67.
- Antos, S., Lall, S., & Lozano Gracia, N. 2016. *The morphology of African cities*. Washington, D.C.: World Bank Group.
- Arimah, B. C. 2001. Slums as expressions of social exclusion: Explaining the prevalence of slums in African countries. Mimeo: UN-Habitat. Retrieved from <http://www1.oecd.org/development/pgd/46837274.pdf>.
- Augustin, M., Acero Vergel, J. L., Aguilera, A. I., Garcia Lozano, M., Andersson, M., Parby, J. I., et al. 2017, . *Central America urbanization review: making cities work for Central America*. Washington, D.C.: World Bank Group.
- Bangladesh Bureau of Statistics. 2011. *Population & Housing Census 2011*. Dhaka: BBS.
- 2015. *Census of Slum Areas and Floating Population 2014*. Dhaka: BBS.
- Baud, I., Kuffer, M., Pfeffer, K., Sliuzas, R., & Karuppanan, S. 2010. Understanding heterogeneity in metropolitan India: The added value of remote sensing data for analyzing sub-standard residential areas. *International Journal of Applied Earth Observation and Geoinformation*, 125, 359-374.
- Begum, H., & Moinuddin, G. 2010. Spatial dimension of social exclusion: an empirical investigation into the relationship of housing and social exclusion in the slums of Dhaka city. *Management Research and Practice*, 23, 314-328.
- Briggs, R. C. 2018. Poor targeting: A gridded spatial analysis of the degree to which aid reaches the poor in Africa. *World Development*, 103, 133-148. <https://doi.org/10.1016/j.worlddev.2017.10.020>
- Centre for Urban Studies CUS; National Institute for Population Research and Training NIPORT; Measure Evaluation. 2006. Slums of Urban Bangladesh: Mapping and Census, 2005. Bangladesh and Chapel Hill: CUS.
- Chugh, S. 2011. Dropout in Secondary Education: A Study of Children Living in Slums of Delhi. *National University of Educational Planning and Administration NUEPA, Occasional Paper Series, Occasional Paper 37*. Retrieved from <http://www.nuepa.org/new/download/Publications/Occasional%20Paper%20No.%2037.pdf>
- Davis, M. 2006, . *Planet of Slums*. New York, NY: Verso.
- Duque, J. C., Patino, J. E., Ruiz, L. A., & Pardo-Pascual, J. E. 2015, . Measuring intra-urban poverty using land cover and texture metrics derived from remote sensing data. *Landscape and Urban Planning*, 135, 11-21.
- Economist Intelligence Unit. 2016, August. *A Summary of the Liveability Ranking and Overview*. Retrieved from <http://www.vancouvereconomic.com/wp-content/uploads/2015/08/EIU-Liveability-Ranking-Aug-2015.pdf>
- Ellis, P. D., & Roberts, M. 2016, . *Leveraging urbanization in South Asia: Managing Spatial Transformation for Prosperity and Livability*. Washington, D.C.: World Bank Group. Retrieved from <https://openknowledge.worldbank.org/handle/10986/22549?show=full>
- GSURR. 2015, . *Inclusive Cities Approach Paper*. The World Bank, GSURR. Washington D.C.: World Bank Group.
- Gruebner, O., Sachs J., Nockert A., Frings M., Khan M. H., Lakes T., & Hostert P. 2014, . *Mapping the Slums of Dhaka from 2006 to 2010*. Dataset Papers in Science, vol. 2014, Article ID 172182, 7 pages, 2014. doi:10.1155/2014/172182
- Hofmann, P. 2001, . Detecting informal settlements from IKONOS image data using methods of object oriented analysis: An example from Cape Town South Africa, . In C. Jurgens Ed., , *Remote sensing in urban areas*, pp. 41-42. Regensburg, Germany: University of Regensburg.
- Islam, N., Shafi, S.A., Mathur, O.P., Samanta, D. 2013, . Sustainable Urbanization in Bangladesh: Delving into the Urbanization-Growth-Poverty Linkages. Sanei Working Paper Series, South Asian Network of Economic Research Institutes. Retrieved from <http://www.sanei-network.net/uploads/research/sustainable-urbanization-in-bangladesh-delving-into-the-urbanization-growth-poverty-interlinkages1464584088.pdf>
- Joseph, G. 2017. *Bangladesh Performance assessment progress: 2007-2016* Internal Report, . Washington, D.C: The World Bank.
- Kit, O., Ludeke, M., & Reckien, D. 2012. Texture-based identification of urban slums in Hyderabad, India using remote sensing data. *Applied Geography*, 30, 660-667.
- Kohli, D., Sliuzas, R., Kerle, N., & Stein, A. 2012. An ontology of slums for image-based classification. *Computers, Environment and Urban Systems*, 36, 154-163.

- Kuffer, M., Pfeffer, K., & Sliuzas, R. 2016. Slums from space—15 years of slum mapping using remote sensing. *Remote Sensing*, 86, , 455.
- Lipu, H. M., Jamal, T., & Miah, M. A. 2013. Barriers to Energy Access in the Urban Poor Areas of Dhaka, Bangladesh: Analysis of Present Situation and Recommendations. *International Journal of Energy Economics and Policy*, 34, , 395-411.
- Lucci, P., Bhatkal, T., & Khan, A. 2018. Are we underestimating urban poverty? *World Development*, 103, 297–310. <https://doi.org/10.1016/j.worlddev.2017.10.022>
- Nandi, S., & Gamkhar, S. 2013. . Urban challenges in India: a review of recent policy measures. *Habitat International*, 391, , 55-61.
- Patel, A., Koizumi, N., & Crook, A. 2014, . Measuring slum severity in Mumbai and Kolkata: A household-based approach. *Habitat International*, 41, 300-306.
- Patino, J. E., & Duque, J. C. 2013. A review of regional science applications of satellite remote sensing in urban settings. *Computers, Environment and Urban Systems*, 37, 1-17.
- Rahman, M. H., & Alam, S. S. 2015, . Nutritional Status of Children in Slums of Dhaka, Bangladesh. *Journal of Nutrition & Food Sciences*, 56, , 1.
- Rashed, T., Weeks, J. R., Gadalla, M. S., & Hill, A.G. 2001, . Revealing the anatomy of cities through spectral mixture analysis of multispectral satellite imagery: A case study of the greater Cairo region, Egypt. *Geocarto International*, 164, , 7-18.
- Rhinane, H., Hilali, A., Berrada, A., & Hakdaoui, M. 2011, . Detecting Slums from SPOT Data in Casablanca Morocco Using an Object Based Approach. *Journal of Geographic Information System*, 3, 217-224.
- Shi, K., Huang, C., Yu, B. Yin, B., Huang, Y., & Wu, J. 2014, . Evaluation of NPP-VIIRS night-time light composite data for extracting built-up urban areas. *Remote Sensing*, 54, , 358-366.
- Sliuzas, R. & Kuffer, M. 2008, . Analysing the spatial heterogeneity of poverty using remote sensing: Typology of poverty areas using selected RS based indicators. In C. Jurgens Ed., , *Remote Sensing: New challenges of high resolution*. Bochum University Press.
- Soukup, T. 2015, . Earth Observation for International Development. *Introducing ESA's Urban Thematic Exploration Platform*. Washington D.C.: ESA.
- Steele, J. E., Sundsoy, P. R., Pezzulo, C., Alegana, V. A., Bird, T. J., et al. 2017, . Mapping poverty using mobile phone and satellite data. *Journal of the Royal Society Interface*, 14 127, .
- Stoler, J., Daniels, D., Weeks, J. R., Stow, D. A., Coulter, L. L., & Finch, B. K. 2012, . Assessing the Utility of Satellite Imagery with Differing Spatial Resolutions for Deriving Proxy Measures of Slum Presence in Accra, Ghana. *GIScience & Remote Sensing*, 491, , 31-52.
- Taubenböck, H., & Kraff, N. J. 2014, . The physical face of slums: a structural comparison of slums in Mumbai, India, based on remotely sensed data. *Journal of Housing & the Built Environment*, 291, , 15–38.
- Tigny, V. 2016, . Informal Settlement and Urban Growth Patterns in Metro Manila. *SATELLITE EARTH OBSERVATION AND GEOSPATIAL DATA FOR SUSTAINABLE DEVELOPMENT*. Washington, D.C.: GIM.
- United Nations. 2015, . *Report on the Millennium Development Goals*. Geneva: United Nations.
- 2016, . *The Sustainable Development Goals Report 2016*. New York: United Nations.
- UN-Habitat. 2006, . *Urban Indicators Programme Phase III and United Nations, World Urbanization Prospects*. Geneva: United Nations.
- 2009, . *The Right to Adequate Housing*. Geneva: United Nations.
- 2010, . Development Context and the Millennium Agenda. *The challenge of slums: global report on human settlements 2003 revised and updated version 2010*, . Geneva: United Nations.
- 2012, . *State of the world's cities: Prosperity of cities*. Geneva: United Nations.
- 2015, . *The challenge of local government financing in developing countries*. Geneva: United Nations.
- WHO, & UNICEF. 2006, . *Core questions on drinking-water and sanitation for household surveys*. Geneva, Switzerland: World Health Organization.
- World Bank. 2015, . *World Development Indicators*. Washington, D.C.: World Bank Group.
- 2016, . *Measuring Living Standards within Cities*. Washington, D.C.: World Bank Group.
- 2017, . *Bangladesh WASH Poverty Diagnostic Summary Document – internal draft*. Washington, D.C.: World Bank Group.
- Zeilhofer, P. & Topanotti, V. P. 2008, . GIS and ordination techniques for evaluation of environmental impacts in informal settlements: A case study from Cuiaba, central Brazil. *Applied Geography*, 28, 1-15.
- Zhuo, L., Ichinose, T., Zheng, J., Chen, J., Shi, P. J., & Li, X. 2009, . Modelling the population density of China at the pixel level based on DMSP/OLS non-radiance-calibrated night-time light images. *International Journal of Remote Sensing*, 30, 1003-1018.

1798 FACTORS INFLUENCING HIV/AIDS AND REGIONAL PATTERN OF FINANCING

ABSTRACT

HIV is a virus that attacks the immune system, which is our body’s natural defence against illness. The virus destroys a type of white blood cell in the immune system called a T-helper cell, and makes copies of itself inside these cells. T-helper cells are also referred to as CD4 cells.If HIV is left untreated, it may take up to 10 or 15 years for the immune system to be so severely damaged that it can no longer defend itself. However, the speed with which HIV progresses would vary depending on age, health and background. Though quality of life has been prolonged with advanced treatment for clients with HIV,yet there is no cure to this infection.There is an increase in HIV/AIDS cases among developing countries.The earlier HIV is diagnosed, the sooner treatment can start – leading to better long term health. While younger age group are more prone to HIV/AIDS in the community, other reasons include drug trafficking corridors in certain countries ; availability of Sex workers;People who inject drugs (PWID) and are HIV positive;Unsafe Sex and Low Condom usage;extramarital sex within specific communities, poverty, low literacy, gender inequality and trafficking of women and girls (prostitution).This paper attempts to determine the factors influencing HIV/AIDS in selected developing countries and reveal prevalence of HIV /AIDS among individuals and find out the approximate funding provided to these countries for early and sustained HIV prevention programs targeting high risk groups

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RS10.2. Regional and Urban Policy and Governance

1211 WHAT DRIVES WHICH CITY? SPATIAL HETEROGENEITY AND ROBUSTNESS OF DETERMINANTS OF EUROPEAN CITY GROWTH

ABSTRACT

European cities have become increasingly more economically successful, demographically popular and socio-economically vibrant in the last decades. However, previous research has shown that this does not account equally for all cities in Europe. This variation in (economic) growth raised a large literature on policy instruments that could spur economic growth, such as investments in accessibility and public R&D, political stability and educational programs. However, not much research has been done on the robustness of these instruments and whether each instrument is equally applicable to each city. This paper shows that (i) most of the policy instruments are not very robust in their impact on economic growth, (ii) some instruments only work conditionally on specific regional characteristics and other instruments, and, finally, that (iii) there is spatial heterogeneity in the effectiveness of most policy instruments.

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1108 SOUND MACROECONOMIC CONDITIONS, STRUCTURAL REFORMS AND PRODUCTIVITY GROWTH IN LESS DEVELOPED REGIONS IN THE E.U.

ABSTRACT

In order to better target regional policy in the post-enlargement context, the EU categorizes 47 lagging regions into low-growth and low-income regions. In addition to their differences in levels of economic development, the lagging regions also differ in their industrial structure, their local labour force or their endowments in natural resources. Catching-up across the EU is therefore a regional issue, yet the reforms that could bring faster growth, lower unemployment and better livelihoods are being decided and applied at the national level. These reforms can take the form of a softening of labour laws by relaxing the rules governing the hiring and firing of temporary or permanent employees, an overhaul of rules around the creation of new firms or of the compensation awarded by the State during unemployment periods, or changes in the taxation of corporations or of labour. In this paper, a regional growth model is estimated whilst identifying the effects of country-level macroeconomic imbalance indicators such as inflation, government debt and the real effective exchange rate (REER) as well as structural policies such as labour market reforms (EPL) and product market deregulation on the productivity growth of subnational regions. As in Bourlès et al. (2013), the effect of the country's frontier region's productivity growth is simultaneously estimated. The results are based on a sample of 199 regions in 22 E.U. countries, over the period 2001-2013. The effects of policies before and after the financial crisis of 2008 can therefore be separately estimated. In order to better interpret the results, the effects of policy changes on regional employment rate growth are also investigated. Policies indeed have very different effects on lagging regions compared to base regions. Inflation has a strong negative effect on low growth regions whilst there is no significant effect on base regions. Increases in government debt lower regional growth for all types of regions: For base regions, an increase in government debt of one standard deviation leads to a reduction in productivity growth of 0.6 percentage points, but the effect is stronger on low growth regions (-1.4 points) and the highest for low income regions (-2 points). A one standard deviation increase in REER (i.e. an appreciation of the domestic currency) yields 0.9 percentage points lower productivity growth in low-income regions. EPL reforms have very different effects depending on whether temporary or permanent contracts are being reformed. Although relaxing constraints on temporary contracts and agency work has a negative impact on the growth of lagging regions, lifting restrictions on regular labour contracts results in higher productivity growth for all types of regions. Lowering the regulatory burden on firms has no significant effect on either type of regions. Deregulation has an initial positive effect on lagging regions' productivity growth but that this effect goes away after two years. This is coupled with a strong negative employment effect for low growth regions, which highlights the need for complementary policies to alleviate the negative impact on jobs in lagging regions.

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1329 ASSESSING ACCESSIBILITY, USABILITY, ACTIVITY PROFILE AND AGE APPROPRIATENESS OF URBAN INDIAN PARKS: COMPARATIVE ANALYSIS OF THREE INDIAN CITIES

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ABSTRACT

Background and Purpose: Proximity and accessibility to parks alleviates human health and well-being by providing the opportunity for play and recreation. For a conducive neighbourhood, providing inclusive public spaces for people with all range of movement capabilities across all age groups is essential. The study of accessibility and usability of a park, as a physical factor of design function, and the quality and availability of age specific services is crucial to understand the age appropriateness of public parks.

Objectives: Few studies have been conducted in India to understand the performance of parks with respect to their design and available amenities. There is a knowledge gap in analytically understanding the implications of landscape design on the feasibility of access and use of parks. To fill this gap, an empirical study of selected neighbourhood level parks across three Indian cities was undertaken to evaluate their accessibility and age appropriateness performance using a multivariate model of analysis.

Methods: A selection of neighbourhood level parks was made based on their location, size, and available amenities. A total of 21 parks were selected, seven each from Mumbai, Bengaluru and Chennai for the empirical study. Primary data that included qualitative and quantitative aspects of physical profile, immediate surrounding, amenities, usage patterns, temporal patterns, and management and maintenance aspects were collated from these selected parks. Statistical models were utilised to analyse these data variables.

Results: The findings indicate a great shortfall in basic entry convenience of public parks for people with movement disabilities. Further, the study reflected the deficit of age specific amenities in most parks. The available park amenities lacked appropriate landscape design principles driving the layout. The activity profile of women was observed to be drastically lower, especially so in women between ages 10 and 40.

Conclusions: The study revealed the dire need of incorporating universal design with barrier free concepts while designing and developing a public park. Also, the study highlighted the gender disparity in the user activity profile.

Implications for Practice and Policy: In this study we further discuss the design strategies that could be incorporated in existing parks and future projects, to make them more accessible and inclusive. Also, detrimental practices in park design causing gender and age-related usage disparities are identified to aid policy guidelines in the design of Indian public parks.

Keywords: Neighbourhood Parks; Universal Design; Amenities; Age appropriateness; developing nations.

1. INTRODUCTION

Recreational open spaces like parks and playgrounds are vital urban amenities that offer crucial contact to nature while providing an opportunity for play and recreation, building a sense of social identity (Matsuoka & Kaplan, 2008). The ability to access these public amenities is an essential factor in improving the quality of urban life (del Saz Salazar & García Menéndez, 2007; Lee & Hong, 2013) irrespective of any categorization of gender, age, physical capacity, race or economic status (Francis, Giles-Corti, Wood, & Knuiiman, 2012). The existing urban India shows a significant lack of open spaces given the WHO recommended standard of nine square meter of open space per person is met only in few Indian cities (MoUD, 2015). Also, there is a lack of an evidence-based decision-making system in place for urban open spaces management in many Indian cities. This results in underperforming open spaces that tend to cater only to a certain section of the society. The sustainable development goals (SDG) as recommended by UNDP (Egmond, 2016), suggests achieving sustainable urban growth by investing in improving urban open spaces with appropriate amenities and design, making them inclusive and participatory for all.

Neighbourhood parks (NP) are recreational open spaces that are public amenities provided at the neighbourhood level for a population of 10,000, located at walking distance from the residential areas and their size ranges between 2000 to 4000 square meters (MoUD, 2014). The Urban Greening Guidelines 2014 published by the Ministry of Urban Development, India enumerates the various ecological, social, physical, cultural, and economic benefits of parks and open spaces, especially in the neighbourhood scale. Given the importance of neighbourhood parks, especially in the developing nation's context, few studies have been conducted in India to understand the performance of parks with respect to their design and available amenities.

The provision of neighbourhood parks in urban India is significantly low when compared to the WHO standards of a minimum of 9 square meters of green open space per person (MoUD, 2014). The Town and Country Planning organization of India report describes the provision of open spaces in Indian cities to be abysmally low and stipulates goals to achieve the international minimum standards by concentrating on various greenfield development. However,

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little importance has been given on the existing parks and developing ways of improving the same. With rapid urbanization in India and swift densification of cities, providing well performing, sustainable parks will be necessary for a conducive urban quality of life.

Various studies conducted on urban green amenities look at specific age groups like children (Reyes, Páez, & Morency, 2014) or the elderly (K, O, & W, 2017) for their assessment of amenities provision or design performance. Most of the studies are concentrated in the global north and developed nations with some upcoming research observed from China and South East Asian countries (Fors, Molin, Murphy, & Konijnendijk van den Bosch, 2015). There exists a significant research gap in evaluation of neighbourhood parks in the urban Indian context, considering the needs of people belonging to all age groups and both genders. To fill this knowledge gap, an empirical study of selected neighbourhood level parks across three Indian cities was undertaken to evaluate their performance with respect to users of different age groups and genders.

2. METHODS AND MATERIAL

An empirical survey was designed with the intention to comparatively analyse the existential conditions of neighbourhood parks in different cities for a better representation of the country. Mumbai, Bengaluru and Chennai were selected as the three tier 1 cities where a selection of 21 neighbourhood parks, 7 per city was finalised post selection from 50 shortlisted parks. The selection of parks was made based on their size acreage, location within a residential zone, available amenities, functional hours and management profile. Private parks, regulated public parks, specialised parks, parks within special zones etc. were excluded from the selection.

The 21 selected parks were each allocated one day of study, with three observations made of 1 hour each in the morning, afternoon and evening hours the day. This was done with the intention to derive a temporal variation of activity profile and usage of the parks. A detailed survey questionnaire was designed by the authors post a detailed literature review encompassing physical built elements, amenities, universal design features, design quality and maintenance along with the study of user behaviour and their activity profile. The WHO defines 'universal design' as a design process that increases the usability, safety, health and social participation of an environment, space, system or product, making it inclusive to the needs of diverse people with diverse abilities (World Health Organization, 2011).

With the study of 21 neighbourhood parks, a total of 2131 users were observed. 56% of the total number of users were male and 44 % female. The users were also divided into 5 age groups of toddlers (0 – 4 yrs.), children (5 – 12 yrs.), young adults (13 – 24 yrs.), adults (25 – 59 yrs.) and the elderly (60+ yrs.). The observed percentage brake-up of these age groups were 13% toddlers, 18% children, 24% young adults, 22% adults, and 23% elderly of the total observed users. Temporal user profile was also captured with 40% morning users, 8% afternoon users and 52% evening users of the neighbourhood parks studied. From the basic descriptive of the user study, it is observed that neighbourhood parks are most popular in the evenings followed by mornings. The usage drops drastically in the afternoon time of the day. From this, we could infer that user comfort within the neighbourhood parks also is not conducive enough to attract users in the afternoon. Also, the working class would be occupied in the afternoons, and so their percentage drops. Also, the dependent age group of toddlers and children users, who rely on adults to escort them to parks also are reduced. Young adults of 13 – 24 years is the highest user group observed, closely followed by the elderly while toddlers were the lowest user group.

The observed neighbourhood park users engaged in various activities which were classified into 5 main groups of walking, sitting & socializing, exercising, active play and miscellaneous activities. The user performed activity was mapped and analysed per the city location as well. Figure 54 explains the activity pattern of the users observed where walking is the most performed activity followed by sitting and socialising. Bengaluru users were found to be most active while Mumbai users were comparatively less active. Miscellaneous activities like engaging in social groups like laughing clubs, yoga club etc. was observed highest in Chennai and lowest in Bengaluru. There is a visible drop observed in the activity of exercising in Mumbai. This can be related to the lower provision of outdoor gym provision noted in Mumbai when compared to Chennai and Bengaluru as explained further in the paper.

The neighbourhood park users of Mumbai, Bengaluru and Chennai when distributed and compared by gender and age, revealed certain city specific aspects of usage. As seen in Figure 55, with males represented in blue and female users in orange, there is a considerable gender disparity in user profile observed in all three cities. The highest gender disparity is seen in the 13 - 24 age group of users in Mumbai with Bengaluru reporting the least gap. Interestingly, 25 - 59 years Bengaluru users showed inverse relationship with the female users exceeding the male users. This is not seen in any other age groups of other cities. There is an upward trend with age in female users of Bengaluru and Chennai, especially rising in the adult and elderly age groups. Only Mumbai reports higher female users in the 13 – 24 age group. The gender gap is lowest in the toddler and children groups of Mumbai and in the elderly group in Bengaluru. Highest gap in the children's group 5 – 12 years is seen in Bengaluru and Chennai. Highest number of 13 – 24 years male users was reported in Mumbai among all cities and age groups.

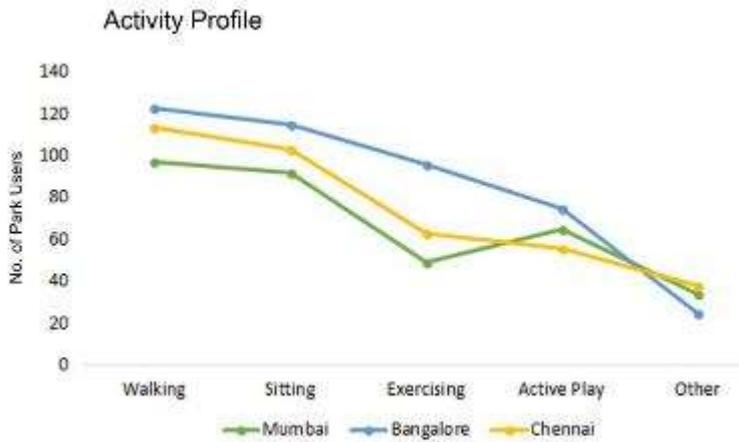
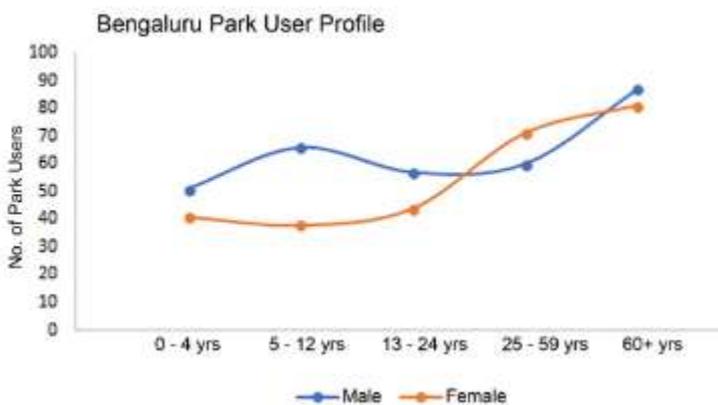
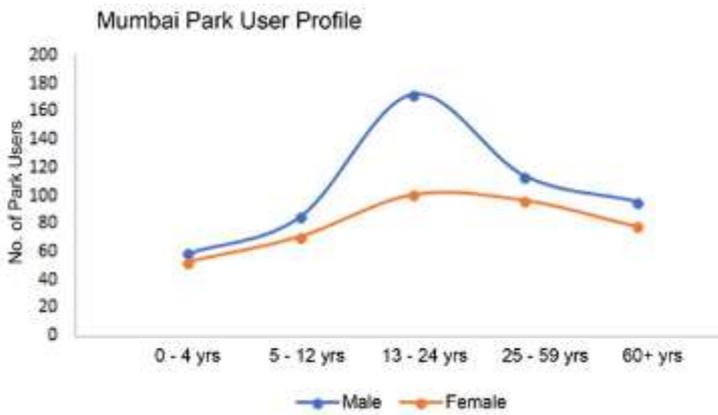


Figure 54 City wise activity profile of neighbourhood park users

Neighbourhood park amenities and universal design features

The empirical study was designed to record the park amenities and UD features with the intention to evaluate the age appropriateness, usability and inclusiveness of the parks as a function of their feature provision. Aspects studied for evaluation were presence of paved walkway, seating benches, toilets, security staff, shading devices, kid’s play area, entry cost, drinking water outlets, universal entry, tactile flooring, maps and signages, handrails and ramps, parking, cleaning, street connectivity, boundary profile, street lighting etc. Out of these features, using dimension reduction factor analysis, 10 aspects were finalised for further evaluation. These were 7 amenities of walkway, seating, entry cost, boundary wall, security staff, shading devices and kid’s play area and 3 UD features of tactile flooring walkway, legible maps and signages and presence of handrail and ramps.



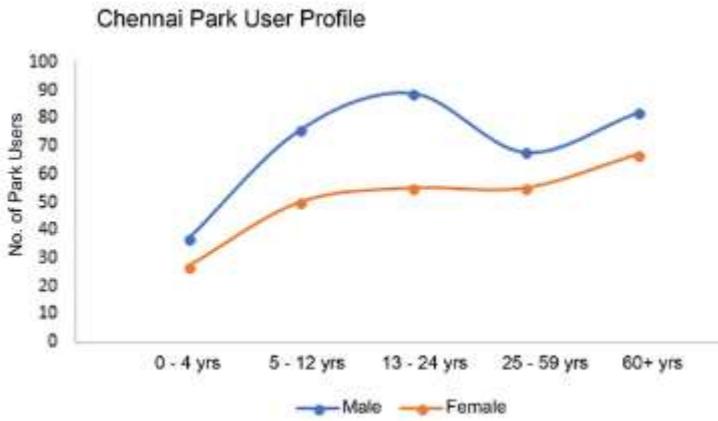


Figure 55 City wise user study distributed by gender and age groups

The selected 10 aspects of neighbourhood parks were further analysed based on design quality and maintenance with scoring done on a scale of 1 being least and 10 being highest per aspect for all parks studied. Each aspect was given equal weightage and the cumulative of all the scores was then collated as the park performance. This performance score, out of hundred, was further analysed with the user footfalls categorised by gender, age and city to assess their impact on usage and user footfall.

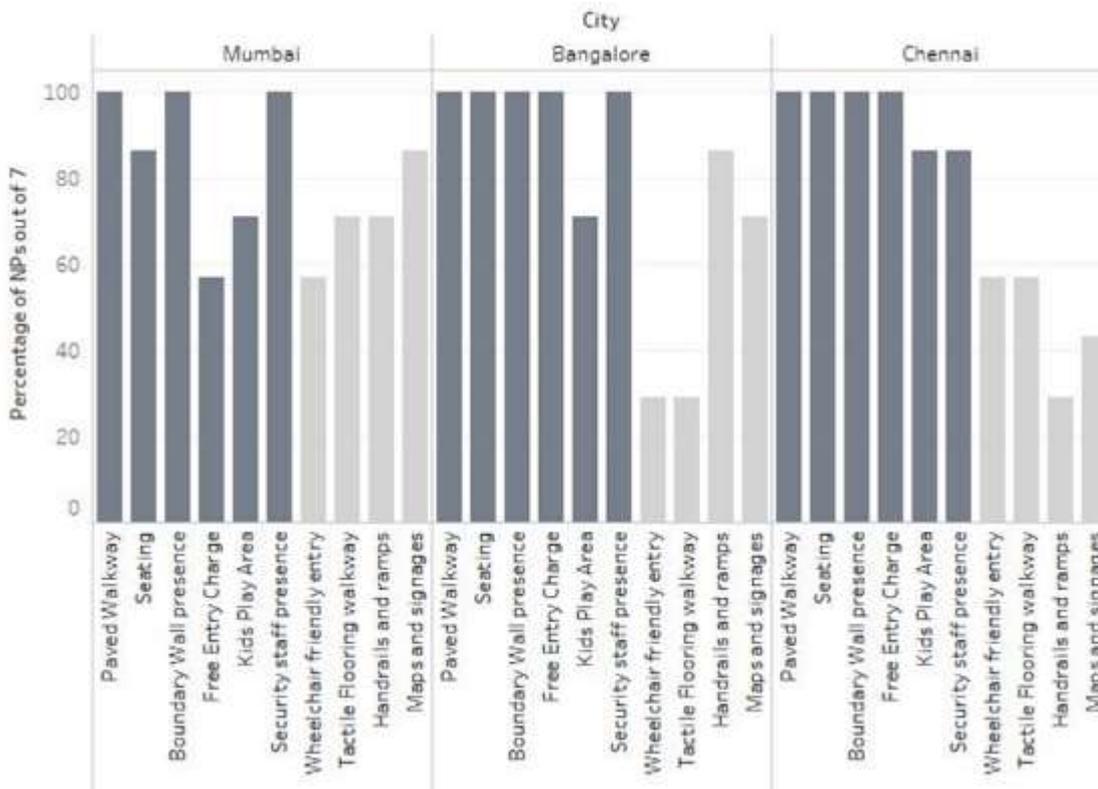


Figure 56 City wise neighbourhood park performance comparison

3. RESULTS

The performance scoring derived for each park were compared city wise. The highest scoring park (95) was observed in Bengaluru and the lowest scoring in Mumbai (31). The highest score in Mumbai parks was 91 and lowest was 31. The highest in Chennai was 82 and lowest was 34. In Bengaluru, the lowest scoring park was scored 42. The seven parks' scoring per city were collated to derive a city-wise comparison. The city wise comparison of park performance across the three cities is shown in Figure 56. The bars in darker grey hue are the 6 amenities aspects and the light grey hue coloured bars are the UD features. As observed in Figure 56, consistently high performance is seen in amenities provision in Bengaluru and Chennai while higher UD feature provision score is seen in Mumbai parks. Moving into specifics, Mumbai performed the lowest in free entry. It was observed that all parks in Chennai and Bengaluru studied had free entry while 3 parks in Mumbai charged an entry fee. Provision of kid's play area was highest in Chennai. Bengaluru performed lowest in UD features of wheelchair friendly entry and tactile flooring walkway provision. Chennai performed lowest in the provision of handrail and ramps among UD features. Maps and signages of Mumbai were scored the highest while provision of handrail and ramps was scored highest for Bengaluru.

The studied neighbourhood parks' user profile was used to gauge the impact of park performance on user footfall, deriving the age appropriateness of the parks specific to the age group or gender. With this intention, the age wise

categorized user data was further classified into the male and female genders and juxtaposed against the park performance to review their impact.

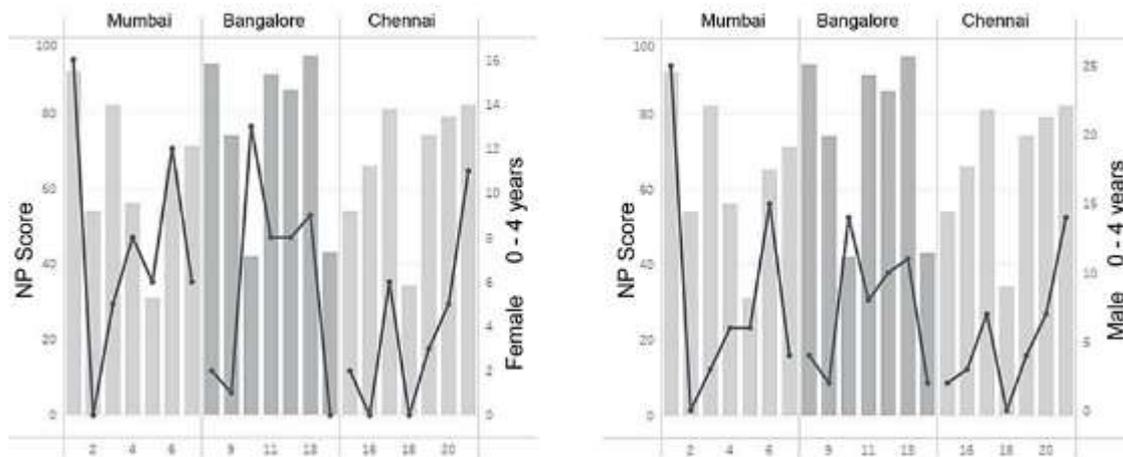


Figure 57 City-wise park performance (bars) juxtaposed with male & female 0-4 years toddler user profile (line)

As seen in Figure 57, the toddler age group user profile is superimposed on the city-wise park performance graph. The female toddler users were higher most open spaces of Mumbai, Bengaluru and Chennai. A general trend of increase in footfall with increase in performance is seen. However, there are certain exceptions seen in parks where female toddlers are responding much more in numbers with the performance in comparison to the male toddlers. Parks 3,4,6 from Mumbai and 10, 13 from Bengaluru with park 21 from Chennai showed presence of UD features which were not present in other parks. Hence the higher numbers of female toddlers in the parks.

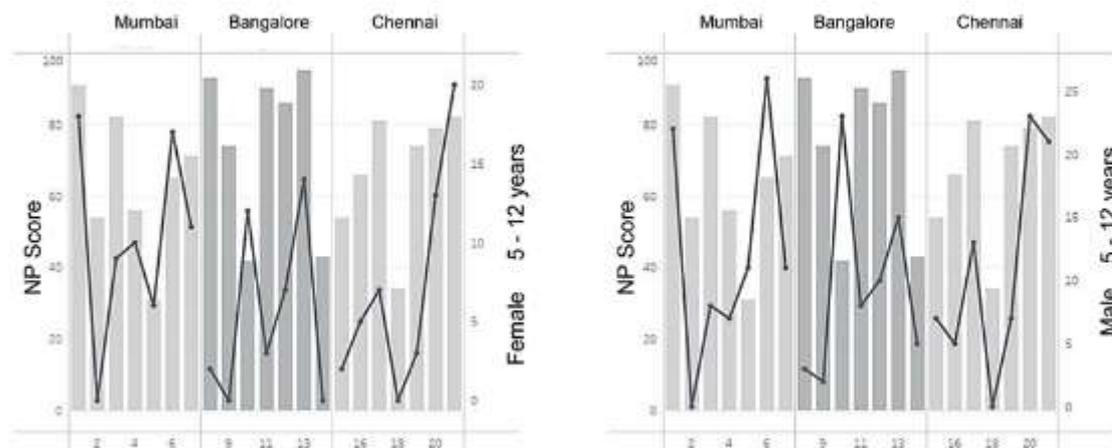


Figure 58 City-wise park performance juxtaposed with male & female 5-12 years children user profile

As seen in Figure 58, the users belonging to 5-12 years start to show gender disparity with the male users superseding the female users. The two groups respond differently to park performance with parks 3,4 of Mumbai, 13 in Bengaluru and 21 in Chennai being more conducive to female children. From the graph it could be deduced that parks 5 in Mumbai, 11, 14 in Bengaluru and 15 in Chennai had certain detrimental factors that reduced the female users drastically. These parks were found to lack in provision of shading devices and UD features.

Figure 59 demonstrates the high number of 13-24 age group users of Mumbai and Chennai, especially the male users. Bengaluru showed lower numbers compared to the other cities. As seen in the figure, there is a considerable drop in female users in Mumbai parks 2, 6, Bengaluru parks 10, 11, 13, and Chennai parks 16, 18 and 19. When checked with the amenities provision of these parks, it was observed that some parks had certain features lacking like kid’s play area, seating provision and security staff presence. Also, the drastic drop of female users seen in parks 2,16 and 18 relates to the missing UD features and shading devices provision.

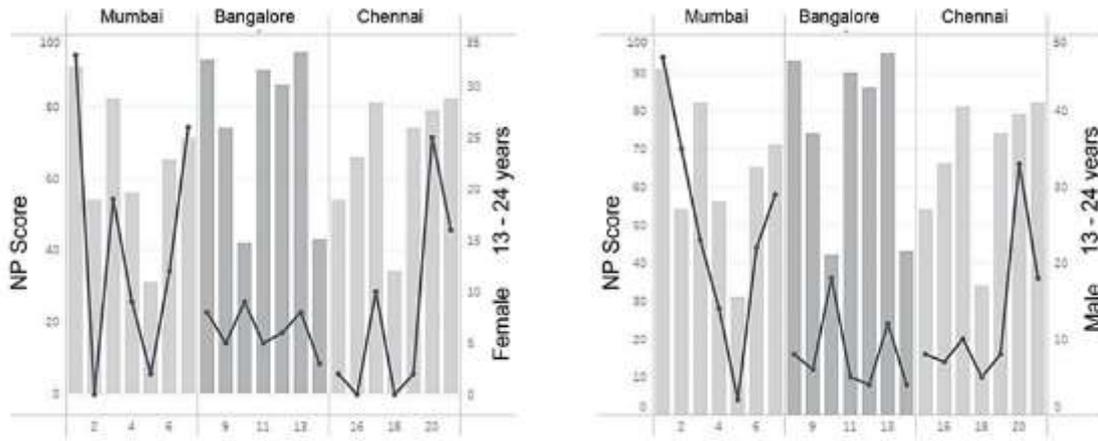


Figure 59 City-wise park performance juxtaposed with male & female 13-24 years young adult user profile

As seen in Figure 60, a drop of female users is seen in parks 2,14 and 18 more drastically than others. The factors missing in these parks were shading devices and UD features. There is considerable gender disparity in male and female users observed in this age group as well. However, certain exception cases in Bengaluru are seen where the female users exceed the male users.

As seen in Figure 61, the gender gap is not as evident with female and male users being more equitable. There are many parks where female elderly users are exceeding the male elderly. The parks where female elderly is showing a downward dip are the same ones observed in earlier age groups that lacked amenities like shading devices and security staff along with UD features.

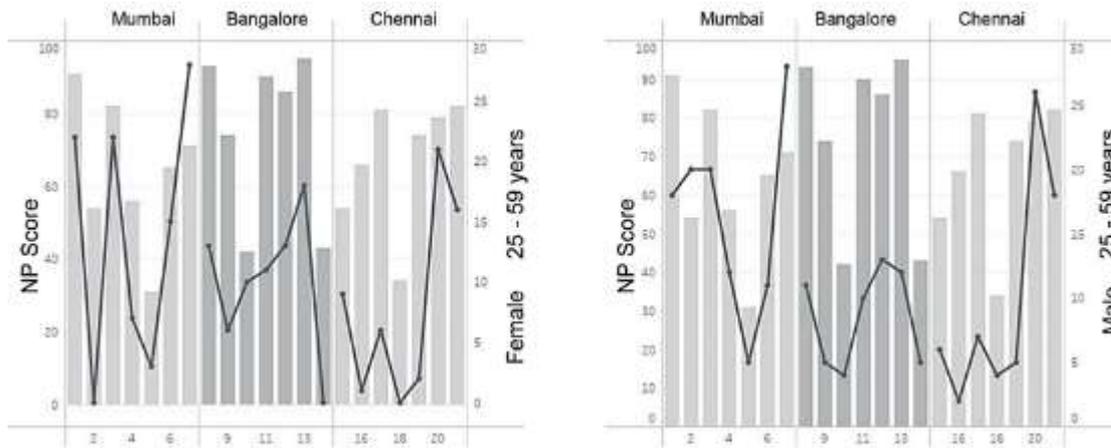


Figure 60 City-wise park performance juxtaposed with male & female 25-59 years adult user profile

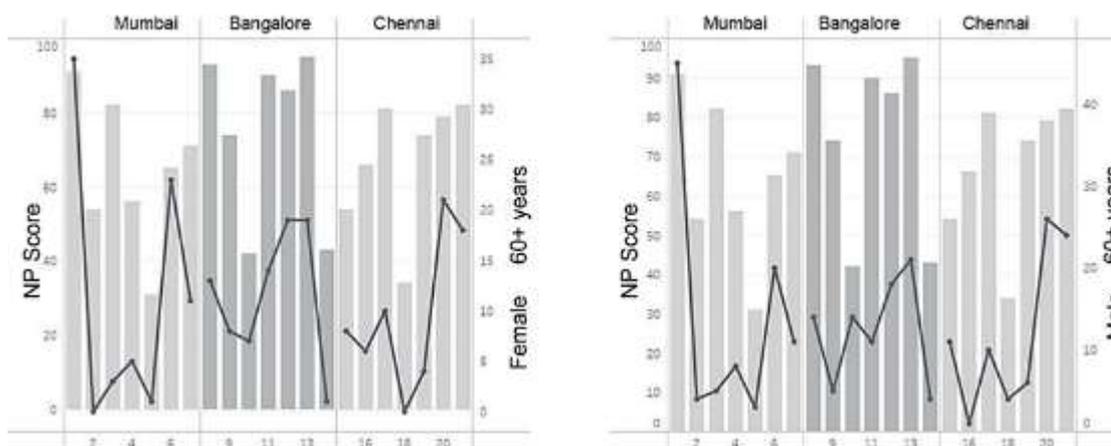


Figure 61 City-wise park performance juxtaposed with male & female 60+ years elderly user profile

Gender disparity of users

From the comparative analysis study, across age groups and divided into genders, it is easy to observe the usage pattern is greatly dependent on the provision of amenities and certain amenities are of more affinity to the female users with their absence causing a significant drop in usage. These features are mainly UD features and amenities like shading devices, security staff and seating provision. The male numbers show a similar trend across all age groups. Gender disparity is lowest in pre-puberty and elderly age groups. Higher disparity is seen in young adults and adults age groups. This could be associated with the sense of safety and how the societal and cultural norms, combined with lack of amenities

causes less females of the young and adult age groups to use neighbourhood parks. To further test the hypothesis that the presence of amenities and UD factors impacts the users based on their age and gender, multivariate analysis was conducted using linear regression for the dependent variable of park performance and independent variable of users of different gender and age groups. As seen in Table 22, five models representing the five age-group of users studied classified by their genders were regressed on the dependent variable of park performance.

Table 22 Multivariate analysis of user groups gender and age wise as a function of park performance
Dependent variable: Park Performance Scoring

	t-stat	sig	R ²
Male 0 to 4	1.044	0.310	.147
Female 0 to 4	-0.484	0.635	
Male 5 to 12	-0.903	0.378	.158
Female 5 to 12	1.531	0.143	
Male 13 to 24	-0.945	0.357	.252
Female 13 to 24	2.176	0.043**	
Male 25 to 59	-0.290	0.775	.359
Female 25 to 59	2.270	0.036**	
Male 60+	-1.691	0.108	.518
Female 60+	2.992	0.008***	

Note: ** significant at 95%; *** significant at 99%

Model 1 which looked at the toddler age group showed insignificant impact of park performance on their numbers. This could be caused by the fact that toddlers are not the decision makers with respect to the choice of parks to visit. Similarly, model 2 showed insignificant impact. In models 3,4 and 5, the results are more significant with female users 13-24 and female users 25-59 showing significant association with the park performance at 95% confidence levels. In the model 5, the strong positive impact of park performance on female elderly users is seen significant at 99% confidence level. The other aspect to notice is that except in the first model of toddlers, male users show negative association with the park performance reflecting that their usage is not as impacted by the park amenities provision.

Table 23 Pattern matrix showing PCA results for user groups

Pattern Matrix	Component	
	1	2
Male 0 to 4	1.077	
Female 0 to 4	1.008	
Male 5 to 12	0.923	
Female 5 to 12	0.801	
Male 60+	0.782	
Female 60+	0.795	
Male 13 to 24		0.834
Female 13 to 24		0.771
Male 25 to 59		1.105
Female 25 to 59		0.744

Note: Extraction Method: Principal Component Analysis. Rotation Method: Promax with Kaiser Normalization.

To further investigate the user age groups and their interrelationship, we performed a principal component analysis taking the five male and female age groups giving ten factor dimensions. Principal component extraction method based on an eigen value greater than one was conducted using Promax rotation of kappa value four. The resultant model was tested to be significant with a KMO value of adequacy of 0.786. The model cumulative explained 85% variance giving two factors. The Table 23 represents the principal component analysis model.

From the PCA analysis, there are two groups of users that we could classify as independent and dependent age groups based on physical capabilities. The elderly, toddler and children are the dependents who have some movement capabilities shortcomings. The independent group of young adults and adults are presumed to have better movement capabilities.

4. DISCUSSION & CONCLUSION

The intention of this study was to evaluate neighbourhood parks across India to evaluate the relation between provision of amenities & universal design feature and resultant user and usage profile. This study has successfully demonstrated the positive impact of amenities provision on the user footfalls and has detailed out the various factors that are essential for user comfort for users based on their age groups and gender. Various studies that have looked into the association of accessibility to parks as a measure of its attractiveness or usability (Chang & Liao, 2011; Kun, Hao, Yannan, Mingrui, & Quan, 2012; Oh & Jeong, 2007; Rigolon, 2016; Rojas, Páez, Barbosa, & Carrasco, 2016; Wei, 2017). However, few studies have looked into the importance of parks amenities and universal design features on their performance (Fors et al., 2015). The current research provides substantial evidence towards significant positive impact of universal design amenities on user comfort or attractiveness and hence must be incorporated into the design process of all recreational open spaces to derive better functioning and more inclusive open spaces.

The research conducted across 21 neighbourhood parks in three cities was done with one day allotted per park. This was done due to time constraints given the authors personally conducted the empirical survey. As the study was limited in time, the temporal variation based on weekdays and weekends as well as seasonal variations could be the way forward to better understand the user requirements and map usage patterns in detail. Also, the study of other types of open spaces like playgrounds, district parks, public squares could be undertaken to devise a better framework or model for ameliorating urban Indian open spaces.

The study also highlighted the dire need to incorporate universal design and barrier free concepts within the design process while developing public parks. The results from this study could be utilized in making better informed decisions to improve urban open space quality. With an evidence-based decision-making process regarding parks and open spaces, the process to achieve sustainable development goal 11.7 set by UN of providing universal, inclusive and safe open spaces with focus on women, children and elderly could be successfully achieved.

REFERENCES

- Chang, H. S., & Liao, C. H. (2011). Exploring an integrated method for measuring the relative spatial equity in public facilities in the context of urban parks. *Cities*, 28(5), 361–371. <http://doi.org/10.1016/j.cities.2011.04.002>
- del Saz Salazar, S., & García Menéndez, L. (2007). Estimating the non-market benefits of an urban park: Does proximity matter? *Land Use Policy*, 24(1), 296–305. <http://doi.org/10.1016/j.landusepol.2005.05.011>
- Egmond, K. Van. (2016). Sustainable Development. *Sustainable Development*.
- Fors, H., Molin, J. F., Murphy, M. A., & Konijnendijk van den Bosch, C. (2015). User participation in urban green spaces - For the people or the parks? *Urban Forestry and Urban Greening*, 14(3), 722–734. <http://doi.org/10.1016/j.ufug.2015.05.007>
- Francis, J., Giles-Corti, B., Wood, L., & Knuiiman, M. (2012). Creating sense of community: The role of public space. *Journal of Environmental Psychology*, 32(4), 401–409. <http://doi.org/10.1016/j.jenvp.2012.07.002>
- K, Y. E. H., O, H. W. K., & W, C. E. H. (2017). Landscape and Urban Planning Elderly satisfaction with planning and design of public parks in high density old districts: An ordered logit model. *Landscape and Urban Planning*, 165(May), 39–53. <http://doi.org/10.1016/j.landurbplan.2017.05.006>
- Kun, W., Hao, S., Yunnan, X., Mingrui, X., & Quan, Z. (2012). Accessibility Analysis of Urban Parks Based on GIS. *2012 Fifth International Conference on Information and Computing Science, 2008*, 56–59. <http://doi.org/10.1109/ICIC.2012.6>
- Lee, G., & Hong, I. (2013). Measuring spatial accessibility in the context of spatial disparity between demand and supply of urban park service. *Landscape and Urban Planning*, 119, 85–90. <http://doi.org/10.1016/j.landurbplan.2013.07.001>
- Matsuoka, R. H., & Kaplan, R. (2008). People needs in the urban landscape: Analysis of Landscape And Urban Planning contributions. *Landscape and Urban Planning*, 84(1), 7–19. <http://doi.org/10.1016/j.landurbplan.2007.09.009>
- MoUD. (2014). *Urban Greening Guidelines*. Retrieved from http://www.indiaenvironmentportal.org.in/files/file/urban_green_guidelines_2014.pdf
- MoUD. (2015). *Urban and Regional Development Plans Formulation and Implimentation (URDPFI) Guidelines. Ministry of Urban Development (MoUD) (Vol. I)*. Retrieved from <http://moud.gov.in/URDPFI>
- Oh, K., & Jeong, S. (2007). Assessing the spatial distribution of urban parks using GIS. *Landscape and Urban Planning*, 82(1–2), 25–32. <http://doi.org/10.1016/j.landurbplan.2007.01.014>
- Reyes, M., Páez, A., & Morency, C. (2014). Walking accessibility to urban parks by children: A case study of Montreal. *Landscape and Urban Planning*, 125, 38–47. <http://doi.org/10.1016/j.landurbplan.2014.02.002>
- Rigolon, A. (2016). A complex landscape of inequity in access to urban parks: A literature review. *Landscape and Urban Planning*, 153, 160–169. <http://doi.org/10.1016/j.landurbplan.2016.05.017>
- Rojas, C., Páez, A., Barbosa, O., & Carrasco, J. (2016). Accessibility to urban green spaces in Chilean cities using adaptive thresholds. *Journal of Transport Geography*, 57, 227–240. <http://doi.org/10.1016/j.jtrangeo.2016.10.012>
- Wei, F. (2017). Greener urbanization? Changing accessibility to parks in China. *Landscape and Urban Planning*, 157, 542–552. <http://doi.org/10.1016/j.landurbplan.2016.09.004>

RS10.3. Regional and Urban Policy and Governance

1775 REGIONAL DISPARITIES IN LEVELS OF DEVELOPMENT IN KOLHAPUR DISTRICT OF MAHARASHTRA

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ABSTRACT

Population of any region plays a vital role in the development of the region. The study of population by age and sex composition, composition of religions, economic status, marital status, education status reveals real picture of the society. In order to deal with problems and ensure development of the region planning policies in terms of quality and quantity of population resource are required. The socio-economic development of any region reflects in these elements. Levels of development can be defined as the position of rank or a scale that a region or a state or a country or any other unit has attained in terms of development. Development is a multifaceted process; it imbibes economic, social, political and ecological dimension of development. In the recent years there has been a surge of interest in the geographical aspects of development and the study of regional disparity. The study area includes the district of Kolhapur which is one of the industrial districts of the state of Maharashtra in India. Census data has been used for analyzing the social and economic conditions of the study area, Demographic, agricultural and infrastructural indicators have been selected to study the disparities of development. Sources like District Economic and Statistical Bureau, socio-economic abstracts of the region and periodicals have been used for the research, economic profile of the region. Development is a process which is continuous in nature. There are several methods for estimating the level of development but most of them are having their own limitation. A total of 33 development indicators have been used in the present study to analyze the level of socio-economic and demographic development of different sub-units of the Kolhapur district. A composite index has been prepared taking into account these indicators of development. Regional disparities have been studied using the index.

INTRODUCTION

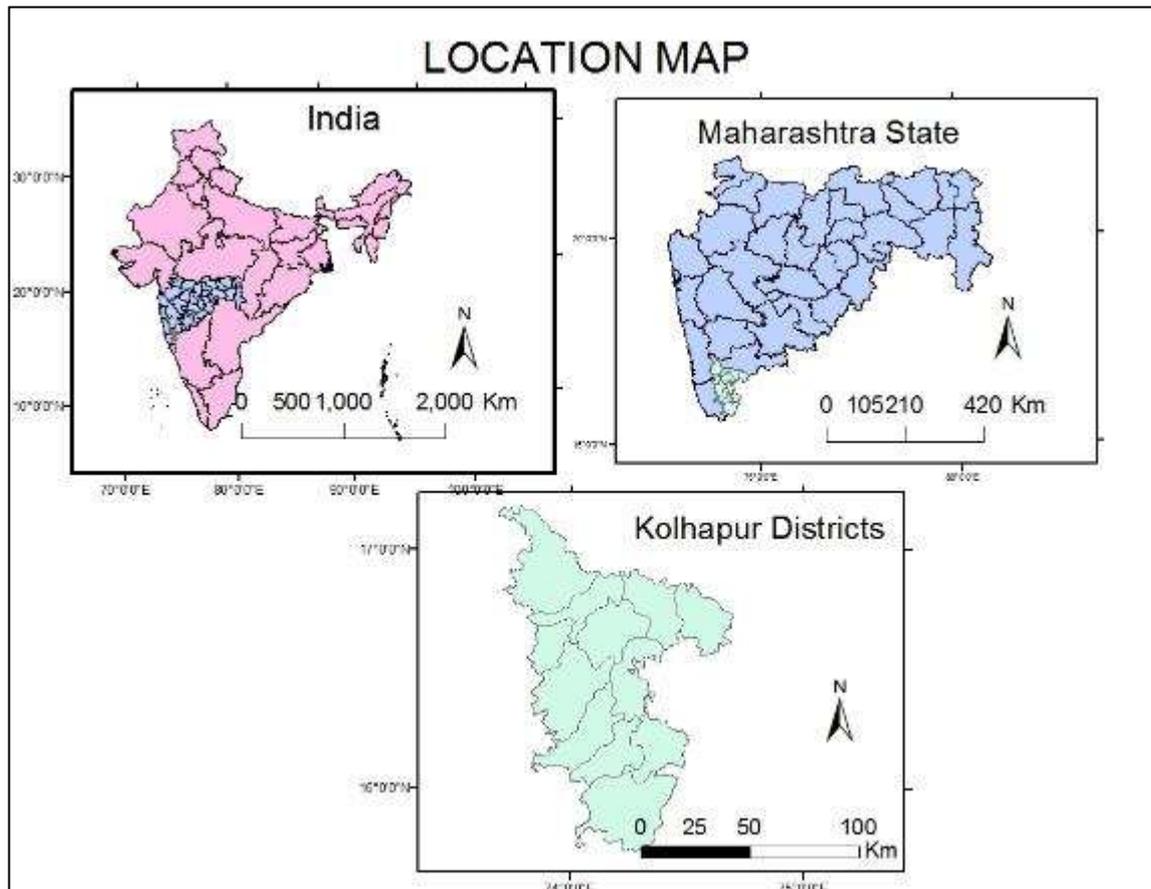
Development is a dynamic concept; it varies from area to area and many other changes from time to time within the same area. What our fore-fathers perceived as development may have been left far behind by future generation. Thus, there is no permanent and universally accepted definition of development. Development is a relative term-the extent to which a country region is developed can be determined if one compare that country region to other. In its strong sense, development means more of everything for everyone in the context of a lot more for a few. Development is associated with growth and refers to growth with social justice. The ultimate purpose of development is to provide increasing opportunities to all people for raising their living standard. Levels of development can be defined as the position of rank or a scale that a region or a state or a country or any other unit has attained in terms of development. Development is a multifaceted process; it imbibes economic, social, political and ecological dimension of development. In the recent years there has been a surge of interest in the geographical aspects of development that is, in the question of where economic activity take place. This research helps to analysis dimensions of development and typology of backwardness and also useful to formulate a future Plan for the balanced regional development and a relevant strategy to minimize spatial variation in the level of development at micro-level. (Dr. Pawan Kumar Sharma.) Composite index, Development indicators, Model districts, Potential targets, Regional disparities these are the core analysis done to study the overall regional development. (Prem Narain, 2001). The study of Regional Geography on Iran, on the basis of social and economic factors of Iran, he has made an attempt to find out the level of development and region (Keramathollah Ziari 2006)

AIM AND OBJECTIVES

The major aim of the study is to assess the overall levels of development of Kolhapur district. The objectives are as follows:

1. To observe the regional disparities in agricultural, Infrastructural and Demographical development at tehsil level.
2. To ascertain the developmental disparities between the tehsils

STUDY AREA



The Kolhapur district is one of the southernmost districts of Maharashtra state. The total area of district is 7,685sq km. It lies between 1543' to 170 17' North latitude and 73040' to 78042, East longitude. The length of the district South to North is 160 kms. And to west is 60 Km. the Sahyadri ranges to the west and Warna River to the north. The river Krishna and Belgaum district to the South and East, forms the natural boundaries of the district.

DATA AND METHODOLOGY

Secondary data were used for study

Data type	Demographic	Agricultural	Infrastructural
Source	Census of India Publications (2011)	District Economic and Statistical Bureau, Socio-Economic Extracts and Periodicals. (2013)	

METHODOLOGY

Development is a multi-dimensional process which is continuous in nature. There are several methods for estimating the level of development but most of them are having their own limitations. The major limitation arises from the assumptions made about the developmental indicators themselves and their weightage in aggregate index. From the detail literature survey carried out the following method was thought to be apt for the present study and thus the same was adopted.

Method of Estimation of Composite Index of Development.

The following statistical procedure for estimation of composite index of development is adopted in the study.

Let [X_{ij}] be the data matrix.

$I = 1, 2, \dots, n$ (Number of area unit)

$J = 1, 2, \dots, k$ (Number of indicators)

Since [X_{ij}] come from different population distribution and they might be recorded in different units of measurement they are not quite suitable from the simple addition for obtaining the composite index. Therefore, [X_{ij}] are transformed to [Z_{ij}] as follows.

$$[Z_{ij}] = \frac{X_{ij} - \bar{X}_j}{S_j}$$

S_j

Where, \bar{X}_j = Mean of the j^{th} indicator

S_j = Standard deviation of the j^{th} indicators

Z_{ij} = is the matrix of standardized indicators

from [Z_{ij}] identify the best value of each

indicator let it be denoted by Z_{0j} .

The best value will be either the maximum value or minimum value of the indicator depending upon the direction of the impact of indicator on the level of development for obtaining the pattern of development, calculate P_{ij} as follows:

$$P_{ij} = (Z_{ij} - Z_{0j})^2$$

Pattern of development C_i as given as

$$C_i = \left[\sum_{j=1}^k P_{ij} / (c.v.)_j \right]^{1/2}$$

Where $(c.v.)_j$ is the coefficient of variation of the j th indicator in X_{ij}

Composite index D_i is given by

$$D_i = C_i / C \text{ for } i = 1, 2, \dots, n$$

Where, $C = \bar{C} + 3D_{D_i}$

\bar{C} = Mean of C_i and

S_{D_i} = Standard deviation of C_i

Smaller value of D_i will indicate high level of development and higher value of D_i will indicate low level of development.

For classificatory purposes, a simple ranking of the Taluka indices will suffice. However, a more meaningful characterization of different stages of development would be in terms of suitable fractile classification from the assumed distribution of mean of composite indices. For relative comparison, it appears to assume that the Talukas having the composite index $\leq (\text{Mean} - SD)$ are leveled as high developed, districts having composite index $> (\text{Mean} + SD)$ are low level developed.

Indicators of Level of Development.

A total of 33 development indicators have been used in the present study to analyze the level of socio-economic and demographic development of different talukas in the Nashik district.

Indicators used to measure level of overall development.

A. Infrastructural Indicators.

- i. Number of PCO
- ii. Total of Primary Schools
- iii. Total Secondary Schools.
- iv. Total Higher Secondary Schools.
- v. Total Colleges
- vi. Number of Medical Facilities.
- vii. Number of Banks.
- viii. Road length.
- ix. Electricity Consumption.
- x. Veterinary.
- xi. Number of Post Offices.

B. Agricultural Indicators.

- i. Number of Total Agricultural Pumps.
- ii. Total Cultivated Land.
- iii. Barren land
- iv. Total Agricultural Land
- v. Total Non-Cultivable Land.
- vi. Chemical Fertilizers in Metric Ton.
- vii. Total Cereals.
- viii. Total Pulses.
- ix. Total Food grains.
- x. Total Fruits.
- xi. Total Vegetables.
- xii. Total Fodder.

C. Demographic Indicators.

- i. Total Population.
- ii. Recorded Deaths.
- iii. Recorded Births.
- iv. Infant Deaths.
- v. Maternal Deaths.
- vi. Total Urban Population.
- vii. Male Literates.
- viii. Female Literates.
- ix. Total Rural Population.

RESULTS

The Level of Development

Composite Index Of Development in Kolhapur District (2011)

Sr. no.	Taluka	Agriculture		Demography		Infrastructure	
		C.I.	Rank	C.I.	Rank	C.I	Rank
1	Shahuwadi	0.624612	7	0.389703	3	0.309543	3

2	Panhala	0.624264	6	0.388044	2	0.504107	8
3	Hatkangle	0.388605	1	0.588320	9	0.280272	2
4	Shilol	0.467295	4	0.416027	5	0.467782	4
5	Karveer	0.393532	2	0.326560	1	0.017204	1
6	Gaganbawda	0.857591	12	0.823780	12	0.817066	12
7	Radhanagri	0.651854	9	0.591691	8	0.479762	5
8	Kagal	0.413445	3	0.514571	7	0.483472	6
9	Bhudargad	0.712555	11	0.395245	4	0.546019	10
10	Aajra	0.690548	10	0.446300	6	0.618913	11
11	Gadhinglag	0.532426	5	0.721058	10	0.517109	9
12	Chandgad	0.631067	8	0.745233	11	0.497616	7

The composite indices of development have been worked out for different taluka separately for agriculture, infrastructural service and demographic development. The talukas have been ranked on the basis of development indices. It shows the composite indices of development along with the ranks of different talukas. In this table, a simple ranking of the talukas on the basis of level of development has been presented. This is sufficient for classificatory purposes.

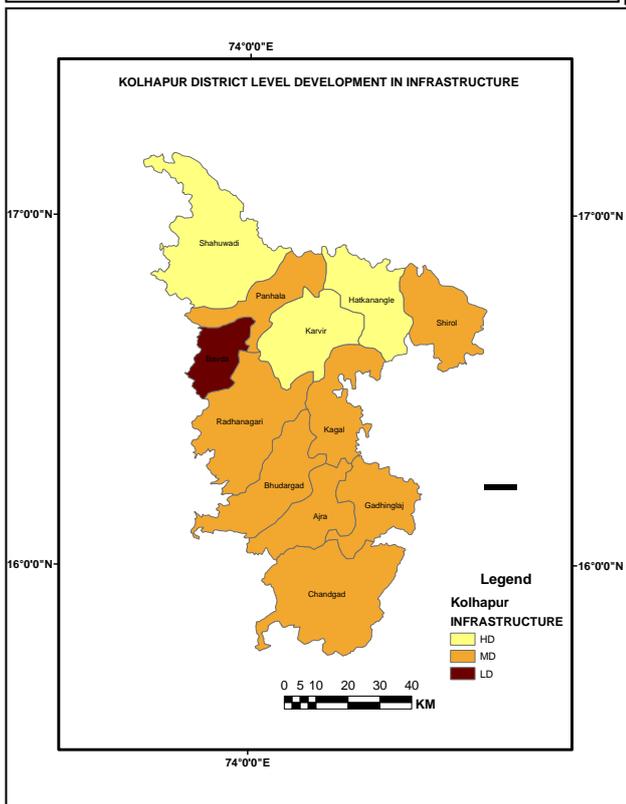
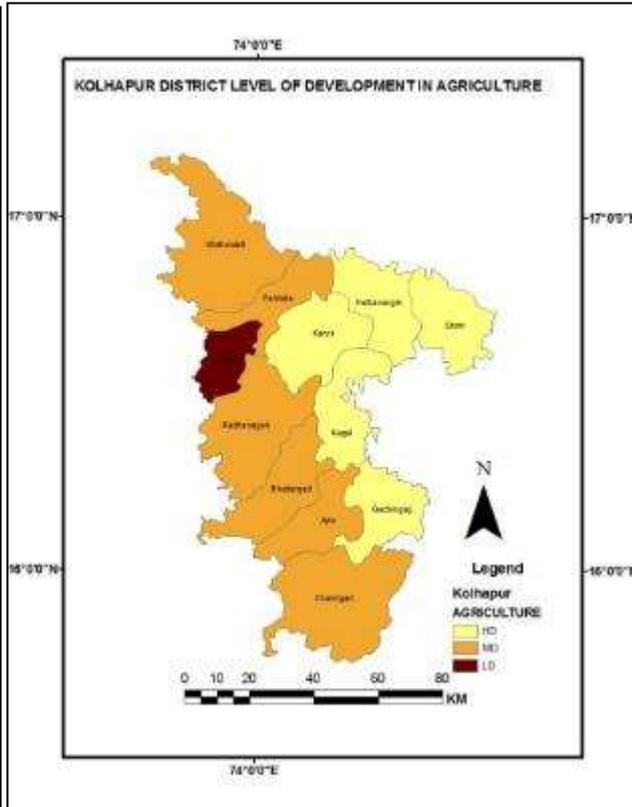
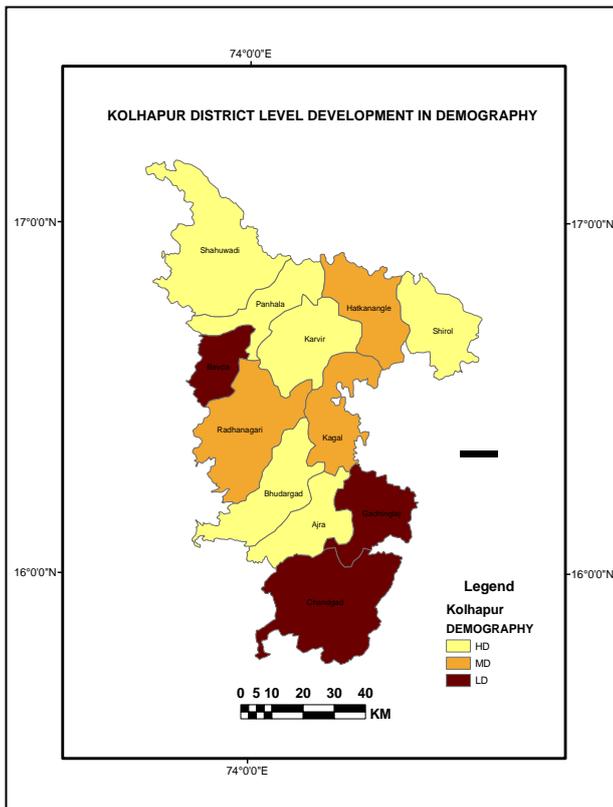
Scope of Development

- Assessment of city infrastructure including preliminary surveys.
- Gap analysis and investment potential.
- Master planning of Mahalaxmi Mandir Parisar and surrounding investment.
- Requirement for upgradation the city infrastructure.
- Project outlay and investment sharing pattern.

Area under different levels of Development (2011)

Sr. no.	Sector of Development	Levels	No. of Tehsils	Area%
1	Agriculture	High(<0.39)	2	16.03
		Moderate (0.39-0.69)	9	68.7
		Low (>0.69)	1	15.27
2.	Demography	High (<0.38)	1	16.24
		Moderate (0.38-0.69)	8	78.05
		Low(0.69)	3	5.71
3.	Infrastructure	High (<0.21)	1	16.03
		Moderate (0.21-0.61)	10	66
		Low (>0.61)	1	17.97

Above table shows that classification of the tahsils can be made by using the average level of development and its standard errors. The tahsils having the composite index equal to or less than (mean minus S.D.) are classified in category first as developed tahsils. The tahsils with composite index line between (mean ± sd) are classified in category second as middle level of developed tahsils and tahsils having the composite index equal to or greater that (mean + sd) are classified in category third as low level of development districts. The analysis reveals that about 16% area is high developed in all the sector. In agricultural sector, about 16.03% area is highly developed and 68.7% area is moderately developed and low level of developed tahsils cover about 15.27% area. In demographic sector, about 16.24% area is highly developed and 78.05% area is moderately developed and only 5.71% area fall in the level of low developed tahsils. In infrastructural services, about 16.03% area is highly developed and 66% area is moderately developed and 17.97% area fall in the tahsils which are low developed. It is observed that low level of development tahsils are not as thickly populated as the tahsils belonging to the category of high development.



CONCLUSION

1. In overall agricultural development, out of 12 tahsils of Kolhapur district, Karveer is highly developed in agricultural sector and Gaganbawda has a low level of development. The rest of the tahsils are moderately developed. In agricultural sector, about 16.03% area is highly developed and 68.7% area is moderately developed and low level of development tahsils covers about 15.27% area.
2. Karveer is highly developed in infrastructural facilities and Gaganbawda is low level of development. In infrastructural services, about 16.03% area is highly developed and 66% area is moderately developed and 17.97% area fall in the tahsils which are low level of development.
3. Karveer is highly developed in demographic sector and Ajra is low level of development. The remaining tahsils like Shahuwadi, Panhala, Gadhinglaj, Radhanagari Chandgad, Shirol, Hatkanangle are moderately developed. In

demographic sector, about 16.24% area is highly developed and 78.05% area is moderately developed and only 5.71% area fall in the level of low development tahsils.

4. Karveer is found highly developed in agriculture, infrastructural and demographic development whereas Gaganbawda is found low level of development in all sectors of development.
5. Hence Karveer is highly developed in overall development whereas the tahsil of Gaganbawda is low level of development in overall development. The analysis reveals that about 16% area is highly developed in all the sectors and remaining areas are moderately and low level of development in all levels of development.
6. It is observed that low level of development tahsils are not as thickly populated as the Tahsils belonging to the category of high development.
7. To reduce the regional disparities the priorities should be given for low level of development tahsils. The state government should include these tahsils in regional planning, encourage the local people to start small scale industries, giving them financial schemes.

REFERENCES

- Census of India 2011, Maharashtra. District Census Hand book Kolhapur. www.censusindia.gov.in
- Keramathollah Ziari (2006) Deccan Geographer volume. 44 No 1, June 2006 Pp1-15 (ISSN-0011-7269)
- Pawan Kumar Sharma, Hari International Journal of Research in Geography (IJRG) Volume 2, Issue 3, 2016, ISSN 2454-8685 PP 1-10 www.arcjournals.org
- Patil B.D., R.C. Patel June (2013) Research Journal of Agriculture and Forestry Sciences ISSN 2320-6063 Vol. 1(5), pp-9-12. www.isca.in
- Prem Narain, S.D. Shanna, S.c. Rai and V.K. Bhatia (2002) 55(I): 88-107 Indian Society of Agricultural Statistics. New Delhi-110 012
- Reference book Regional Gregraphy Majid Hussain.
- Ravi .S. Ahuja, Ashish. A. Nikam ZENITH International Journal of Business Economics & Management Research ISSN 2249- 8826 ZIJBEMR, Vol.5 (1), (2015), pp. 64-79 online available at zenithresearch.org.in

1789 GOVERNANCE PRACTICES ACROSS CENTRAL BANKS IN THE WORLD

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ABSTRACT

Past two decades have seen enormous changes in central banks and their practices, especially in reforms of how those banks are governed. These reforms are different across countries. In some countries older institutions have been fundamentally restructured. While in other countries, entirely new central banks have been established. Even certain countries have created a supranational central bank that oversees a monetary union. In all of these above situations, central bank law was either revised or newly written, while institutional objectives, practices, and structures were amended or created from scratch. As a basis for this study, central banks of top 20 economies as per GDP were analyzed: United States, China, Japan, Germany, UK, India, France, Brazil, Italy, Canada, Russia, Korea, Australia, Spain, Indonesia, Mexico, Turkey, Netherlands, Saudi Arabia and Switzerland. The above mentioned countries were classified into two major groups: advanced economies and emerging market and developing economies. Work has been carried out on parameters like organizational structure, board size, accountability, and transparency. The study is primarily based on secondary data, such as scientific papers, books, and other data sets/documents available on the central banks Internet websites. It is found that central banks in emerging market economies have a wider range of functions than in advanced economies. Each of the countries in the list has its own institutional, economic, social and cultural characteristics, which differentiates their governance models. Board size differed in all central banks as it is related to country size and country heterogeneity as well as to country's political institutions. Transparency and accountability support central bank independence and monetary policy effectiveness.

Keywords: Governance; Central Banks; Countries

INTRODUCTION

The recent global financial crisis has raised questions about the role of central banks in executing governance practice. Central banks and their business are changing at a rapid pace responsibilities are greater while demands on central bank accountability increase. Central bank governance arrangements and practices vary greatly reflecting the diversity of backgrounds, objectives and functions of the institutions, origins of the bank, the country's political system and the extent of the development of its financial sector.. This is further reflected in the board structure in terms of the number of boards and their decision-making and management functions. Accountability and transparency are complementary elements to the central banks. Central bank that shows significant improvement in clear communication across its internal and external platforms is said to have transparency. The central bank should act in a transparent manner by keeping the government and the public continually informed of its actions. In general, central banks in emerging market economies have a wider range of functions than in advanced economies. No central bank can be totally independent in the sense that it does not have to report to anyone. As a basis for this study, central banks of top 20 economies as per GDP were analyzed: United States, China, Japan, Germany, UK, India, France, Brazil, Italy, Canada, Russia, Korea, Australia, Spain, Indonesia, Mexico, Turkey, Netherlands, Saudi Arabia and Switzerland. The above mentioned countries were classified into two major groups: advanced economies and emerging market and developing economies.

Table 1: classification of countries based on GDP

Advanced economies	Emerging and developing economies
United States	China
Germany	India
France	Brazil
Italy	Mexico
Spain	Indonesia
Japan	Saudi Arabia
United kingdom	Turkey
Canada	Russia
Switzerland	Korea
Australia	
Netherland	

Table 2: Name of central bank in advanced economies

Advanced economies	Name of central banks
United States	<u>Federal Reserve System</u>
Germany	<u>Deutsche Bundesbank</u>
France	<u>Bank of France</u>
Italy	<u>Bank of Italy</u>
Spain	<u>Bank of Spain</u>
Japan	<u>Bank of Japan</u>
United kingdom	<u>Bank of England</u>
Canada	<u>Bank of Canada</u>
Switzerland	<u>Swiss National Bank</u>

Australia	Reserve Bank of Australia
Netherland	De Nederland sche Bank

Table 3: Name of central banks in emerging and developing economies

Emerging and developing economies	Name of central banks
China	People's Bank of China
India	Reserve Bank of India
Brazil	Central Bank of Brazil
Mexico	Bank of Mexico
Indonesia	Bank of Indonesia
Saudi Arabia	Saudi Arabian Monetary Authority
Turkey	Central Bank of the Republic of Turkey
Russia	Bank of Russia
South Korea	Bank of Korea

LITERATURE REVIEW

Maxwell Fry, Charles Goodhart and Alvaro Almeida (1996) analyze the objectives, activities and independence of central banks in developing countries. They emphasize the importance of the recruitment of skilled staff for establishing independence. The authors also found a positive correlation between the recruitment of skilled staff and central bank independence, but did not further explore this relationship.

Fry, Julius, Mahadeva, Roger and Sterne (2000) construct an index of 'policy explanations' that consists of three components: (i) explanations of policy decisions, (ii) explanations in forecasts and forward-looking analysis, and (iii) explanations in published assessments and research. Their index captures many transparency issues, but does not highlight the role that different kinds of transparency play in the decision-making process. In addition, their index is constructed using survey responses from central banks.

Blinder, Goodhart, Hildebrand, Lipton and Wyplosz (2001), gave a detailed account of transparency at the Federal Reserve, the European Central Bank, the Bank of Japan, the Bank of England and the Reserve Bank of New Zealand, but do not provide objective criteria to measure the degree of transparency.

Alan Blinder (2004), stresses the need for diversity in the composition of the committee. He cites four potential benefits of member diversity: it prevents decisions based on one or few sets of beliefs and preferences; it is likely to lead to more stable monetary policy; pooled knowledge improves information in an uncertain environment; and it improves information processing in the execution of complex tasks.

Tonny Lybek and JoAnne Morris (2004), agree that diversity in education and experience is important for ensuring informed and balanced policy making. They argue that both internal and external members are important for deterring conflict of interests and encouraging such diversity.

Eijffinger and Geraats (2006), elaborated on this categorization, developed an explicit methodology for measuring transparency, and used it to code the practices of nine major central banks.

Hammadou, and Stanek (2009), show many factors that significantly affected central bankers' decisions such as professional backgrounds and even the board member's gender

[Peter T. Hughes](#), [Stefan Kesting](#), (2014) studies the central bank communication to address the questions of how economists account for the effects of speech acts and whether and to what extent discourse analysis is applied in their studies

OBJECTIVE OF THE STUDY

1. To access organizational characteristics across central bank and find differential causalities factors underlying it through literature study
2. To access the underlying functionality impacting diversity conditions in board size differences across central banks
3. To look into nature of transparency in central bank to find out the level in pace of economic development underlying the need of specific transparency attributes

RESEARCH METHODOLOGY

This research is classified as qualitative, exploratory and bibliographic. The process and its significance are the main focal points of its qualitative approach, as it seeks to interpret the phenomena without using statistic methods and techniques. The study is based on secondary data, such as scientific papers, books, and other documents available on the central banks' internet websites. Research was carried out in four stages: planning, bibliographic research, analysis, and preparation of the final report. In the planning stage, the research subject and its scope were defined. During the bibliographic research stage, besides academic papers and books, data in documents made available on the internet websites of the central banks were gathered and cross verified. Information related to the organizational structure of central banks, their board size and accountability and transparency in their decisions and actions is among the selected data. In the analysis stage, the countries and criteria used was: India, as it is the researchers' native country.

ORGANIZATIONAL STRUCTURE

An organizational is defined as the boundaries within which staff throughout the organization can perform their work .So why are the organizations are so different. The reason for this variety is that an organization's structure can make a real difference to the way it performs. Henry Mintzberg (1979) a renowned management theorist developed a well-known typology consisting of five organizational structures: the simple structure; the machine bureaucracy; the professional bureaucracy; the divisionalized form; and the adhocracy. The organizational structure of a central bank with good governance practices has many features of Mintzberg’s adhocracy structure. There appears to be significant variation in organizational structures and institutional arrangements across central banks. Table 4 states different theories of Mintzberg’s and the central and that falls into those theories.

Henry Mintzberg (1992, 2009) suggests that organizations can be differentiated along three basic dimensions: (1) the key part of the organization, that is, the part of the organization that plays the major role in determining its success or failure; (2) the prime coordinating mechanism, that is, the major method the organization uses to coordinate its activities; and (3) the type of decentralization used, that is, the extent to which the organization involves subordinates in the decision making process. Using the three basic dimensions key part of the organization, prime coordinating mechanism, and type of decentralization, Mintzberg suggests that the strategy an organization adopts and the extent to which it practices that strategy result in five structural configurations: Entrepreneurial structure, machine bureaucracy, professional bureaucracy, divisionalized form, and adhocracy.

Table 4: Theories of organizational structure

Theory Country	Entrepreneurial Organization	Machine Organization (Bureaucracy)	Professional organization	Divisional Organization (Diversified)	Innovative Organization (Adhocracy)
United States			✓		✓
Germany				✓	
France		✓			
Italy				✓	
Spain				✓	
Japan			✓		✓
United kingdom			✓		✓
Canada			✓		✓
Switzerland			✓		✓
Australia			✓		✓
Netherland		✓			
China					✓
India			✓		
Brazil				✓	
Mexico			✓		
Indonesia		✓			
Saudi Arabia				✓	
Turkey				✓	
Russia					✓
South Korea			✓		

In fact, most of the major central banks that are believed to follow best governance practices generally display many of the elements of the ideal structure. However, there is likely no central bank in the world that achieves all of the characteristics above. Furthermore, the relative importance of these features will depend on the objectives, autonomy, authority and accountability delegated to the central bank. Not all central banks could achieve these characteristics because of local political, economic, structural and cultural considerations.

The entrepreneurial type of organization has a simple, flat structure it is relatively unstructured and informal. Since it is a flat structure with few top managers the decision-makers can become so overwhelmed that they start making bad decisions. The machine organization is very formalized, there are many routines and procedures, decision-making is centralized, and tasks are grouped by functional departments. There is a formal planning process with budgets and audits; and procedures will regularly be analyzed for efficiency. Functional lines go all the way to the top, allowing top managers to maintain centralized control. The professional organizations rely on highly trained professionals who demand control of their own work. So, while there's a high degree of specialization, decision making is decentralized. If an organization has many different product lines and business units, you'll typically see a divisional structure in place. In innovative organization companies typically bring in experts from a variety of areas to form a creative, functional team. Decisions are decentralized, the clear advantage of adhocracies is that they maintain a central pool of talent from which people can be drawn at any time to solve problems and work in a highly flexible way.

From the table we find US, Canada, Japan, UK, Switzerland, Australia has adhocracy organizational structure implying that decision are decentralized and they maintain a pool of talent from which people are selected from different background and focus on highly skilled employees. Also these countries’ central banks encourage innovation. Saudi Arabia has diversified structure implying the bank operates under limited vertical decentralization. Moreover further work in this area is necessary.

BOARD SIZE

The size of the central bank board, or the monetary Policy Committee (MPC), is an important feature of central bank design. It is likely to reflect costs and benefits of an increasing number of board members as well as the political environment in which the decision on MPC size is made. On the benefit side, the most prominent argument in favor of increasing the number of board members is that larger MPCs could be in a better position to process, analyze, and interpret economic information ultimately leading to better monetary policy decisions than individuals relying mostly on their own information and judgment. On the cost side, a plausible conjuncture is that larger MPCs will generally imply greater effort from all involved for a given decision problem. This may translate into less effective monetary policy making. The most important aspect is communication among members and the dynamics it creates. Larger MPCs would require more time than smaller MPCs in reaching a decision. The view that increasing MPC membership size may reduce the effectiveness of policymaking. In developing countries, the role of board of directors is far more complex due to the severe form of information asymmetries. Gender diversity in boardrooms has also become a central component of corporate governance reforms around the world. Another factor that might be relevant for MPC size is the number of central bank staff. A possible link between the two variables is that larger MPC size could be simply reflective of a larger number of functions performed by the central bank, which may require both more staff and a larger MPC if the MPC also performs other functions

Table 5: Board size and employees of different central banks

Country	Board Name	Board members	No. of female	Branches	No of employees
United States	Board of Governors	07	01	12	2919
Germany	Governing Board	06	01	35	8480
France	Monetary Policy	04	01	13	9258
Italy	Governing Board	05	0	39	6799
Spain	The governing Council	18	03	15	4830
Japan	Policy Board	09	01	32	4646
United kingdom	Monetary Policy Committee	09	01	12	3883
Canada	Board of Directors	14	04	06	1500
Switzerland	Governing Board	03	01	02	616
Australia	Reserve Bank Board	09	03	05	1589
Netherland	Governing Board	04	0	-	1703
China	Board of Directors	12	03	09	-
India	Central Board of Directors	15	03	20	15461
Brazil	Board of Governors	09	0	-	-
Mexico	Board of Governors	05	01	-	-
Indonesia	Board of Governors	06	01	39	5820
Saudi Arabia	Board of Directors	05	0	10	2800
Turkey	Board of Directors	07	0	21	4746
Russia	Board of Directors	12	05	11	54700
South Korea	Policy Board	07	0	16	2215

The size of the respective boards should strike a balance between having a sufficient number of members to ensure an informed, balanced, and professional view, while at the same time limiting the number so that the board remains effective and avoids a dilution of individual responsibilities. Reportedly, board members sometimes feel an obligation to speak, which can be time consuming if they do not contribute with new information or perspectives. Most policy boards have seven to nine members. Supervisory boards and advisory boards, on the other hand, often have a broader representation. Where a management board exists, it tends to be smaller, thus allowing for quick decisions and avoidance of the dilution of responsibilities.

MPC size may vary systematically with a number of country characteristics:

- board's size increases with greater diversity and country size;
- board's size is larger at higher levels of development, but decreases with greater openness;
- board's size is larger in the presence of stronger democratic institutions;
- board's size is larger in the presence of higher public debt levels;
- board's size is larger in the presence of a floating exchange rate system; and
- board's size interacts systematically with other elements of central bank design, including the degree of central bank independence, monetary policy strategy, staff size and operating expenditures, and the term length of MPC members.

In today's world, board diversity has become a relevant topic and gender diversity is an important aspect of board diversity. There are scarce of studies about women's presence on the boards of directors of banks. In order to justify the low representation of women in the highest executive positions and on the boards, it is important to get evidence of the phenomenon known as the glass ceiling. This is usually defined as a set of obstacles that mean a barrier made up of procedures, structures, power relations, beliefs or habits, which complicate a woman's access to high directive positions

(Morrison et al., 1987; Powell and Butterfield, 1991). Their presence in central banks, on the other hand, is a relatively new subject of research. The issue first came to the foreground in 2012, when a group of renowned economists signed an [open letter](#) denouncing the absence of female appointees on the European Central Bank (ECB) board.

The above study (table 5) show that presence of women on boards of directors is limited worldwide. The majority of female Central Bank chairs were appointed in emerging countries. Russia has more women in the board (42%) as compared to advanced countries women on board. However in countries like Netherland, Brazil, Saudi Arabia, Turkey and South Korea there is no women in the central bank board. This implies women remain under presented in the economics profession, particularly in specialization like macroeconomics or finance which is the backbone of central banking. However many countries are recently planning to introduce a gender equality action plan. Therefore it shows diversity is lacking in the top echelons of central banking globally.

FUNCTIONS OF CENTRAL BANK

The central bank is nowadays primarily an agency for monetary policy. It also has important financial stability, employment, growth and welfare functions. But the range of functions allocated vary between countries. Central Banks generally had three main objectives or functional roles. (i)To maintain price stability, (ii)To maintain financial stability, (iii)To support the policies of the government,(iv) To maintain growth and welfare.

The table 6 reveals the objective of central banks. It is found that all central banks conduct monetary policy to achieve price stability (low and stable inflation) and to help manage economic fluctuations. Monetary policy and financial stability are intimately linked. Price stability supports sound investment and sustainable growth, which in turn is conducive to financial stability. Countries like Spain and South Korea maintains both. However central banks are not only designed to tackle monetary and financial issues but economic growth, employment and welfare are also relevant variables in countries like US, Italy ,Canada,Switzerland,Australia,India and brazil

Table 6: Characteristics of Central Banks

Country	Monetary policy	Financial stability	Employment, growth & welfare	Support policies of government
United States	✓		✓	
Germany		✓		
France	✓			✓
Italy	✓		✓	
Spain	✓	✓		
Japan	✓			
United kingdom		✓		✓
Canada	✓		✓	
Switzerland	✓		✓	
Australia	✓		✓	
Netherland		✓		
China	✓			✓
India	✓		✓	✓
Brazil	✓		✓	
Mexico	✓			
Indonesia	✓			
Saudi Arabia	✓			✓
Turkey	✓			✓
Russia				✓
Korea	✓	✓		

Countries such as France, Italy, Mexico. used monetary policy for short-term political purposes, either to finance fiscal deficits or to stimulate economic activity, and to reduce unemployment. Central banks have played an increasingly prominent role in advanced economies over the last decade. however, its role is different in emerging and developing countries .In advanced economies central bank mandates are predominantly focused on price and financial stability, whereas in emerging and developing countries central banks have a wider remit to support sustainable development and the government’s economic policy agenda.

TRANSPARENCY AND ACCOUNTABILITY OF CENTRAL BANK

Transparency relates to a central bank’s openness in explaining the rationale behind its specific policy decisions. The rationale for policy actions cannot be fully understood unless the central bank makes clear its long-term objectives, as well as its strategic goals and its short-term tactics to achieve them. The central bank should also describe the economic environment in which it expects its actions to be felt. Indeed, transparency may be regarded as one of the most important conditions of central bank independence. Transparency in the mandate of the central bank and clear rules of procedure for its operations ensure good governance and facilitate policy consistency. Transparency therefore leads to more effective monetary policy, in particular because it facilitates better decision-making by the public. Another argument against transparency is that the public may read too much and get confused in interpreting the information released by central banks, and that the more transparent a central bank becomes, the more signals it sends, the more volatile are the financial markets. The concept of transparency is closely related to accountability. In fact, some degree of transparency

is a necessary condition for accountability. Conceptually, transparency refers to mere information disclosure, whereas accountability concerns the explanation of one's actions and bearing responsibility for them, including possible repercussions when the policy outcomes fall short of the objectives.

Table 8: Transparency of central bank

	Political	Economic	Procedural	Policy	Operational
United States				✓	✓
Germany		✓	✓		✓
France					✓
Italy					✓
Spain					✓
Japan			✓		✓
United kingdom	✓	✓	✓		✓
Canada	✓				✓
Switzerland	✓				✓
Australia	✓				✓
Netherland					✓
China			✓		
India			✓		
Brazil			✓		
Mexico			✓		
Indonesia			✓		
Saudi Arabia			✓		
Turkey			✓		
Russia			✓		
Korea			✓		

Political transparency refers to openness about policy objectives. Political transparency is enhanced by institutional arrangements, like central bank independence, because they ensure that there is no undue influence or political pressure to deviate from stated objectives. Economic transparency focuses on the economic information that is used for monetary policy. This includes the economic data the central bank uses, the policy model it employs to construct economic forecasts or evaluate the impact of its decisions, and the internal forecasts the central bank relies on. Procedural transparency is about the way monetary policy decisions are taken. And how the policy decision was reached, which is achieved by the release of minutes and voting records. Policy transparency means a prompt announcement of policy decisions. In addition, it includes an explanation of the decision and a policy inclination or indication of likely future policy actions. Operational transparency concerns the implementation of the central bank's policy actions. It involves a discussion of control errors in achieving the operating targets of monetary policy and (unanticipated) macroeconomic disturbances that affect the transmission of monetary policy.

From the table we find that Fed place strong emphasis on ensuring the transparency of the decision-making process. The Fed is ultimately accountable to the Congress, which can amend the Federal Reserve Act legislation at any time. whereas in Germany Shareholders and the public are regularly kept up-to-date through the 20-F Report and the Financial Report, including the Consolidated Financial Statements, as well as the Interim Reports. The reporting of Deutsche Bank Group is in accordance with International Financial Reporting Standards (IFRS). This provides for a high degree of transparency in financial reporting and facilitates comparability with international peers. All of the measures that make up the Basel III reforms are expected to be in force by 2022 (with phase-in provisions in some cases).

GOVERNANCE PERSPECTIVE FROM INDIA

Transparency, continue to be the mainstay of the Reserve Bank of India's communication strategy. The Reserve Bank endeavours to strike a chord with the public through communication that is dynamic, evolving and responsive to domestic and international developments.

The Central Board of Directors is the apex body in the governance structure of the Reserve Bank. There are also four Local Boards for the Northern, Southern, Eastern and Western areas of the country which take care of local interests. The central government appoints/nominates Directors to the Central Board and Members to the Local Boards in accordance with the Reserve Bank of India (RBI) Act. It comprises of the Governor, who is the Chair, and four Deputy Governors of the Reserve Bank; four Directors nominated by the central government, one from each of the four Local Boards. Ten Directors nominated by the central government and two government officials nominated by the central government. The Central Board held seven meetings during the accounting year 2016-17 in Bengaluru, Mumbai, Kanpur, Kolkata, New Delhi (twice) and Chennai. The present RBI Act does not provide for any Monetary Policy Committee and it would not be possible, under the extant legislative framework, to set up a Committee independent of the RBI Board. It would, however, be possible to take a cue from the institutional framework worked out while setting up the Board for Financial Supervision (BFS). The Advisory Group recommends that, even without any legislative changes, the RBI should set up a Monetary Policy Committee (MPC) as a Committee of the RBI Central Board. There could be a seven member MPC consisting of the Governor, the three Deputy Governors and three other members drawn from the RBI Central Board; concerned Executive Directors and Departmental Heads dealing with monetary policy, internal debt, exchange rate management and economic analysis could be permanent invitees. The tenure of non-executive MPC members could be

coterminous with that of the Central Board Directors, i.e. four years, with a clause for reappointment. There should be a convention under which the members are appointed for different periods to ensure periodic new appointments while ensuring continuity. The members of the MPC should be knowledgeable in the areas of macro economics, monetary analysis, central banking policy and operations and banking and finance. More importantly, to ensure against any conflict of interest, the three Board members who would be on the MPC should be independent professionals. It would be desirable to delineate the role of the non-executive members vis-a-vis the executive members; moreover, the question of information access and staff support as between non-executive and executive members should be addressed upfront to head off any inherent conflicts. The Advisory Group recommends that the MPC be set up early so as to give the MPC some time to work out its modalities and to undertake a few trial runs before the formal procedures are put in place starting from say the next financial year.

CONCLUSION

The matrix in governance structure taken in this study was divided into 4 categories i.e. organizational structure, characteristics of central bank, board size, transparency and accountability. Each of these characteristics is looked into taking the theories into fold .Through these criteria it can be concluded that a further way out of this approach understanding the parametric specificity of the central bank would be pointing out to diversity and need of socio, economic, political outcomes and fulfillment of those needs via allocation and control of fund flow into the system.

REFERENCE

- Eijffinger, Sylvester, and Petra Geraats. 2006. How Transparent Are Central Banks? *European Journal of Political Economy*, 22(1): 1–21.
- BIS. 2009. *Issues in the Governance of Central Banks*. Report from the Central Bank Governance Group. BIS: Basel.
- Blinder, Alan. 2004. *The Quiet Revolution: Central Banking Goes Modern*. New Haven, CT: Yale University Press.
- Lybek, Tonny and JoAnne Morris. 2004. "Central Bank Governance: A Survey of Boards and Management." IMF Working Paper No. 226. Washington, DC: IMF.
- Fry, Maxwell J., Charles A.E. Goodhart and Alvaro Almeida. 1996. *Central Banking in Developing Countries: Objectives, Activities & Independence*. London: Routledge.
- Mintzberg, Henry. 1979. *The Structuring of Organizations: A Synthesis of the Research*. Englewood Cliffs, NJ: Prentice-Hall.
- Farvaque, É., Hammadou, H. & Stanek, P. 2009. Select your Committee: The Impact of Central Bankers' Background on Inflation. *Economy International*, 117: 99–129.
- Working paper no. 08-5 Central Bank Institutional structure and effective central banking: Cross-Country Empirical Evidence Iftexhar Hasan Rensselaer Polytechnic Institute and Bank of Finland Loretta J. Mester Federal Reserve Bank of Philadelphia and the Wharton School, University of Pennsylvania April 2008
- Morrison, A., White, R. and Van Velsor, E. (1987). *Breaking the Glass Ceiling*, Addison-Wesley, New York
- M. Fry, D. Julius, L. Mahadeva, S. Roger and G. Sterne, "Key Issues in the Choice of Monetary Policy Framework in a Global Context", Routledge, London, 2000, pp. 50-66.
- [Alan S. Blinder](#), [Charles Goodhart](#), [Philipp Hildebrand](#), [David Lipton](#), and [Charles Wyplosz](#), "How do Central Banks Talk? Geneva Reports on the World Economy 3, 2001
- Bank for international settlements. *Issues in the governance of central banks*. 2009.
- Berger, Helge, Volker Nitsch and Tonny Lybek, (2006), Central Bank Boards around the World: Why Does Membership Size Differ?, IMF Working Paper 06/281
- Diamondopoulos, John. Transparency 'footprints' of central banks: the role of minutes/voting records. *The journal of socio-economics*, v. 41, n. 2, p. 235-247, 2012
- Dincer, Nergiz; Eichengreen, Barry. Central bank transparency and independence: updates and new measures. *International journal of central banking*, v. 10, n. 1, p. 189-253, mar. 2014.
- Mihailovici, Gabriela. Challenges for central banks governance in the context of a deeper economic and monetary union. *Procedia economics and finance*, 2nd international conference "economic scientific research - theoretical, empirical and practical approaches", espera 2014, 13-14 Nov. 2014, Bucharest, Romania, v. 22, p. 442-451, 2015
- Boyer, Pierre, and Jorge Ponce, (2011), Regulatory capture and banking supervision reform, *Journal of Financial Stability*, 8(3), 206–217
- [Peter T. Hughes](#), [Stefan Kesting](#), (2014) "A literature review on central bank communication", *On the Horizon*, Vol. 22 Issue: 4, pp.328-340
- Mintzberg, H. (1992). *Structure in fives: Designing effective organizations*. Upper Saddle River, NJ: Prentice Hall.

RS10.4. Regional and Urban Policy and Governance

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ABSTRACT

The lecture covers the concept of spatial structure, the connecting interpretations and seeks to support the background of the definition from three approaches. In the lecture, we also deal with the definition of the region itself, to which two levels of explanations are presented. The regions can be distinguished and compared in terms of the spatial structure (economic, social, historical, geographic, etc.) and this allows for the creation of different groups, which is actually the main challenge of the regional approach. The aim of spatial structure analyzation is to identify the common features of a larger territorial unit - a country or a group of countries -, by analyzing the kind of measures that are used to differentiate them, and in what direction they may evolve, may change in the future. Many analytical methods are known or are currently being developed to measure the territorial levels, to register their status and to compare them. In the lecture we intend to present two possible directions of analysis, which can be the starting point and the basis of these methods. In addition to current and future development zones, in the 1990s, temporary regions with different characteristics were also present in Central Eastern Europe, some of which demonstrate the special features of the region well. The conclusion drawn from the spatial structure study shows slow changes, while when it comes to competition, it highlights significant differences. The territorial features of the region highlight the growing competition space, the concentration of the increasingly powerful resources of the capital, which is very much central to the European spatial development thinking. The presentation focuses on what the regional centers lack when it comes to co-operation especially regarding mutual spatial planning. It also emphasizes that the automotive industry has become the dominant economic sector in these regions, which can increase the competitiveness amongst them. Based on the results of the analysis, a certain ranking of competitiveness can be set up amongst the regions, which gives a clear picture of the spatial structure of the Central Eastern Europe region. In our view, Central Eastern Europe will not become a new development zone in Europe, but the capitals and some regional centers and their neighborhoods can successfully catch up while the spatial differences in the region are spectacularly increasing. Basically, Central Eastern Europe still shows some of its 1990' characteristics when it comes to integration or the renaissance of the former Eastern nation states and this can be demonstrated by both political and economic processes. The construction of the examined spatial structure can be considered both complex and macro-regional, not necessarily characterized by socio-economic homogeneous zones, but we can establish common features. The division of the large area is even more spectacular, and it becomes clear that significant developmental disparities have emerged between some parts of Central Eastern Europe. Our findings also extend to the growing competition and its main characteristics between the countries of Central Eastern Europe. The conclusions can contribute to developing policy directions for each region.

Keywords: regions, Central Eastern Europe, spatial structure, regional approach

INTRODUCTION: THE EXAMINED AREA

What do we consider Central Eastern Europe? In recent years the number of domestic studies and studies on great region research has increased dramatically, which clearly indicates that this region has become the focus of professional interest. The announcements also indicate that there are significant differences in the definition of large areas. One of the research groups focuses on the countries of the Visegrad Cooperation (V4), which was founded in 1991 (Czech Republic, Poland, Hungary, Slovakia), and more are complemented by Austria and thus represent Central Europe. Other analyses also link the eastern provinces of Germany, possibly Bavaria and the Western Balkans (Horváth 2010) to Slovenia and Romania, so they are talking about a wider Central Eastern Europe.

In this study, a broader approach is justified to be used. On the one hand, most of the countries have joined the European Union already, or will soon join (Serbia is still insecure). On the other hand, looking from the Hungarian perspective, we can discover a number of identities in the common historical foundations of this region, but in the twentieth century, the individual countries, and thus the whole region, are linked together by millions of economic, commercial and millions of historical-cultural relations. Furthermore, this part of Europe has been characterized by the same political system, and we are also seeing similarities in the simultaneous elimination of it. And last but not least, the specific geopolitical situation characterizes these countries, since they are located in the middle of West and East, and in changing political polices this position can be validated in the past, but in the future in a specific way.

Therefore, our research is focused on a larger, more coherent, developmental and moving area, and so we consider Central Eastern Europe as the eastern and southern provinces of Germany, Austria, Poland, the Czech Republic, Slovakia, Hungary, Slovenia, Romania and Bulgaria. In this country group as a European large area we are attempting to outline the spatial structure and register its changes.

ABOUT THE SPATIAL STRUCTURE

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Pál Szabó summarizes the Hungarian interpretations of the spatial structure in an excellent study (2009) and in his habilitation thesis (2015). It gives you three approaches of using the concept. In the first case, the elements (constituents) and their spatial arrangement can be considered as the basis of the definition, while in the other sphere the terms emphasizing the constituents of the space are categorized. Finally, the third group lists those studies in which the analysis of the spatial form of the spatial elements, ie the differences in the structures and the distribution of spatial formations as their distributions, is the focus. To illustrate the differences in spatial development, we can attach the other groupings mentioned by the author, which can be made in geographic and regionalistic (spatial development) approach. Szabó considers the interconnection of the terms of the region and of the spatial structure, or the description of the geographic spaces it has spawned in network elements (transport, settlement networks, infrastructure systems). For the regionalist view, it lists those who define the boundaries by quantitative and qualitative differentiation between spatial units, and then define the spatial development directions accordingly. Analyses for a country may also target administrative units (municipalities, micro-regions, counties, planning-statistical regions) that may appear in different types of spatial formations. These can be distinguished by the common features, from the unique spatial shapes found in the particular analyses. Separation is also a confrontation, it is capable of a presumed or real level of development that can form the basis for statements about spatial structures.

In our opinion, the regional approach is aimed at defining spatial developmental directions. Describing the processes and system of factors that can be used to describe the developmental characteristics of a country and continent. Spatial distributions and differentials can be identified and point to directions for development interventions, to identify desirable political or ideological goals in the spatial structure, and to determine the tools and institutions that can be assigned to them.

It may be justified, but the study does not aim to explain further general determinations of the spatial structure.

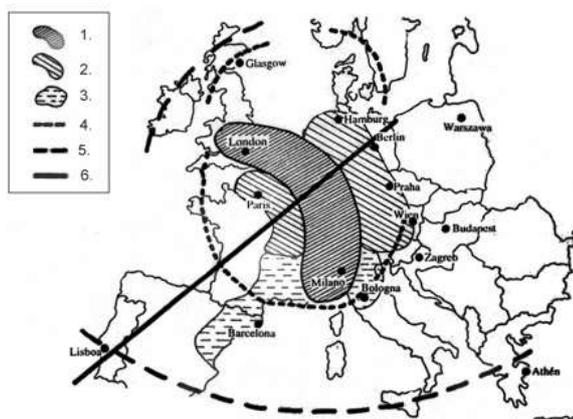
CENTRAL EASTERN EUROPE IN THE EUROPEAN SPATIAL STRUCTURE

The spatial structure models in Europe appeared in the eighties and nineties of the last century, with the aim of illustrating the evolution of the European space. The depictions and the territorial delineations are based on the classical principles of the centre-periphery model. Centrum regions - whose hubs were the centers of the Western European - economic resources - but all institutions of political decision-making - were concentrated, and in this well-defined space the economy was renewed and the aggregation of innovations took place. Thus, Blue Banana was created as the economic - historically interpretable - European zone of high prestige centers that displayed the dominant centers of Western Europe and their attraction (Brunet 1989). The extension of this zone takes place in the reflection of the models, as part of the development zone that has formed with the agglomeration areas of the megacentres and the integration of new centers has occupied the dominant centers of Europe and their influence fields from London and Paris, from the Ruhr country to Milan, and Kunzmann (1992).

Outbound development zones continued to emerge in the 1990s. The South -European development zone, comprising the major centers and agglomeration areas of Barcelona - Lyon - Marseille - Genova - Milan - Venice - Rome, will be featured. This has been called the developmental axis of the North, the European Sunbelt or the Second Banana (Lever, 1995) with special functions (service orientation, tourism, growing local economies, new types of production systems and regional connections).

Along with this, the European high-tech ring, which, starting from Glasgow to Barcelona via Milan, entering Vienna - interrupted in Central Europe - returning to Malmö in its starting position. This is the first Vienna to appear here, as the last station in Europe at that time, which is beyond the peripheral regions, such as Central Eastern Europe, with its unknowingness and unopposedness (Figure 1).

Figure 1: Europe's structural model of the 1990s



Legend:

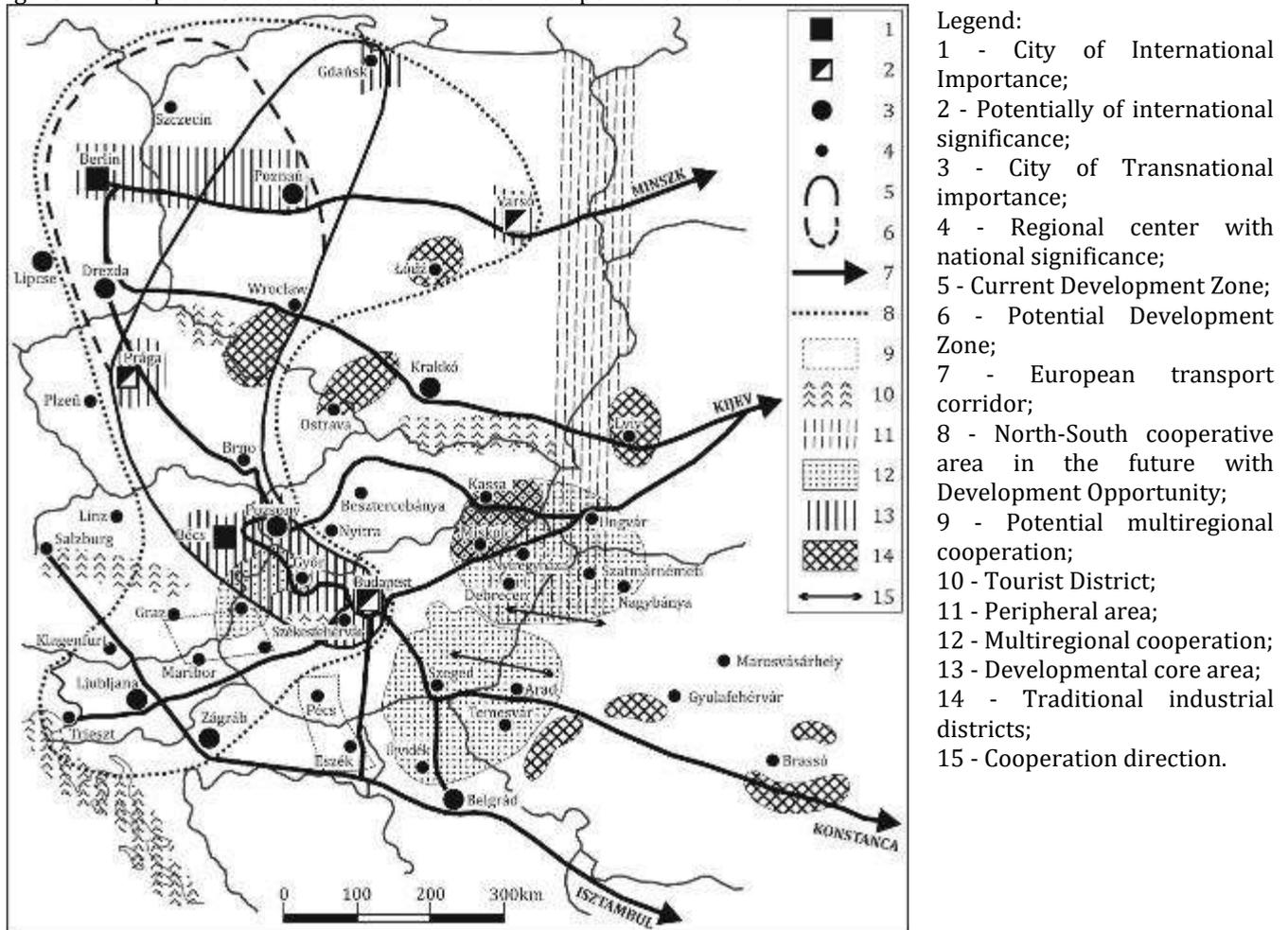
1. Blue Banana;
2. The extent of Blue Bananas, the induced zones;
3. South of the South (sunbelt zone);
4. High-tech ring;
5. Circle of undeveloped regions;
6. Problem region.

Source: Rechnitzer 1998., 67.

In the early nineties, regional processes clearly indicated that the economic integration of Central and Eastern European countries would inevitably take the form of regional integration (Enyedi 1996). The Visegrad Cooperation, which the economies and institutions of their countries could in principle be suitable for economic integration, these effects could

simultaneously initiate territorial integration processes, not just the neighboring countries of the then European Community but also the Eastern and post-socialist countries. Certain aspects of this integration process were recognized in macro-regional structures emerging in Central and Eastern European countries (Gorzalak 1996, Rechnitzer 1998, Rechnitzer, Smahó 2011), which showed a number of specificities and some developmental directions (Figure 2)

Figure 2: The spatial structure of Central Eastern Europe in the 1990s



Source: Rechnitzer, Smahó 2011, 55.

In the macro-regional structure, urban regions are the embodiment of relationships. In Hungary, the agglomeration in Budapest, the agglomeration of Prague and Brno in the Czech Republic, Warsaw, Poznań, Wrocław, Gdansk, Krakow in Poland, Bratislava and its area, and the region of Košice in Slovakia. The west-east development slope was already prevailing in the countries, but it was close to the eastern borders, and it was broken and staged in another level of development that was much worse than the previous one. Thus, essentially, the Western border regions of the countries of the Central and Eastern European region were regarded as the founders of the macro-regional cross-border cooperations considered to be unfolding, while the eastern regions were the real periphery with the poor chance of catching up.

The Western growth zone of Central and Eastern Europe has been analyzed as "Central Eastern Europe banana (boomerang)" in the Gdansk-Poznań-Wrocław-Prague-Brno-Bratislava-Vienna-Budapest metropolitan areas. Here, the capital cities and the major industrial and administrative centers were concentrated and their organizations were in direct contact with the Austrian and German economies, large and medium-sized investors settled in these areas, and these centers were also suitable for receiving services and shopping tourism from the West in the middle of the nineteenth century.

Another speciality, is that for the very first time within this zone have met the relatively developed infrastructurally advanced decisively industrially potent central eastern european regions with the correlatively undeveloped Austrian and German regions, the latter representing major transformations. Therefore a natural competition evolves among these areas, that was not only valid for the Austrian-German relationships but also effected the intraregional relations of the individual countries. By which we mean that due to the inflow of foreign capital in the aforementioned western or the metropolis-based regions the economy went through a faster and as a matter of fact a more successful transition, thus the western-eastern and metropolis-countryside divisions have not decreased by time, rather they further increased within the particular countries.

The Central Eastern European banana (in other denomination the boomerang) could be starting or has already started two potential developmental zones and extensions. One of which has Prague and the former East German cities (Berlin,

Leipzig), connecting to Berlin, in focus, curving back to the area of the Czech capital with Poznan. Indicating the spectacular formation of the Berlin-Warsaw axle, which not only could serve as a new transportation and communicational passageway (II. transportation corridor) in direction to Minsk and Moscow in the future, but can also be reviewed as an innovation axle. This can also result in the dislocation of the hub in the Central Eastern European configuration, beguiling major movements of goods and marking out new economic directions, that could call for the devaluation and dislocation of the preceding spatial contacts and may cause the realignment of the spatial structure²⁷².

Another potential extension of the Central Eastern European banana is yet a north-south cooperational direction, where it connects the Adriatic coastline with the Northern Sea. In this hypothetical expansion the Berlin-Warsaw axle could more expressly prevail, also Slovenia, Croatia and the eastern and southern provinces of Austria may gain activity. In view of the particularity of the spatial structure it can be presumed, that the joining of the northern and southwestern developmental areas of Central Eastern Europe can come into existence on the Prague-Brno-Vienna-Bratislava-Győr-Budapest axle. Here can shape an economic and spatial structure 'turning disk' (Central Eastern European mushroom), that can interweave in the following decades the future renewal zones of Central Eastern Europe in the direction of Eastern Europe – decisively Eastern Slovakia and The Ukraine – and the Balkan, mostly Romania Serbia and Bulgaria, transmitting the capital, the knowledge and the innovations towards their regions and major centers.

Beyond the current and future developmental zones other different transitional areas have been apparent in the 1990's in Central Eastern Europe with their unique characteristics. Part of these are the traditional industrial areas, the areas of the transitioning agriculture or the mountainous territories worth the renewal through tourism, as well as the bigger municipalities that are willing to participate in cross-border cooperations and the traditional peripheries. The 'eastern wall' was able to be traced out, the one that broke the developmental slope and involves the eastern peripheral border territories interlocking Belarus and The Ukraine. In these mostly rural areas based on agriculture characterized by a settlement of villages and small towns and an unfavourable and domestically subaverage level of infrastructural supply. In other rural regions the internal resources that serve the renewal were far too poor, the interest of foreign capital is minimal, the employment and social tensions are intensified. Beside the numerous disadvantages of the peripheral condition the fact that the post-soviet areas border on quasi developed 'western' regions signify an advantage as it serves the possibility to activate certain elements of resources and create new fields of relations. The destruction of the 'eastern wall' was permanently obstructed by the anachronistic and bottleneck transportation (and border-connective) infrastructure, the slowly forming institutional structure of the post-soviet states, the intensifying eastern border security of the European Union, the pullulating black economy and the specifically bad public safety.

THE COMPETITIVENESS OF THE CENTRAL EASTERN EUROPEAN REGIONS

The research is continued by the analysis of the competitiveness of the self-interpreted Central Eastern European large regions (NUTS 2). Our main goal on the one hand was to provide those coefficients, thus economic, social and institutional factors, that are intensely determine the whole of the examined large region, its internal and correlated structure, on the other hand positioning the Hungarian regions allows us to draw recommendations in order to improve our position assessing and later strengthening our competitiveness.

Our analyses contributed to the evaluation of the theoretical models of competitiveness, and the researches about it, in a way that new elements have been introduced to the already existing models (Lengyel 2000, 2012). The classic main categories of productivity of labour and employment have been refined, thereupon beside the main factors regarding the research and development, the human capital and the working capital, new social capital factors have been built in, as well as new parameters regarding the traded sector (industries producing to export).

We have compared the NUTS 2 units of eight countries, which mean 93 regions, we based the analysis on 25 variables²⁷³, which we evaluated through different mathematical-statistical methods.

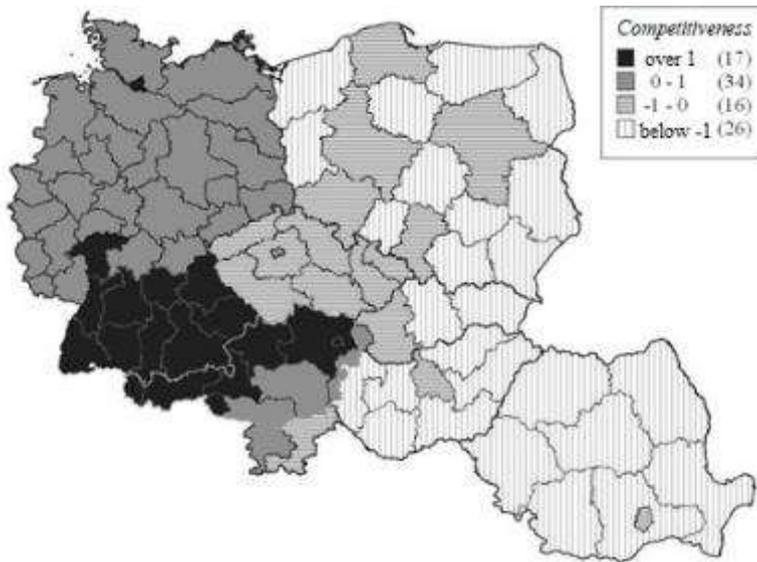
While analyzing the constituting factors of competitiveness, such as the productivity of labour and the employment it can be determined, that the large region is heavily differentiated, an easily distinct fault-line could be drawn. The seclusion may be characterized overall by the phenomena that two areas – the developed western European market economies (Germany, Austria) and the Central Eastern European regions that are closing up – are unequivocally separated from each other. Within the former high employment rate couples with high productivity, while the latter can be described by the opposite, namely low employment and low productivity.

The large region is strongly divided – as the researches confirm the known disparities between west and east, the concentration of resources in the capital cities in terms of the former socialist countries, the major differences among regions, – so the developmental zones (measures of contiguous, equally developed regions) could be recognized in a relatively small number, as against the huge blocks of weakly developed, decisively peripheral regions (Figure 3).

Figure 3: Competitiveness of the regions of Central Eastern European

272 The actuality of this new direction is shown by the fact that Poland strongly seek the reception of the Russian railway transportations, herewith intermediating the further Asian connections towards the core area of the European Union.

273 The 25 variables have been divided into six groups, thus beside the general income state (4 variables) we have examined the distinctiveness of research and development (5 variables), the composition of the human capital (5 variables), the parameters of the working capital (1 variable), the traded sectors (2 variables) and the social capital with its institutions (8 variables).



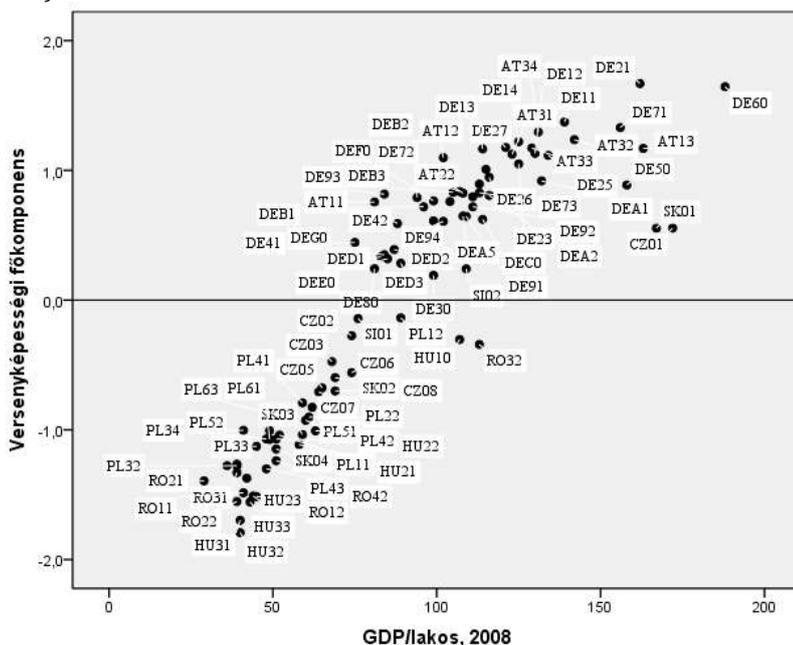
Source: Lengyel, Rechnitzer 2013, 113.

The Hungarian regions compared to the regions of the other post-soviet countries within the major area are in a rather unfavourable position. Solely Central Hungary, that contains the capital, and also Western Transdanubia can be marked with an appraisable competitiveness, the remaining regions are broken away being rated to the weak competitiveness category. This can be confirmed by the examen, when the main competitiveness component, as the concentrated expression of the analyzed factors, are compared with the GDP per capita and the connections are ranged into a two-dimensional graph (Figure 4).

The division of the large region is even more apparent and obvious in the significant developmental differences that have been evolved in Central Eastern Europe. The fault-line (the average rate of competitiveness) could be stepped across beyond the foresaid German and Austrian regions only by the Prague and Bratislava region among the areas of the formerly socialist countries²⁷⁴.

The Hungarian capital merely flips over the average rate of the broad region with the prominent level of competitiveness and a favouring specific GDP, nationwide. The GDP supply of the Western Transdanubian and the Central Transdanubian region is also still sensible, however it disposes a low level of competitiveness, which is even more vigorously present at every other Hungarian region, that are located on the bottom of the heavily lagging block, rather than its midfield.

Figure 4: The relationship between the main component of competitiveness and economic development (GDP per capita, 2008)



Source: Lengyel, Rechnitzer 2013, 112.

274 The latest regional GDP datas (2012) simply strenghten this result, as among the 20 most developed regions of the European Union the Bratislava region (Bratislava kraj) sits ont he sixth place, with 179 % of the EU average, the Prague region (Praha) is on the ninth place producing a 172% result, Vienna (Wien) 12th ont he same list with 162% of the EU average, and Central Hungary containing Budapest is permanently between the 96th to the 98th place continuously, barely being over the EU average.

Further researches – mainly the internal analysis of the factors which affect competitiveness – have found, that basically two of the coefficients determine the competitiveness of the regions. One of those is the human capital – this factor contains the development of the labor force, the ability of labor attraction and the presence of patents –, that strongly divide the large region, providing a more subtle picture in terms of the derivation. Amongst the Hungarian regions the two fore-mentioned, namely Western and Central Transdanubia, stand closer to the Czech and Polish regions that approach the confine. The rest of the Hungarian regions then again are significantly lag behind showing similar rates to the peripheral Romanian and Polish regions.

The Research and Development factor – R&D expenses, the proportion of employed in the high-tech sector, fixed capital formation, successful framework programmes – symbolises the presence of the knowledge-based economy and the innovative sectors, which coefficients expand through the Central Eastern European area. Within this division taking the shape of a mushroom the Hungarian regions are even more prominently break away from primarily the Czech and Polish regions. The analysis once again confirms the Hungarian – but as it were also a Central Eastern European – particularity, that the capital characteristically dissever from the rest of the regions – in our case Budapest –, and its numbers rather converge to the western European areas, being closer to the 'head of this mushroom'. In the 'stipe' as the lagging block, one can find the remaining Hungarian regions, indicating a rather unflattering R&D potential, and herewith a specifically weak competitiveness in Central Eastern Europe.

SUMMARY: TRENDS AND DIRECTIONS IN THE SPATIAL STRUCTURE OF CENTRAL EASTERN EUROPE

Based on the ongoing researches it is anything but easy to summarize the directions and the possible routes of development of the spatial processes in Central Eastern Europe.

Our first conclusion is that the countries and areas of the large region are more heavily getting into the course of competition, as the contest is sharpening, mainly when it comes to receiving and settling foreign investments, and being able to show the attractions offered by the capital cities and the larger regional centers (service-providing institutions, research and development, supply of academic qualification, the receiving of international organizations, supply of tourism, appealing environment, etc.). This course of competition is constantly rearranging, thriving with newer and newer elements, as some countries and regions emerge, whilst others, setting off from a more prosperous position, find themselves in a competitive disadvantage, and whereas for several, the process of going ahead is rather slower and not spectacular at all.

The competition is consequently intensified, as this phenomena is even more easily recognizable in case of the capitals (Horváth 2007; Csomós 2011). The European tendency, that the incomings are increasingly concentrated in the capital cities, is confirmed, as we see that in every Central Eastern European capital and in its region the GDP per capita is nationwide the highest, and its concentration rises steadily in course of time. It can be said, that three capitals exceed in this competition. For years – with varying rankings – Bratislava, Prague and Vienna stand amongst the twenty most profitable regions of Europe, however amongst the emerging regions not only Warsaw and Budapest but Ljubljana, Zagreb and even Belgrade can be found. These centers may not entered the contest of the European metropolises, as those capitals are more successful at receiving international organizations, in settling them they achieve a leading role within the larger region (extending over more countries), or even at a European level. Apart from this their supply of metropolitan functions, and the factors describing the quality of life is ever more broader and diverse (Csomós 2011).

Besides the income and function of the capital cities and concentration of the population we may consider another typical spatial structure characteristic, which is the *sub-urbanizational processes*, that are accelerated around the centers of the countries, moreover these population-clustering tendencies seem to be discovered in specific regional centers as well. Namely the capitals and some larger municipalities, regional centers offer favourable possibilities of employment, secure more easily accessible services, and develop better conditions in terms of the quality of life, therefore becoming a more and more significant target of internal migration. In opposition to this, the geographical territory of the *emptying areas* are expanding, the ageing of the extant population, the falling of municipal-level services, unfavourable work conditions, the appearing of disadvantaged social groups and sets of people, then their concentration in certain areas. All these follows the European trends, although in case of Central Eastern Europe they are more spectacular, moreover the balling of lagging areas is not even interrupted by the national borders. The peripheries of the peripheries are outlined within the large region, and the elimination or the moderation of the spreading of these territorial 'black holes' consume significant sources, that most countries cannot or would not like to obtain.

Securing the fast accessibility of the *spatial disclosure* of the countries, – that is e.g. the capital and regional centers, as well as the linking of those, – is not consistent, the individual countries followed differing network development philosophy and practice, therefore the internal connections and interweavings of the large region are uncertain. The European long-range transport network development goals seem purposeless, as the road-system is constructed on a limited speed, not always tracking the most favourable directions or the accessibility of the centers. *Connections along the national borders* however smarten up, the interoperability gradually comes into existence – relatively poorly in peripheral areas –, but even in this spatial segment the ever-keener competition is present, therefore it is quite frequent, that the neighbouring regional centers undertake parallel developments, neglect relations and assign projects to internal needs (e.g. airports, universities, R&D bases, industrial scientific parks, etc.)

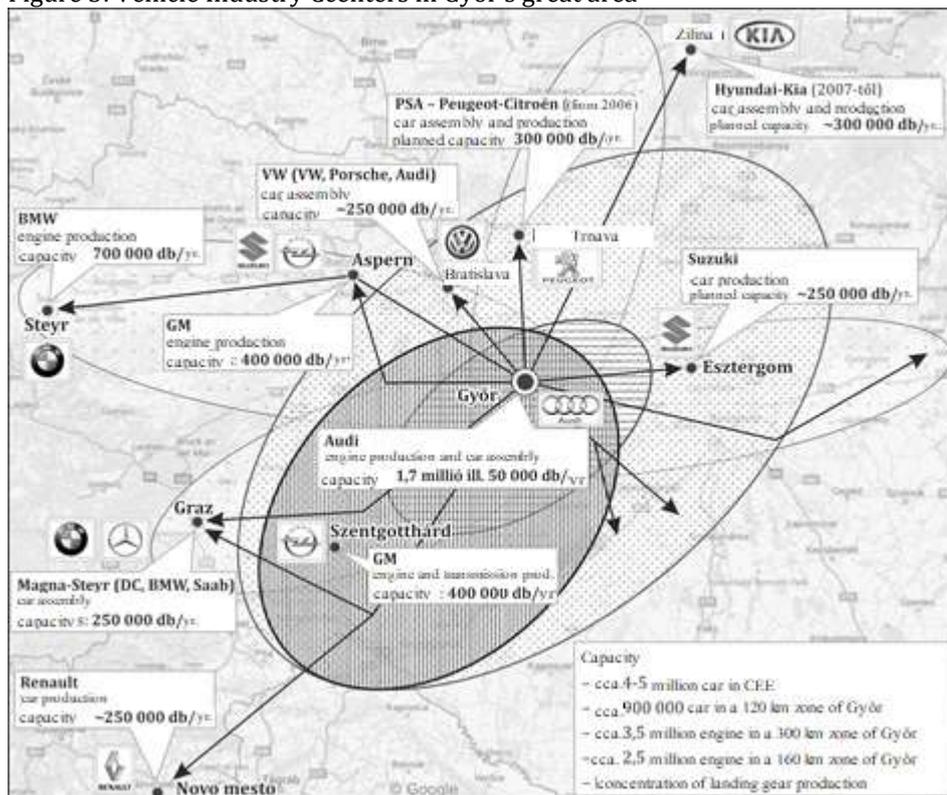
A main characteristic of the large region is that the countries – and their spatial planners – have not yet recognized the importance of the joining and 'glancing' of the *developmental conception*. Therefore in certain national spatial

developmental conception prevails an island effect, as there is yet to be a Central Eastern European dimension – or at least in case of the neighbouring, interlocking territories –, common thought about spatial structure, or even its illusion – quasi its institutional framework – is not yet found.

At last, but not least it must be mentioned, that decisively in the central european (core) region the *automotive industry* is becoming a more and more significant sector (Rechnitzer, Smahó 2012) (Figure 5). Not only because the automotive appears in numerous city – mostly the automobile assembly plants –, but also in line with that we see the settlement of diverse types of suppliers providing other european production centers as well, either being concentrated in larger towns or being scattered in different municipalities. The positive effect of the automotive concentrations is visible in many centers (supply of education and training, higher incomes, appearing suppliers, extension of services, wider consumption supply, rising immigration, development of the urban infrastructure, etc.), but the exposure of these centers are increasing as well (route-dependent local development), and the solution for it do not always have a place in the developmental notions (Molnár 2012; Fekete 2015).

Can the whole of Central Eastern Europe be considered as a new european developmental zone? The entire area presumably will not be a growth zone, as one can see non-integrated, rather strongly divided, – in terms of spatial structure – isolated elements, zones, that are recognized in core regions, surrounded by deep peripheries, or permanently stagnant, motionless places and set of municipalities. The suction effect of the centers – in truth the capitals – is easily recognizable, that only escalate the spatial differences and the system of counterpoint. The competition is intense between the capitals and the zones, and at the same time the ever more spectacular spatial differences within the countries must be treated or need to be treated. The economic and spatial policies of the countries (where there at least is one) might be following the european principles, however fundamentally they differ. Thus there is a great chance in certain countries for the capitals and a few regional centers to become an exciting, future-bearing power places, other regions – perhaps even in spite of the persistent political actors – might remain in or drift into the poorhouse of the continent.

Figure 5: Vehicle Industry Centers in Győr's great area



Source: Rechnitzer 2016, 87.

LITERATURE

- Brunet R. (1989): *Les villes Europas*. Reclut/Datar, Paris.
- Csomós Gy. (2011): A közép-európai nagyvárosok gazdaságirányító szerepe. *Tér és Társadalom*, 3., 129-140.
- Enyedi Gy. (1996): *Regionális folyamatok Magyarországon az átmenet időszakában*. Ember, település, régió. Budapest.
- Fekete D. (szerk.) (2015): *Nyugat- és kelet-közép-európai járműipari térségek működési modellje*. Universitas-Győr Alapítvány, Győr.
- Gorzalak, G. (1996): *The regional Dimension of Transformation in Central Europe*. Regionalis Studies Association, London.
- Horváth Gy (2010): *Territorial Cohesion in the Carpathian Basin: Trends and Tasks*. Discussion Papers; 81., Hungarian Academy of Sciences Centre for Regional Studies, Pécs.
- Horváth Gy. (2007): Régióközpontok Európában. *Magyar Tudomány*, 6., 704-720.
- Kunzmann, K. R. (1992): Zu Entwicklung der Stadtsysteme in Europa. In. *Mitteilungen der Österreichischen geografischen Gesellschaft*. Ed. Stiglbauer, K. Band 134. Wien. 25-50.
- Lengyel I. (2000): A regionális versenyképességről. *Közgazdasági Szemle*, 12., 962-987.
- Lengyel I. (2012): Kelet-közép-európai térség régióinak versenyképessége. In. *Járműipar és regionális versenyképesség*. Szerk.

- Rechnitzer J., Smahó M. Széchenyi University Press, Győr. 126-158.
- Lengyel I., Rechnitzer J. (2013): The Competitiveness of Regions in the Central European Transition Countries. *The Macrotheme Review: A Multidisciplinary Journal of Global Macro Trends*, 4., 106-121.
- Lever, W. (1995): The European Regional Dimension. In: Lever, W., Bailly, A. Averby (ed.): *The spatial impact of economic changes Europe*. Ashgate, Vermont, 178-203.
- Molnár E. (2012): Kelet-Közép-Európa az autóipar nemzetközi munkamegosztásában. *Tér és Társadalom*, 1., 123-137.
- Rechnitzer J. (1998): *A területi stratégiák*. Dialóg-Campus Könyvkiadó, Budapest-Pécs.
- Rechnitzer J. (2016): *A területi tőke a városfejlődésben*. A Győr-kód. Dialóg Campus Kiadó, Budapest-Pécs.
- Rechnitzer J., Smahó M. (2011): *Területi politika*. Akadémiai Kiadó, Budapest.
- Rechnitzer J., Smahó M. (2012): A jármű- és autóipar hatása a kelet-közép-európai térség versenyképességére. *Magyar Tudomány*, 7. (annex), 38-48.
- Szabó P. (2009): Európa térszerkezete különböző szemléletek tükrében. *Földrajzi Közlemények*, 2., 121-134.
- Szabó P. (2015): *Régió és térszerkezet az elmélettől a területpolitikáig*. ELTE Eötvös Kiadó, Budapest.

1688 SPATIAL & TEMPORAL ASSESSMENT OF ACCESS TO HEALTHCARE FACILITIES IN MUMBAI: K-WEST WARD***Naveen Krishna Alla, Arnab Jana, Rathin Biswas***Centre for Urban Science & Engineering, Indian Institute of Technology Bombay, Mumbai-400076, India, E-mail: naveen.krishna@iitb.ac.in (Corresponding author), arnab.jana@iitb.ac.in, rathin.iitb@gmail.com**ABSTRACT**

There is a necessity of healthcare facilities (HCFs) to perpetuate human life from various kind of diseases. The demand is growing briskly day by day with the growing population in urban areas, which generates some questions like, are the HCFs well distributed over the area based on their speciality, affordability and service timing, if so then, how much area can be served by the existing HCFs, if so then, are they able to provide 24 hour service, if not then, which areas are underserved or health facilities shortage areas and in which time window, and which are the probable areas to place a new HCFs. In this paper, we analysed the current situation of HCFs both spatially and temporarily in the K-west ward of Mumbai as a study area. The spatial analysis demonstrates the spatial inequality in terms availability and accessibility of HCFs. From the results, it was found out that most of the underserved areas are low-income neighbourhoods and they are lack of affordable HCFs (i.e. public). The spatial inequality of various healthcare services was computed using the network analysis with different catchment areas. The temporal analysis considers different time frames of service timing of HCFs like morning, afternoon, evening and midnight. The results show that only a few out of 179 HCFs provide 24hrs services, of which only two are public HCFs that means lack of public HCFs, especially in night hours. This spatial and temporal analysis will give an idea to health managers, policy makers and planners where to open new HCFs, or what will be its operating time window. This methodology can be applied to other geographic areas.

Key words: Health Care Access, Spatio-Temporal Analysis, Net Work Analysis, Underserved Areas

1 INTRODUCTION

Health equity has become an important policy issue all over the world. Providing adequate access to health care providers is vital for any health care system (Bauer & Groneberg, 2016). Access to health can be defined as enabling a patient in need to receive the right care from the right provider, at right time depending on the context. Access is a multidimensional concept, it depends on both the suppliers (Health care providers) and demand (People) factors. In broad, access depends on social, geographical, personal and final factors. (Penchansky & Thomas, 1981) first proposed the theory of access in the health care system. They defined access as the degree of fit between the user needs and service provision by the providers; the better the relation, better the access. The degree of fit could be measured across five dimensions such as availability, accessibility, affordability, accountability and accommodation. All these dimensions are independent but interconnected and each is important to assess the achievement of equity in health care access. The term availability deals with the volume of health care providers or other health care services (Goddard & Smith, 2001). Inequalities in access to health care are more in urban areas as compared to the rural areas (Ministry of Health and Family Welfare, 2015). This is because of the rapid growth of urban population and stagnation of public healthcare facilities.

Urban population in India has gone up to 31.2 percentage in 2011 from 17.3 percentage population in 1951 (Government of India, 2011). At the same time, nearly one third of urban population live in slums or low-income neighbourhoods. By the year 2020, India's total slum population will increase to 200 million (UN-HABITAT, 2015). In addition, India is undergoing dual burden of disease, an incessant rise in communicable diseases and a spurt in non-communicable diseases (Boutayeb & Boutayeb, 2005; Upadhyay, 2012). Hence, the demand for healthcare is growing briskly day by day with growing population in urban areas. Assessment of healthcare access is complex in urban areas as compared to the rural areas. This is due to heterogeneous mix of population, fragmented health services and complex transport network. Which generates some of the important questions like how much area can be served by the existing HCFs, if so then, are they able to provide 24 hour service, if not then, which areas are underserved or health facilities shortage areas and in which time window, and which are the probable areas to place a new HCFs.

In India, there are no detailed policies regarding geographical location of HCFs (Rao, 2012) The location of public HCFs is based on simple metric such as threshold population. This creates geographical distribution variation of HCFs in urban areas. The spatial variation of HCFs is very high in urban areas as compared to the rural areas. It is reported that in India more than 70 percent of health infrastructure located in urban areas. Despite the supposed proximity of HCF's to urban poor their access to these facilities severely limited. This is because of high costs at private facilities and the limited public HCF's. In this context, it is very important to understand the spatial distribution of HCF's based on their speciality, affordability and service timings.

An efficient assessment of health care access is critical for decision makers to take necessary actions. Especially, it is important to identify the locations that have less access to health care facilities both spatially and temporally. The development of Geographical information system (GIS) facilitates the analysis of health care access (Higgs, 2005). The application of GIS is diverse in literature, the increasing availability of information and advanced tools in GIS has led to a number of studies that concerned with the developing measures of access to health care access (Black, Ebener, Aguilar, Vidaurre, & Morjani, 2004; Kohli et al., 1995; Luo & Wang, 2003). In addition, availability of spatially disaggregated data has led to the application of GIS in health care accessibility studies (Higgs, 2005). The healthcare access depends on spatial

factors such as location of health centers, population zones and catchment areas. GIS can be used as a tool to integrate all these factors for effective evaluation of health care access.

In literature, there are numerous methods have been used to assess the spatial accessibility to HCF's. The most widely used techniques are physician to population ratio, closest facility, average distance to HCFs (HCFs) (Luo & Qi, 2009) and the number of facilities or services within a threshold distance & time (Coker et al., 2010; Luo & Wang, 2003; Schuurman, Berube, Crooks, Bérubé, & Crooks, 2010). These methods take into consideration of both population (demand) and physicians (supply). It is very ease to compute and interpret results of these models. However, the major weakness of these models is that there are no considerations on influence of distances within the catchment. The basic assumption in the accessibility models is that people patronize to nearest services or tend to utilize the services within a threshold distance. It is evident from literature that distance and access to the facility are inversely proportional to each other. Thus, effective catchment area of healthcare facility is important for assessing the service utilization.

In the last few decades, different methodologies to defining catchment area have been developed especially in the field of health research (Luo & Whippo, 2012; McGrail, 2012; Zinszer et al., 2014). In literature, different authors have used different catchment sizes to assess the health care access based on the study area (Urban vs Rural), disease type, transportation mode (Public vs private). There is no standard catchment size for evaluating the health care access. The simplest way of defining the boundaries of a catchment area is to use distance for health care facility. The distance from a facility can be measured using different approaches such a linear distance, Euclidian distance, network distance or travel time. Of these, network based travel time is effective in assessing health care access n urban areas (Delamater, Messina, Shortridge, & Grady, 2012; Kobayashi, Otsubo, & Imanaka, 2015).

Catchment size of a facility measured using a buffer tool in GIS. Buffer analysis is a simple proximity measurement tool in GIS; it has been applied to many applications such as environmental, transportation, medical, emergency system and others (Andersen & Landex, 2009; Luo & Whippo, 2012; Parker & Campbell, 1998; Pullar & Springer, 2000). Buffer tool is used to measure the catchment size or service area on the basis of threshold distance or travel time of a health care facility (Jones, Wardlaw, Crouch, & Carolan, 2011; Ni, Wang, Rui, Qian, & Wang, 2015; Zinszer et al., 2014). As per National Urban Health Mission 2015 (NUHM) there should be a one primary healthcare centre within 500metre proximity from slum location and it can serve maximum of 30,000 population. The fixed catchment size can't capture the actual potential accessibility to HCF's. Hence, in our study we consider the multiple catchment sizes such as 500 Metre, 750 Metre and 1000 Metre from health centre. The spatial and temporal assessment of HCFs was computed using network buffer distance.

The proposed methodology is applied in a case study spatial and temporal assessment of HCFs in K west ward, Mumbai. The rest of the paper is organized as follows. Section two describes the study area details. In section three mentioned about the data collection procedure and data preparation. The conceptual framework of the study is mentioned in section four. The analysis is carried out in section five and section six. The results and discussions mentioned in section seven. The conclusions of the study mentioned in the final section.

2 STUDY AREA

The K-West ward of Mumbai, is taken as the study area, which is located at the West region of Mumbai and the Arabian Sea in North, East South, West direction respectively. It is situated at the western bank of Maharashtra on the Arabian Sea. It lies between latitude of 19⁰4'-19⁰9' North longitude of 72⁰47'-72⁰51' East. Andheri West and Oshiwara area of Mumbai comes under this ward. As per census 2011, the total population was 748,688 in 23.39 km² area, which results a population density of 32009 persons per km². There are total 179 small, medium and large HCFs located in the study area; of which two are public or municipal hospitals (one general and one maternity hospital) and remaining are private clinics or hospitals. The study area (K-west ward) is depicted in figure1.

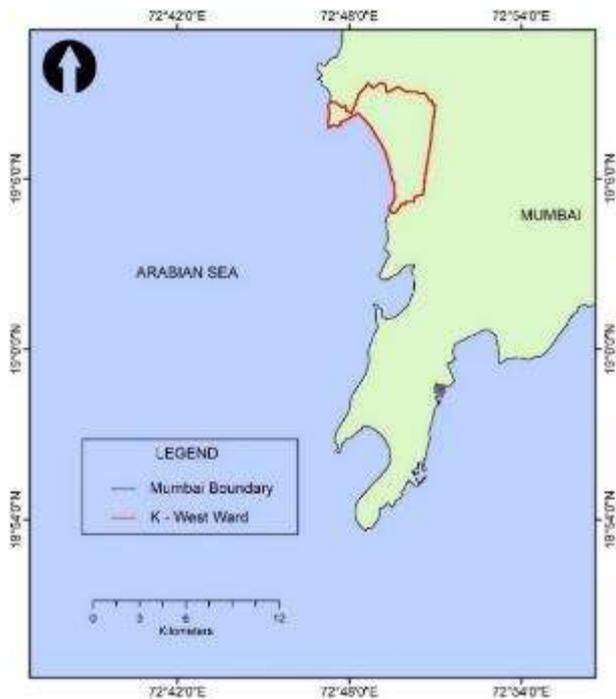


Figure1: Study area (K-west ward, Mumbai)

3 DATA EXTRACTION & PREPARATION

To do analysis in GIS, at first the shape file of K-West ward (Mumbai) was created manually and converted into KML file later on. There are no data sources available publically for the location of private HCF's in Mumbai. The location of public HCF's is available with the public health department of Mumbai. First, we geocoded the public HCFs using the google earth. Then, google earth was used as a tool to find out the location of private HCF's in K west ward. The K ward boundary KML file was projected on the google earth and searched the keyword "hospitals in Mumbai"; then all individual HCF's were extracted one by one as a KML file. While extracting the individual locations, the other information related to healthcare facility such as name, service speciality, category, type, operating timings, and address were also extracted from the web and noted down in a separate csv file.

All the individual KML files were imported into the ARCGIS software and then converted them into single shape file, which consist of location of HCF's. The final shape file was created by merging both the location information shape file and the attribute csv file.

4 CONCEPTUAL FRAMEWORK

The conceptual framework of the study is depicted in Figure2. After the data collection and preparation the final shape file was considered to assess the spatial and temporal analysis. The spatial distribution of HCF's is observed through four ways, i.e. with respect to land use, type of authority, speciality in service and diurnal operational time span (details are given in the section 4). The temporal analysis was carried out using the network work distance buffer analysis (detailed analysis was given in the section 5). Based on the results, discussions and conclusions were provided for the K west ward.

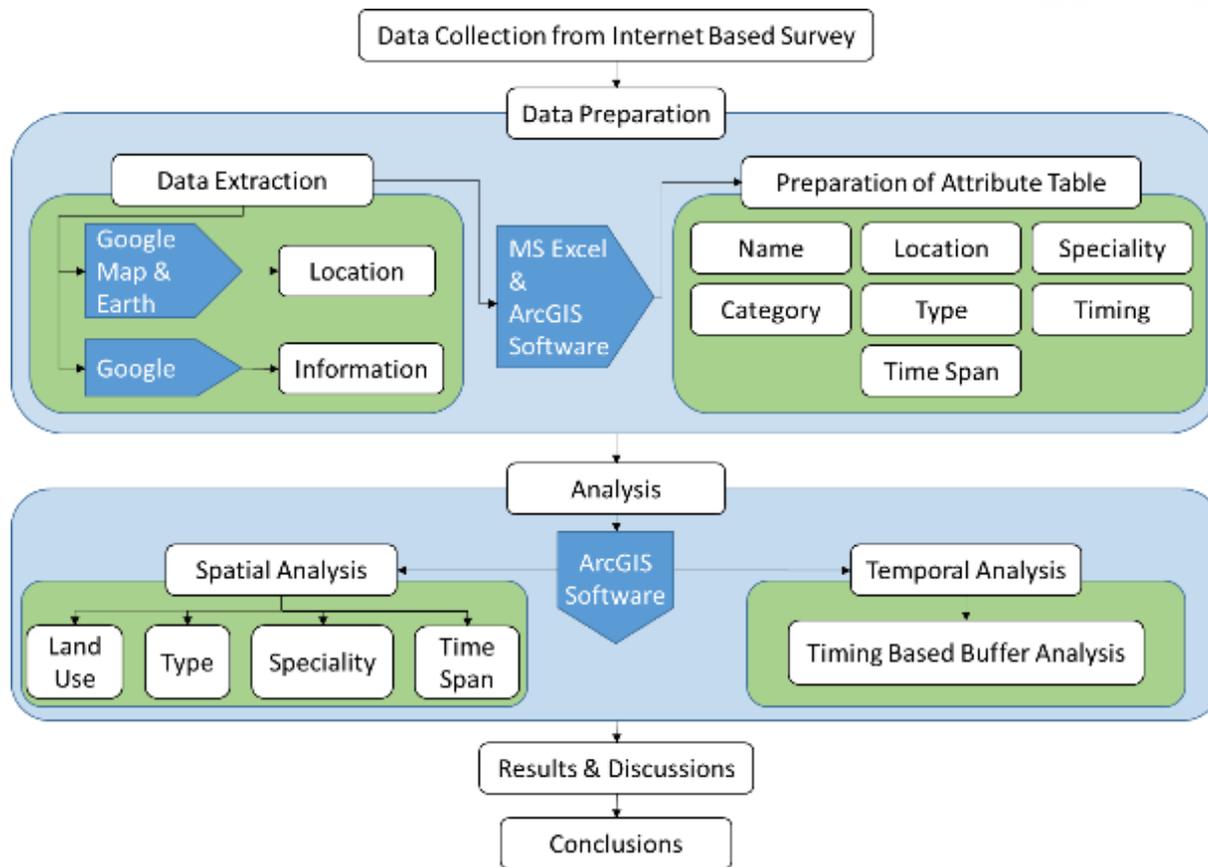


Figure 2: Conceptual framework or methodology of the study

5 SPATIAL DISTRIBUTION OF HCFs

5.1 HCFs with Land Use

To understand the spatial distribution of HCFs over the land use pattern of k-west ward, HCFs location layer was projected on the land use layer in ArcGIS. Figure 3 shows the distribution pattern of HCFs over land use of K west ward. Which indicates that most of the HCFs are located at near to any type of transport network. Further, we can also observed that most of these facilities are located distant from slum locations. It is also noticed from figure 6.3 that all these HCFs unevenly distributed over the K west ward, for example the two government hospitals are located far from most needed slum locations.

5.2 Type of HCFs

The total available HCFs in k west ward primarily classified in to two categories: Public and Private. Further, they are divided based on their ownership and size (poly clinic or multi-speciality hospital), nursing homes, clinics and individual practitioners. The four classified HCFs were projected on land use of K west ward to understand the spatial distribution pattern. From figure 4, we can observed that there are more hospitals and clinics. There are less number of nursing homes located in K west ward and most of them are located in central part of the study area. The southern part of the study area lacks with the nursing homes. Further, we can also notice from figure 4 that there are only two public HCFs and these two are located far from the slum locations.

5.3 Speciality of HCFs

The total available HCFs in K west ward are classified based on their speciality of service like multi-speciality, maternity, general, single speciality such as ear, nose etc., Ayurveda and pharmacy. Figure 5 shows the spatial location of speciality of HCFs in the study area. There are more number of general and multi-speciality hospitals located in K west ward. For example, in maternity care only one public hospital is available and the remaining maternity hospitals works under private sector. In India, Ayurveda is also followed by large number people apart from general allopathic medicine, but less number of Ayurveda facilities are located in K west ward.

5.4 Time Span of HCFs

Spatial access to HCFs is also affected by the operating times of HCFs. The operating timings of HCF's are noted first and then those are added to the three common categorised operating hours (daily basis), i.e. 4-8 hours, 10-16 hours and 24 hours. Figure 6 depict the time span of HCFs in K west ward. Especially, speciality clinics operates in a particular time period of the day either morning or evening hours. Most of the facilities operate in between 4-8 hours and 10-16 hours. The number of 24 hours working HCFs are less in number and majorly located on the northern half of the ward.

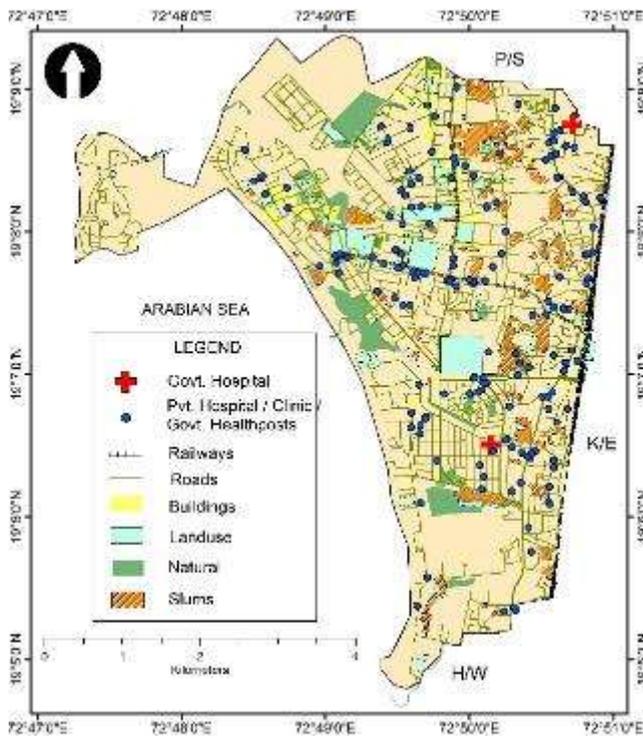


Figure 3: HCFs with land use pattern

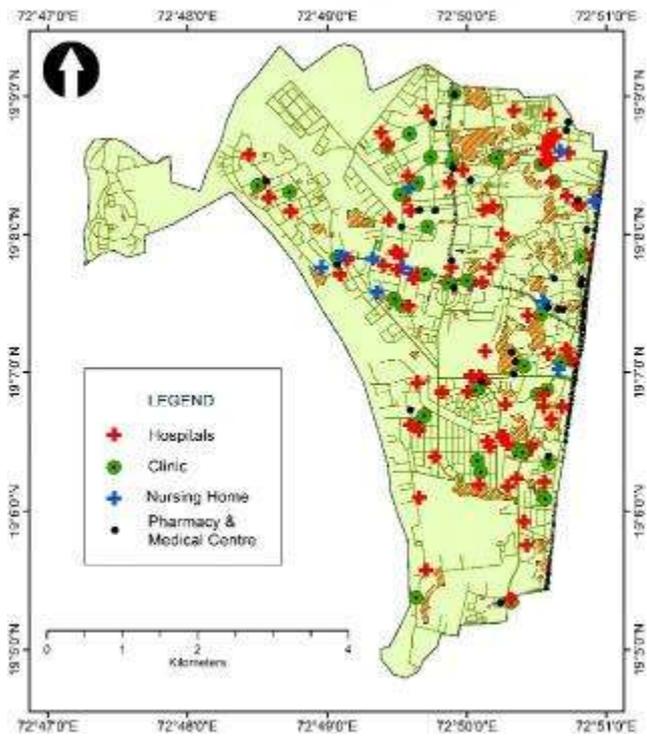


Figure 4: Type or genre of HCFs

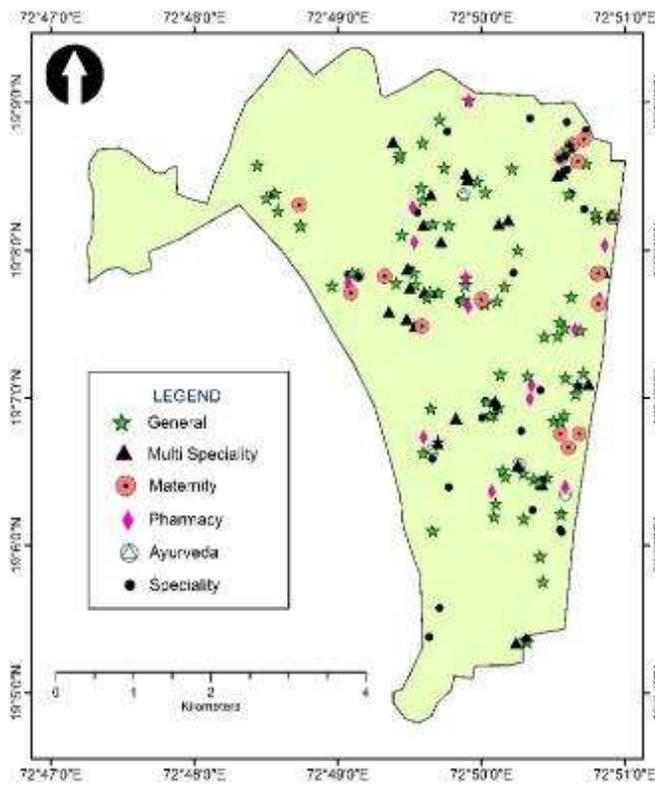


Figure 5: Speciality of HCFs

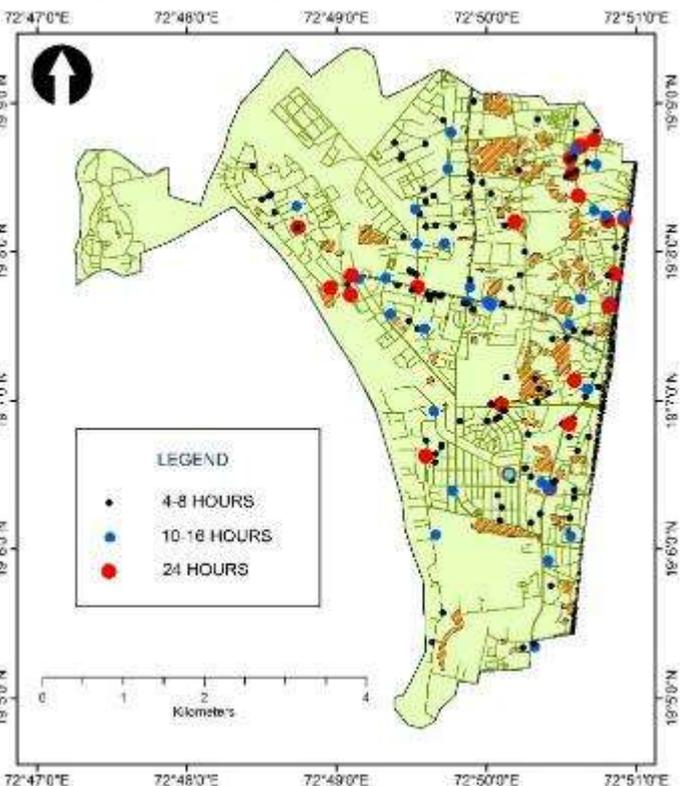


Figure 6: Time span of HCFs

6 TEMPORAL ANALYSIS

The temporal analysis was performed on four time periods of the day i.e. morning, afternoon, evening & night session. The total available HCFs are classified according to their operating timing between 06:00-12:00hrs (Figure 7), 12:00-18:00hrs (Figure 8), 18:00-24:00hrs (Figure 9) and 24:00-06:00hrs (Figure 10) respectively. This method was computed using the catchment area of a healthcare facility. The analysis was carried out separately for each operating time zone and with variable catchment sizes 500, 750 & 1000 meters network distances from the location of HCFs.

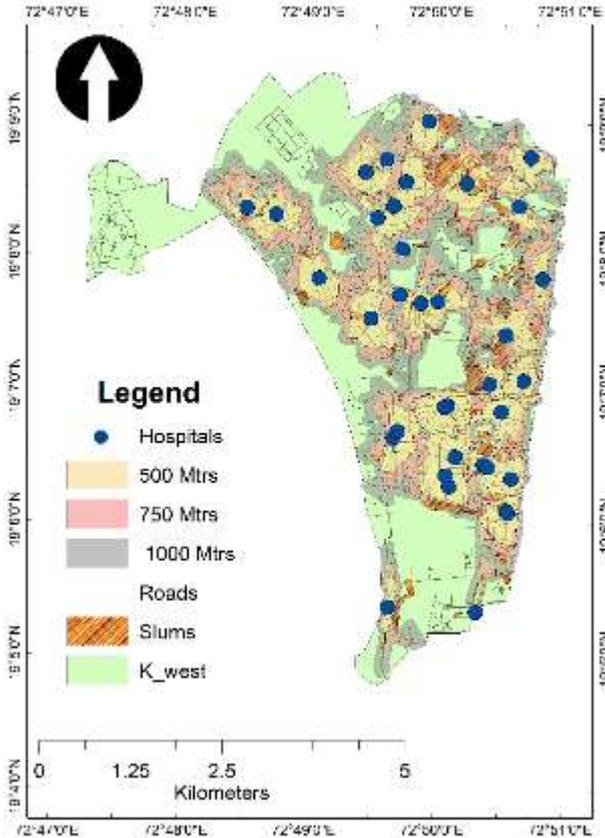


Figure 7: Buffer analysis for morning session

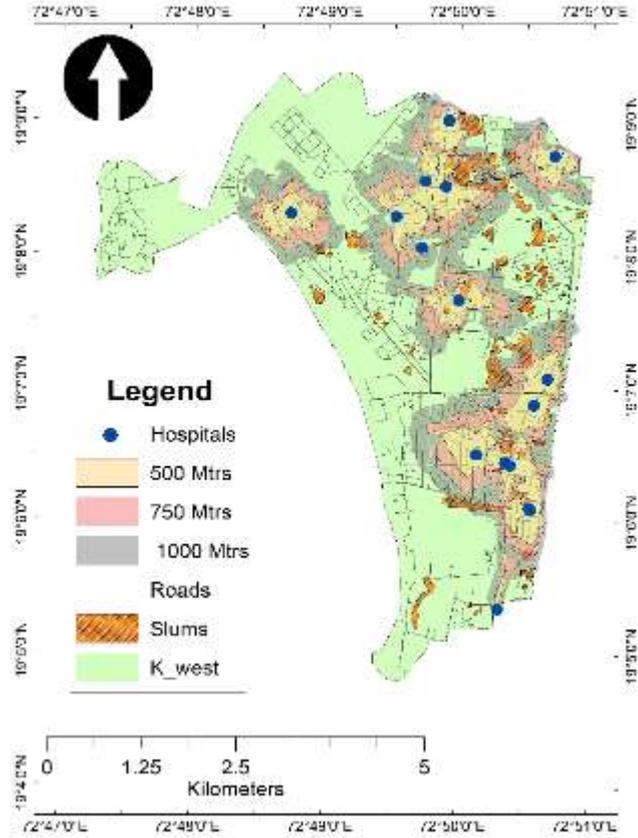


Figure 8: Buffer analysis for afternoon session

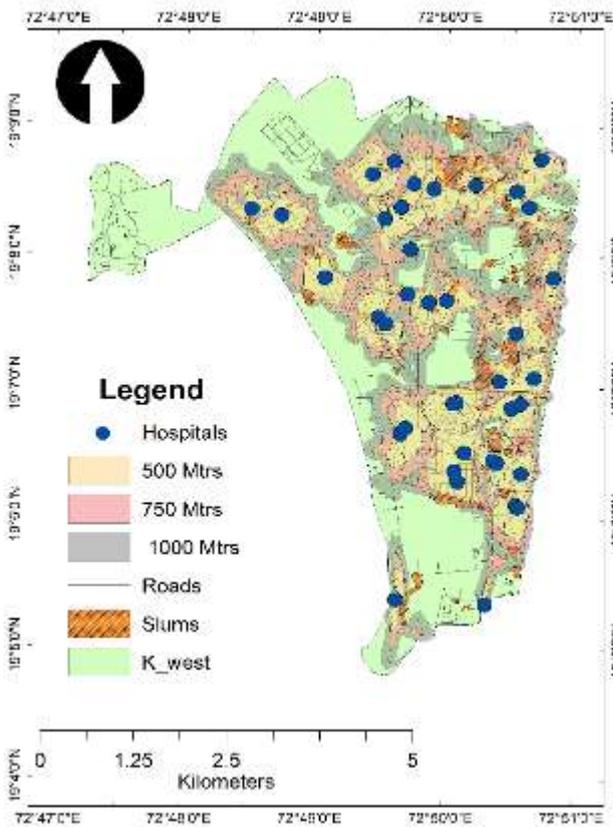


Figure 9: Buffer Analysis for evening hours

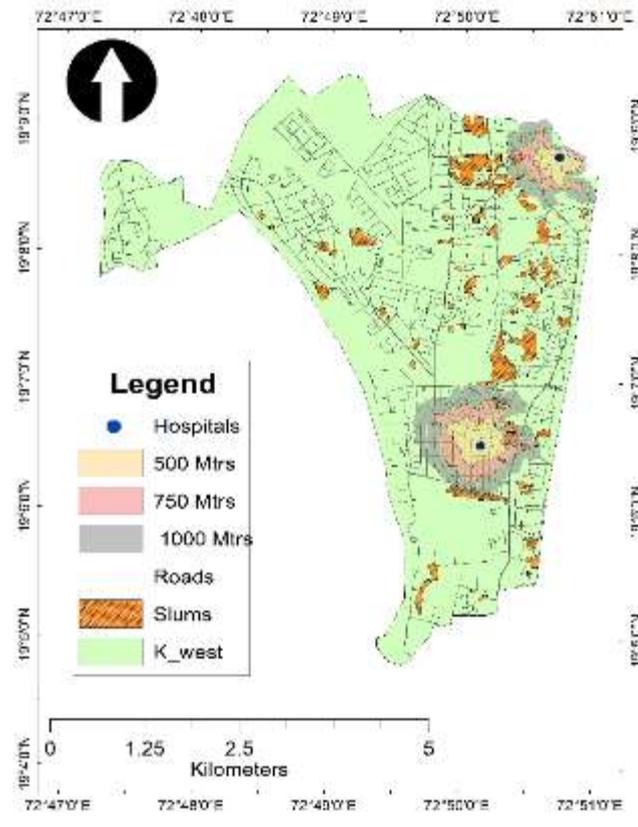


Figure 10: Buffer analysis for night hours

7 RESULTS & DISCUSSIONS

From spatial analysis, we can observed that a total of 179 HCFs are located in k-west ward of Mumbai, of which only two are govt. or municipal hospitals (one general hospital at cooper & one maternity hospital at Oshiwara), and the rest of 177 are private hospitals or clinics or medical centres (illustrated in Figure 3). The wide inequalities in different medical supply can be observed from the figure 4. Though the large number of hospitals located in K-west ward, but most of them are under private. Due to the cost of treatment is high in private hospitals urban poor can't access these facilities. From

figure 5, we can noticed that there are only limited speciality clinics or hospitals available in K-west ward. From figure 6, we can found that 122 HCFs operates for only 4-8 hours, 35 HCFs for 10-16 hours and 22 HCFs operates for 24 hours. This timing or operating hour based analysis was conducted further in deep, to observe the temporal variation of service or operation time of HCFs (Figures 7 to 10).

The spatial analysis showed that most of the HCFs are located near to the road network. So there are many areas which are still uncovered and majority of those portion belongs to the slum areas. The availability of HCFs might be good in a given study area in terms of volume. But, of which only few of the HCFs are affordable to the lower income group (LIG) and Middle Income Group (MIG) people. The access to these facilities further will be decreased if we consider time span of HCFs. For example, 24 hrs access to maternity hospitals is very important because of its emergency. But only one municipal maternity hospital and one general hospital operates 24 hours and remaining hospitals are private. These two hospitals will not be sufficient for all those lower-income people in K-west ward. The clinics, medical centres and pharmacies are well distributed, but multi-speciality hospitals are less in number. From the temporal analysis, we can found that better access to HCFs available during morning and evening hours. The access to HCFs is less during night hours, especially for the lower-income people because during this period only two public hospitals operates. As a result, LIG patient need to travel a long distance to get access to these facilities. There is need of providing sufficient number of public hospitals during the night hours also. Another important point is that most of the LIG people access to primary HCFs during evening hours to avoid the daily wage loss. But the public facilities operates only between 10:00 A.M to 5:00 P.M.

8 CONCLUSIONS

In this paper, we proposed a novel approach to assess the access to health services in urban areas. The developed methodology was applied in K-west ward of Mumbai. The analysis consist of two parts: spatial and temporal. The spatial analysis demonstrated the spatial distribution of HCFs with respect to land use, time span, ownership type and type of speciality. In addition, we also identified the areas which are medically underserved areas based on the above mentioned factors. For example, most of the lower-income neighbourhoods face lack of affordable HCFs especially public HCFs. The spatial analysis shows that of 179 HCFs, only few remains open for 24 hours, of which only two are govt. or municipal (or considered as affordable). It clearly shows that there is lack of HCFs especially during night time. The temporal analysis was performed based on operating time period i.e morning, afternoon, evening and night hours. This analysis revealed that there is variation in access to HCFs temporally. This analysis would help planners, medical practitioners and policy makers to make the necessary actions to improve the overall access to HCFs both spatially and temporally. Further, this analysis can be helpful in where to open new HF, how much should be its capacity, or what will be its operating time window. This similar type of analysis also can be conducted in case of other areas or locations where inadequate data is available. Despite the study has some advantages, it has limitations too. The main limitation of the study is we considered only private HCFs which were extracted from google earth. The other limitation is that instead of network distance or travel distance we can use the travel time for effective planning approach.

REFERENCES

- Andersen, J. L. E., & Landex, A. (2009). GIS-based Approaches to Catchment Area Analyses of Mass Transit. *ESRI International User Conference*, 1–13.
- Bauer, J., & Groneberg, D. A. (2016). Measuring spatial accessibility of health care providers-introduction of a variable distance decay function within the floating catchment area (FCA) method. *PLoS ONE*, 11(7). <http://doi.org/10.1371/journal.pone.0159148>
- Black, M., Ebener, S., Aguilar, P. N., Vidaurre, M., & Morjani, Z. El. (2004). Using GIS to Measure Physical Accessibility to Health Care. *World Health Organization*, 3–4(November 2016), 1–22.
- Boutayeb, A., & Boutayeb, S. (2005). The burden of non communicable diseases in developing countries. *International Journal for Equity in Health*, 4. <http://doi.org/10.1186/1475-9276-4-2>
- Coker, T. R., Sareen, H. G., Chung, P. J., Kennedy, D. P., Weidmer, B. A., & Schuster, M. A. (2010). Improving access to and utilization of adolescent preventive health care: The perspectives of adolescents and parents. *Journal of Adolescent Health*, 47, 133–142. <http://doi.org/10.1016/j.jadohealth.2010.01.005>
- Delamater, P. L., Messina, J. P., Shortridge, A. M., & Grady, S. C. (2012). Measuring geographic access to health care: raster and network-based methods. *International Journal of Health Geographics*, 11. <http://doi.org/10.1186/1476-072X-11-15>
- Goddard, M., & Smith, P. (2001). Equity of access to health care services : Theory and evidence from the UK. *Social Science & Medicine*, 53(9), 1149–1162. [http://doi.org/10.1016/S0277-9536\(00\)00415-9](http://doi.org/10.1016/S0277-9536(00)00415-9)
- Government of India. (2011). *Census of India 2011. State of Literacy*. Retrieved from http://www.censusindia.gov.in/2011-prov-results/data_files/india/Final_PPT_2011_chapter6.pdf
- Higgs, G. (2005). A Literature Review of the Use of GIS-Based Measures of Access to Health Care Services. *Health Services & Outcomes Research Methodology*, 5, 119–139. <http://doi.org/10.1007/s10742-005-4304-7>
- Jones, S., Wardlaw, J., Crouch, S., & Carolan, M. (2011). Modelling catchment areas for secondary care providers: a case study. *Health Care Management Science*, 14(3), 253–61. <http://doi.org/10.1007/s10729-011-9154-y>
- Kobayashi, D., Otsubo, T., & Imanaka, Y. (2015). The effect of centralization of health care services on travel time and its equality. *Health Policy*, 119(3), 298–306. <http://doi.org/10.1016/j.healthpol.2014.11.008>
- Kohli, S., Sahlén, K., Sivertun, Å., Löfman, O., Trell, E., & Wigertz, O. (1995). Distance from the Primary Health Center: A GIS method to study geographical access to health care. *Journal of Medical Systems*, 19(6), 425–436. <http://doi.org/10.1007/BF02260846>
- Luo, W., & Qi, Y. (2009). An enhanced two-step floating catchment area (E2SFCA) method for measuring spatial accessibility to primary care physicians. *Health and Place*, 15(4), 1100–1107. <http://doi.org/10.1016/j.healthplace.2009.06.002>
- Luo, W., & Wang, F. (2003). Measures of spatial accessibility to health care in a GIS environment: Synthesis and a case study in the Chicago region. *Environment and Planning B: Planning and Design*, 30(6), 865–884. <http://doi.org/10.1068/b29120>

- Luo, W., & Whippo, T. (2012). Variable catchment sizes for the two-step floating catchment area (2SFCA) method. *Health and Place*, 18(4), 789–795. <http://doi.org/10.1016/j.healthplace.2012.04.002>
- McGrail, M. R. (2012). Spatial accessibility of primary health care utilising the two step floating catchment area method: an assessment of recent improvements. *International Journal of Health Geographics*, 11(1), 50. <http://doi.org/10.1186/1476-072X-11-50>
- Ministry of Health and Family welfare. (2015). *National Health Policy 2015 draft*. India. Retrieved from <http://www.mohfw.nic.in/showfile.php?lid=3014>
- Ni, J., Wang, J., Rui, Y., Qian, T., & Wang, J. (2015). An enhanced variable two-step floating catchment area method for measuring spatial accessibility to residential care facilities in Nanjing. *International Journal of Environmental Research and Public Health*, 12(11), 14490–14504. <http://doi.org/10.3390/ijerph121114490>
- Parker, E. B., & Campbell, J. L. (1998). Measuring access to primary medical care: some examples of the use of geographical information systems. *Health & Place*, 4(2), 183–193. [http://doi.org/http://dx.doi.org/10.1016/S1353-8292\(98\)00010-0](http://doi.org/http://dx.doi.org/10.1016/S1353-8292(98)00010-0)
- Penchansky, R., & Thomas, J. W. (1981). The concept of access: definition and relationship to consumer satisfaction. *Medical Care*. <http://doi.org/10.2307/3764310>
- Pullar, D., & Springer, D. (2000). Towards integrating GIS and catchment models. *Environmental Modelling and Software*, 15(5), 451–459. [http://doi.org/10.1016/S1364-8152\(00\)00023-2](http://doi.org/10.1016/S1364-8152(00)00023-2)
- Rao. (2012). The private health sector in India: A framework for improving the quality of care. *ASCI Journal of Management*, 41(2), 14–39.
- Schuurman, N., Berube, M., Crooks, V. a., Bérubé, M., & Crooks, V. a. (2010). Measuring potential spatial access to primary health care physicians using a modified gravity model. *The Canadian Geographer/Le Geographe Canadien*, 54(1), 29–45. <http://doi.org/10.1111/j.1541-0064.2009.00301.x>
- UN-Habitat. (n.d.). *slum almanac*. Nairobi.
- Upadhyay, R. P. (2012). An Overview of the Burden of Non-Communicable Diseases in India. *Iranian Journal of Public Health*, 41(3), 1–8. Retrieved from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3481705/%5Cnhttp://www.ncbi.nlm.nih.gov/pmc/articles/PMC3481705/pdf/ijph-41-1.pdf>
- Zinszer, K., Charland, K., Kigozi, R., Dorsey, G., Kanya, M. R., & Buckeridge, D. L. (2014). Determining health-care facility catchment areas in Uganda using data on malaria-related visits. *Bulletin of the World Health Organization*, 92(3), 178–186. <http://doi.org/10.2471/BLT.13.125260>

1784 GOVERNMENT OF INDIA'S ROLE AND RESPONSIBILITY IN CSR IMPLEMENTATION

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ABSTRACT

CSR has become a priority issue on governments' agenda (Alberda, et al., 2007) and a partner (Marks 2013). It spans the entire spectrum of relationships between firms, states, civil society and markets (Dicken, 2007). CSR drivers are categorized as Business, Social and Government by Moon. Government drivers are seen as substitutes for government effort, complementarity issues government policies and fear of punishment for the irresponsibility of business and governance failures (Moon, 2004). Relationship between firms and society is symbiotic (Deegan et al., 2014) and so is the relationship between firms and government. Bell D V J (2002) identified five potential key roles of Governments in promoting corporate sustainability nationally and internationally: Vision/goal setter, Leader by example, Facilitator, Green Fiscal Authority and Innovator/Catalyst. In a globalized era, state remains a significant force in shaping the world economy and continues to play a fundamental role in the economic development of all countries; intervening in various degrees in the operation of the market (Dicken, 2007). India is not an advanced welfare state and there are many issues plaguing the nation. As quoted by Rossow (2015), India's development needs are immense and are host to some of the world's most striking social problems, often at massive scale though it is on a clear path of economic growth. India has changed its gear from voluntary to mandatory disclosures regarding Corporate Social Responsibility (CSR) reporting and spending. This paper outlines metamorphosis of CSR in India and role of Government. The purpose of this study is to find the extent of reporting done by selected companies operating in India. Understanding of companies in publishing their Business Responsibility Reports is studied. Top hundred companies in terms of market capitalization as on 1st April 2012 are considered as they are expected to publish the Business Responsibility Reports (BRR). Of these companies, it is noted that fifteen companies have not been given a score of zero: as reports are not in prescribed format, financial year followed is not 1st April to 31st March, incomplete reports and due to mergers and acquisitions. The BRRs of the selected companies of year 2015-16 is considered. The data of these reports is coded and analysed using multi-level content analysis for achieving purpose of this study.

Keywords: Government, Corporate Social Responsibility, Legislation, Business Responsibility Reporting

INTRODUCTION

In a globalized era, state remains a significant force in shaping the world economy and continues to play a fundamental role in the economic development of all countries; intervening in various degrees in the operation of the market (Dicken, 2007). Corporate Social Responsibility (CSR) aims to achieve sustainable economic, environment and social development. CSR enables business entities to contribute to the agenda of sustainability. CSR is understood as a part of a wider system of national societal governance incorporating government institutions, business organizations and non-governmental organizations (Moon, 2004).

CSR spans the entire spectrum of relationships between firms, states, civil society and markets (Dicken, 2007). Relationship between firms and society is symbiotic (Deegan et al., 2014) and so is the relationship between firms and government. In the last quarter of the 20th century UK Government realised the governance deficit and started encouraging CSR irrespective of political hue (Conservative as well as Labor). Business was encouraged to participate in formulation and enactment, or 'steering' and 'rowing', of community action (with non-profit organizations) and of public policy (with governmental organizations) (Moon, 2004). While Bell (2002) opines that Government's role is to steer society towards articulation of goals in public policy; business that propels a healthy economy, is best equipped to generate wealth by providing products and services. As increasing environmental and social standards in traditional public policy concerns, the spillover of CSR from business into government should not be a great surprise (Midttun et al., 2015).

CSR drivers are categorized as Business, Social and Government by Moon (2004). *Business drivers* include employee recruitment, motivation and retention; learning and innovation, reputation management; risk profile and risk management; competitiveness and market positioning; operational efficiency, investor relations and access to capital and license to operate (Deegan, 2014). Imperatives acting on companies from investors, suppliers, partners and customers as well as imperatives identified by corporations such as reputation, marketing, branding, employee relations and knowledge are mused as business drivers for enhanced CSR (Moon, 2004). *Social drivers* include demands from consumers, particular publics, organizations claiming to act on behalf of society and employees; *Government drivers* include - it can substitute for government effort, complement government effort and legitimize government policies and the fear that it will be punished for the irresponsibility of business and more widely for governance failures (Moon, 2004).

This study aims to study role of government in promoting CSR in general and particularly in India by focusing on Institutions and Ministries involved in formulating guidelines, trends in regulations, expansion of applicability, principles emphasized.

GOVERNMENT AND CSR

CSR has become a priority issue on governments' agenda (Alberda, et al., 2007) and a partner (Marks 2013). Governments at every level and in all regions of the world are beginning to recognize the importance of addressing the

challenge of sustainability (Bell, 2002). In addition to national governments, supra and intergovernmental organizations discuss CSR as well (Dentchev et al. 2015). Bell also stresses that government has an opportunity and a responsibility to take on a leadership role by creating a more suitable 'habitat' in which sustainable business can thrive. Government has an important role to promote the business case for CSR and to provide leadership by helping to achieve consensus on overall vision and priorities for action, whilst recognizing the very diverse interests of the companies involved. Governments are reviewing regulatory frameworks to integrate Corporate Social Responsibility into routine corporate disclosure regimes (Waheed, 2005) taking into account the diversity characterizing different national systems (Waagstein, 2011).

REVIEW OF LITERATURE

We will not arrive at more sustainable environmental performance (Deegan, 2014) and social performance unless there is a regulatory framework that guides the market. Deegan (2014) found that Social and Environmental organizations in Australia favor government's intervention in CSR. Governments often encourage CSR in order to manage an array of governance issues and in addressing public policy problems; in 1980s UK government focused to solve unemployment problem through CSR, in 1990s other countries followed the suit - Denmark : Unemployment and Social Inclusion, Australia : Social Problems, South Africa : Governance implications from Apartheid to Democracy and Sweden : Commitment to uphold relevant International standards.

Literature review reveals that focus area of research in the field of CSR and Government (including its agencies) has gained importance in the beginning of 21st century. Albareda et al., (2002) study focused on CSR public policies in EU-15, and proposed four ideal models viz. Partnership, Business in the Community, Sustainability & Citizenship and Agora. They contributed an analytical framework to analyze CSR public policies that provides relationships between governments, businesses and civil society stakeholders. Fox et al., (2002) analysed role of public sector agencies in providing an "enabling environment" for CSR and classifies public sector engagement along two axes namely roles and activities.

Bell D V J (2002) identified five potential key roles of Governments in promoting corporate sustainability nationally and internationally: Vision/goal setter, Leader by example, Facilitator, Green Fiscal Authority and Innovator/Catalyst. And has presented five policy levers that could be used by governments: Rebalancing the Roles of Government and Public Enterprise, Direct Regulation, Market Instruments and Economic/Fiscal Measures, Voluntary/Non Voluntary Initiatives and Education/Persuasion/information for Decision Making. Dentchev et al (2015) in their study on role of governments in CSR, approaches of CSR-Voluntarism vs. Regulation and limitations of public policy in CSR outlined how governments can support CSR, how CSR activities can support policy development; what will happen when business take over through their CSR activities what previously was considered as government roles and limitations of public policy in support of CSR. They present arguments that favor a contingency approach on the principle of voluntarism and secondly how governments are part of the CSR debate.

Much of the literature in the field of Government and CSR, focuses on individual nation state while Fox et al., (2002) focused on initiatives at national levels and came up with a two dimensional framework. They classified public sector engagement on dimensions of roles and activities that created an enabling environment for companies to carry on CSR; and found examples from developing countries that fit in this matrix. Roles considered include mandating, facilitating, partnering and endorsing while ten activities include: Setting and ensuring compliance with minimum standards, Public policy role of business, Corporate governance, Responsible investment, Philanthropy and community development, Stakeholder engagement and representation, Pro-CSR production and consumption, Pro-CSR certification, Pro-CSR reporting and transparency and Multilateral processes, guidelines and conventions.

Governments are complex and multileveled entities that have different responsibilities and powers depending on the level at which they operate and the geographical area with which they are concerned (Dentchev et al, 2015). As CSR is highly contextual not only in terms of its corporate environment but also in terms of its national environment (Moon, 2004), our focus is to analyse role of government in India in metamorphosis of CSR.

CASE OF INDIA

India is not an advanced welfare state and there are many issues plaguing the nation. As quoted by Rossow (2015), India's development needs are immense and are host to some of the world's most striking social problems, often at massive scale though it is on a clear path of economic growth. Over the past two decades, the issue for companies seems to be no longer about whether or not to engage in CSR, but rather on how to conduct CSR in a strategically and effectively planned manner with a clear and demonstrable narrative of its impact on company and Community (Wang, et. al., 2016).

Prior Acts in India since independence related to CSR:

Acts in independent India are galore in general and particularly in the broad field of environment and social, typically applicable to all companies. From late 1940s to mid70s, focus was on employees Acts include: Minimum Wages (1948), Employee Provident Fund (1952), Maternity Benefits (1961), Payment of Bonus (1965), Contract Labour (1970), Payment of Gratuity (1972) and Equal Remuneration (1976). Focus on natural resources and environment commenced with Wildlife Protection Act (1972) and followed by Water (1974, 77), amendment to Forest Act of 1927 in 1980, Air (1981), Environment Protection (1986), National Environment Tribunal (1995), National environmental Appellate Authority (1997), Biological Diversity (2002), Coastal Aquaculture Authority (2005). While there have been few Acts

that focused on social aspect - Essential Commodities (1955) and after half a century came the Right to Information Act in 2005.

With these acts in place and as companies have been carrying on CSR activities sometimes innovatively (for eg. ITC) and at other times experimenting - CSR is relatively mature in India. Government of India had a choice whether to regulate CSR or not, each of the option is constrained. As noted by Deegan (2014), in the presence of 'free-riders' market mechanisms fail to operate efficiently (see Cooper and Keim 1983), thereby necessitating the requirement for regulatory intervention. Total Environment Centre opines that regulation often creates a minimum standard, but rarely inhibits competition and innovations for those businesses willing and able to do better (see Deegan, 2014). Embedded in specific contexts, structures and places – and constrained by the knowledge and resources (Dicken, 2007); it has opted to regulate it in a *phased manner*.

Metamorphosis of CSR:

The series of Acts indicate that there has been an established approach to CSR. As recognized by Fox et al., (2002), many Acts and initiatives of Government of India, have not been expressly been promoted or recognized as part of the “enabling framework of CSR”. Development of CSR in India since 2009 indicates current enthusiasm of the Government. With an aim for wholesome & inclusive process of economic growth and for sustainable value creation, guidelines developed include inputs from diverse stakeholders. Guidelines formulated built on existing/prior initiatives and capacities of companies. Guidelines however voluntary in nature, in order to be responsible companies should adopt all principles in entirety or totality. In India, CSR metamorphosed with a succession of guidelines and regulations since 2009. Figure 1 depicts string of guidelines and regulations during 2009 and 2014. The metamorphosis can be perceived in three phases. The first outlines trend prior to transition, second presents quick transition from voluntary to mandatory (only for a class of companies) in a systematic and more encompassing nature. Third section presents in detail, mandatory Business Responsibility Framework for top hundred companies (in terms of market capitalization) which is extended to top 500 companies from 2016-17 and provides a detailed analysis of the Section 135 (CSR) of the Companies Act, 2013.

Prior to transition phase (before 2009): During this period there has been no particular guideline but companies have been carrying out activities related to environmental and social though sometimes under the name of CSR while most of the time not. Companies' response to environmental and social problems ranged a spectrum, while some were leading by investing in innovation, research and development and adopting to the new socio-economic-environment while others waited for the Government to push them. Crane et. al., (2014) notes corporations are actively entering social spaces that hitherto were the prerogative of (democratic) governments. Most of the companies practices of business responsibility varied in terms of amount spent and activities undertaken.

Transition phase (2009 to 2013):

Government has played an active role in encouraging corporations to voluntarily assume greater responsibility for the social and environmental impacts of their business policies and later on made mandatory to some select companies. Throughout this, period based on what companies have been doing prior to 2009, happenings in this field in different countries and intergovernmental bodies and organizations guidelines are formed and acts enacted. Government has aimed to steer the business community in a holistic approach in the field of CSR by providing a broad framework about procedure to be adopted, focus areas, what to report and frequency of reporting and where to report, personnel responsible for policy making, areas to be focused on and the like.

During this period following guidelines have been issued:

- i. Corporate Social Responsibility Voluntary Guidelines released by Ministry of Corporate Affairs in December, 2009. With a fundamental principle of formulating a CSR policy with an aim to guide in strategic planning and providing a roadmap for CSR initiatives. Core elements of this guideline included: Stakeholders, Ethical Functioning, Respect for Workers' rights and welfare, respect for human rights, respect for environment, along with activities for social and inclusive development.
- ii. National Voluntary Guidelines on Social, Environmental and Economic Responsibilities of Businesses published in July, 2011 by Ministry of Corporate Affairs is more encompassing; with nine principles with relevant core elements.
- iii. BRR Framework (2012): Vide a circular issued in August, 2012; Securities Exchange Board of India (SEBI), India's financial market regulator has made compulsory for top hundred listed companies (in terms of market capitalization) as on 31 March, 2012; listed on Bombay Stock Exchange and/or National Stock Exchange to include Business Responsibility Report in the annual reports of the company from 2012 onwards.

2013 and Beyond: Unlike many countries like Australia (Deegan, 2014), India has legislated CSR through Section 135 of Companies Action, 2013. In contrast to many governments that have chosen to draw businesses further into governance issues without actually mandating behaviour (Moon and Vogel, 2009), Government of India has mandated a class of companies, but without specifying any penalties for non-compliance of the same. Section 135 of Indian Companies Act, 2013 is not a strong regulation to control corporate conduct rather is more of hand holding and directing companies to focus on how much to spend, what to report, creation of a sub-system in companies for implementation of the policy/ies related to CSR. This Section has many elements both traditional and contemporary, traditional elements include

philanthropic (Moon, 2004) which is included in this Section - it is a must to contribute two percent of net profit by the selected class of companies. Contemporary elements include the following: i. Like *'how business is performed'* (Moon, 2004) thereby influencing core business activity; companies need to design products and services by incorporating social and environmental concerns that result in reduction of use of resources (energy, raw material and water) at different levels of procurement, operations, distribution and consumption. ii. Reporting.

Figure 1: Mandatory and Voluntary Guidelines for Public and Private Companies

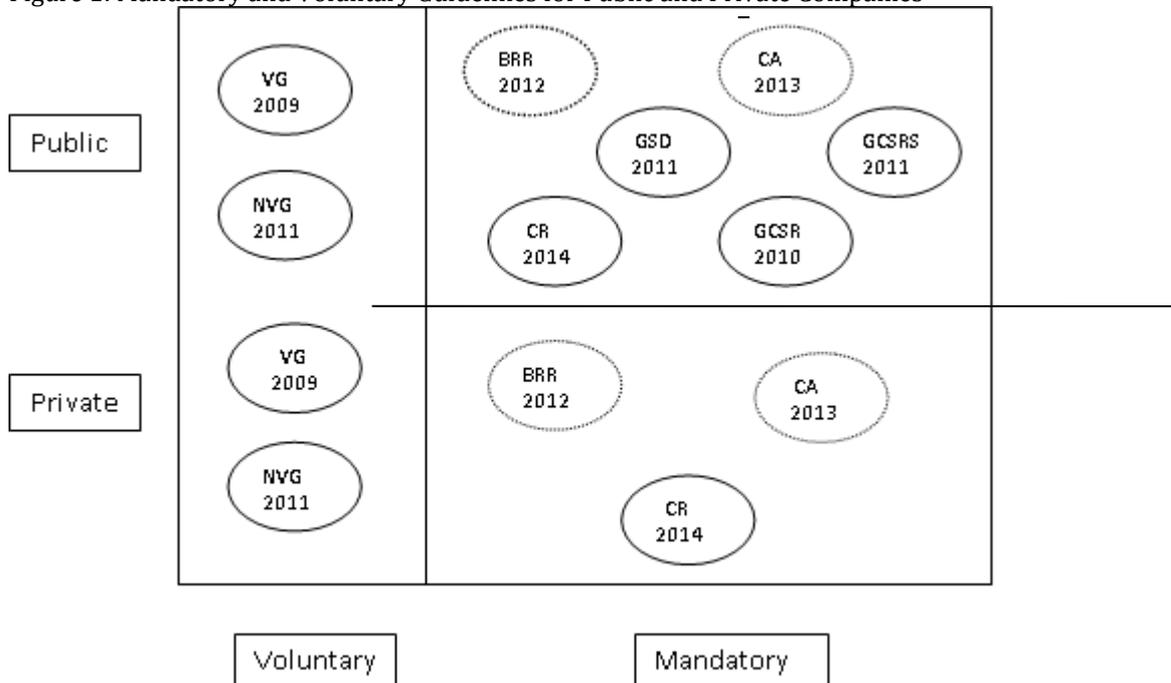


Figure 1 outlines various voluntary and mandatory guidelines to be adopted by Public and/or Private Companies. It is noted that voluntary guidelines remain the same for Public and Private but Mandatory guidelines are greater for Public Sector Enterprises, indicating that Government is keen to take up CSR initiatives and hence more mandatory guidelines. According to Jain et al., (2007) publicly listed companies are more likely to have greater pressure for accountability and thus more need for disclosures (quoted in Kansal, 2016). Prior to 2012 no mandatory guidelines were applicable to Private companies while Public Sector Companies had from 2010 onwards. CSR is deemed to have strategic importance to both public and private sectors of the Indian economy, as is evidenced by the GOI initiating the concept of mandatory corporate contributions towards social initiatives and activities (Kansal et. al., 2016).

RESEARCH METHODOLOGY

To understand how serious the mandatory guidelines are followed by Public and Private sector companies, researchers considered SEBI's 2012 Business Responsibility Reporting (BRR) mandatory. This mandatory reporting has five sections covering broad areas of i. General information about the company – Basic profile, sector in which the companies do business, their key products and services and also foot prints of the companies, whether they are local or global. Section ii. Financial details of the company – like paid up capital, turnover, profits earned and extent of CSR spending and also activities in which it is spent iii. Details related to subsidiary companies and also whether they participate in parent company's CSR initiatives iv. Business Responsibility information concerning Director/s responsible for implementation of BR policies, Company's policies related nine principles and governance related to BR v. Principle-wise performance of the companies' with respect to nine principles.

SAMPLE

The sample is comprised of all the hundred top companies (in terms of market capitalization) as on 31st March 2012 listed on Bombay Stock Exchange, oldest stock exchange in India. These companies have significant market share in more than a score of industries. Majority of the companies, sixty nine percent are private companies while rest are public sector enterprises.

DATA COLLECTION

This study considered Business Responsibility Reports which are part of the annual reports of the selected companies; according to Yuthas et al., (2002) Annual Reports is seen as 'legitimate and trustworthy'. These reports are independently audited and are presumed to have higher level of accessibility, consistency and timeliness on account of regulated financial disclosure requirements (Kansal et. al., 2016). The Business Responsibility Reports (BRRs) generally a part of Annual Report for the year 2015-16 are considered though it is mandatory for selected companies to publish the same from 2012-13 onwards; as by 2015-16, companies could have understood the reporting format.

DATE ANALYSES

Content analysis is used to empirically measure the extent of reporting done by the selected companies in Business Responsibility Reports. As quoted by Kansal et al., (2016) – Content analysis is a popular method of coding social and environment information from annual reports, and it has given empirically valid results in prior accounting research (Guthrie and Parker 1990). BRR format has five sections. Section A covers - a brief profile of the company, sectors engaged in, key products/services, geographical spread and markets covered; Section B covers – financial details, spending on CSR and CSR activities engaged in; Section C covers – details about subsidiary company/companies and their participation in business responsibility initiatives. Section D covers details of business responsibility director and head, governance related to business responsibility and nine principles. Section E covers detailed performance of companies with respect to nine principles. To measure extent of reporting, the BRR has been equated to 232 items, each company's extent of reporting is measured. This research relies on dichotomous scale (0 and 1) to measure the extent of disclosure made by companies. To measure extent of reporting, a score of 1 is given when companies report against each of the 232 items and a score of 0 when the company does not report. It is noted that there are certain items among 232 items that could not be applicable to some companies and hence each of the item has been given any one the following score of 0 or 1 or NA (Not Applicable). The overall score of each company is calculated using the following formula:

$$\text{BRR Score} = \frac{\text{Number of items with a score of 1}}{232 - \text{Number of items with NA}}$$

Section wise extent of disclosures of each of the company is calculated using the following formula:

$$\text{Section Score} = \frac{\text{(Number of items with a score of 1 in the Section)}}{\text{(Number of items in the Section - Number of items with NA in the Section)}}$$

ANALYSES AND DISCUSSION

This section presents extent of Business Responsibility Reporting of top one hundred listed companies (in terms of market capitalization) on Bombay Stock Exchange as on 31st March, 2012. This research aims to answer the following questions: First, what is the extent of business responsibility reporting done by top one hundred companies when it is mandatory? Second, what is the extent of reporting by public and private sector companies? Third, does the industry have impact on extent of reporting? Fourth, is the section wise score same in case of public and private sector companies?

With respect to first question, findings of the study indicate that level of disclosure made by companies is as low as zero in case of fifteen companies this could be due to non-penalisation; companies not complying need to only mention the reason for not doing the same. The extent of reporting done by rest of eighty five companies is presented in Table 1.

Table 1: BRR Scores of top one hundred companies

BRR Score	Frequency	Cumulative Frequency
Less than 10	17	17
10 to less than 20	1	18
20 to less than 30	0	18
30 to less than 40	2	20
40 to less than 50	0	20
50 to less than 60	7	27
60 to less than 70	12	39
70 to less than 80	16	55
80 to less than 90	37	92
90 to less than 100	8	100

From Table 1 it is noted that companies have taken BR reporting seriously as thirty-seven percent have scored between eighty and ninety; and eighty percent have scored more fifty percent. While seventeen percent of them scored below 10 percent, this could be because firms are not penalized for not reporting and an explanation suffices if they do not report.

With respect to second question, majority of the top one hundred companies in terms of market capitalization are private companies. Number of private companies (69) is more than public sector companies (31). The business responsibility reporting scores of public and private sector companies is presented in Table 2. It is noted from the table that private and public sector companies score similar on minimum and maximum values while average score of public sector companies is better than private sector companies. The variation in BRR scores is greater in case of private companies in comparison to public companies.

Table 2: BRR Scores of Private and Public Sector companies

S.No.	Particulars	Private companies	Public Companies	Selected Companies
1	Number of companies	69.00	31.00	100
2	Minimum BRR Score	0.00	0.00	0.00
3	Maximum BRR Score	95.54	94.67	95.54
4	Average BRR Score	61.38	70.03	64.06
5	Stdd. Deviation	32.41	29.15	31.55

With respect to the third question, the selected companies belong to thirty eight industries; companies are grouped in these industries based on BSE’s classification. Top three industries include Banks (12 companies), Electric Utilities (9) Pharmaceuticals (7); while Cement and Cement products and IT consulting and software (5 each) indicating that these six industries make up a majority in the selected companies. The BRR scores industry wise are presented in Table 3. Average scores of twenty three industries are greater than the average score of 64.06.

Table 3: Industry wise BRR Scores of companies

Industry	Min.	Max.	Average	Industry	Min.	Max.	Average
2/3 Wheelers - 2	8.19	56.64	32.41	Furniture Furnishing Paints - 1	68.89	68.89	68.89
Aluminium - 2	13.48	87.50	50.49	Heavy Electrical Equipment - 3	64.29	90.52	81.50
Auto Parts And Equipment - 2	66.52	82.27	74.40	Housing Finance - 2	0.00	77.72	38.86
Bank - 12	0.00	89.42	66.53	Industrial Machinery - 1	37.83	37.83	37.83
Breweries & Distilleries - 1	0.00	0.00	0.00	Integrated Oil & Gas - 1	85.33	85.33	85.33
Broadcasting And Cable Tv - 2	62.33	74.30	68.31	Iron & Steel/Interm. Products - 4	0.00	95.54	55.21
Cars And Utility Vehicles - 2	83.41	87.95	85.68	IT Consulting & Software - 5	0.00	89.45	58.78
Cement And Cement Products - 5	69.87	94.55	78.74	Marine Port And Services - 1	82.57	82.57	82.57
Cigarettes And Tobacco - 1	6.90	6.90	6.90	Mining - 1	87.00	87.00	87.00
Coal - 1	0.00	0.00	0.00	Oil Marketing And Distribution - 3	71.70	87.00	78.01
Comm. Trading And Distribution - 2	65.40	81.82	73.61	Other Apperals And Accessories - 1	0.00	0.00	0.00
Commercial Vehicles - 1	94.67	94.67	94.67	Packaged Foods - 2	91.28	91.82	91.55
Construction And Engineering - 2	64.89	66.82	65.85	Personal Products - 4	56.64	89.59	77.66
Copper - 2	0.00	88.64	44.32	Pharmaceuticals - 7	0.00	86.64	62.81
Defence - 1	87.00	87.00	87.00	Refineries/Petro Products - 2	80.00	83.48	81.74
Realty - 1	72.94	72.94	72.94	Telecom Services - 3	75.22	87.00	82.17
Electric Utilities - 9	0.00	89.04	58.59	Transport Related Service - 1	81.78	81.78	81.78
Exploration And Production - 3	0.00	81.70	27.23	Utilities Non Electric - 1	92.04	92.04	92.04
Finance (Including NBFC) - 3	57.87	89.14	77.23	Zinc - 2	0.00	94.62	47.31

With respect to Section wise score of private and public sector enterprises, the findings are presented in Table 4. As the BR reporting format has five sections, it is noted that BR average scores of public sector companies have scored better than private sector companies except in case of general information. The variation in BR scores measured by standard deviation is less in case of public sector companies in comparison to private sector companies. Based on average score and standard deviation, it is concluded that public sector companies are doing well.

Table 4: Section wise scores of public and private sector companies

Sector ↓	Particulars ↓/Section →	General Info.	Financials	Other details	Bus. Resp. Info.	Principle Info.
Private	Minimum	0.00	0.00	0.00	0.00	0.00
	Maximum	100.00	100.00	100.00	100.00	87.36
	Average	74.23	80.58	65.63	64.10	41.14
	Standard Deviation	34.82	37.73	38.24	35.58	30.55
Public	Minimum	0.00	0.00	0.00	0.00	0.00
	Maximum	100.00	100.00	100.00	100.00	78.13
	Average	73.93	83.87	77.90	70.49	52.50
	Standard Deviation	32.24	33.63	34.30	30.35	25.62

IMPLICATIONS

Government’s initiatives will incentivize companies to institutionalize their socially responsible actions, values, reporting (Moon, 2004), to build capability over time (Deegan, 2014) and environmental initiatives. Regulation often creates a minimum standard (Total Environment Centre) and a uniform approach will be of benefit to shareholders and stakeholders and ultimately to the reputation of company itself (Gippsland Community Legal Centre), as quoted by Deegan (2014)).

Implications to the Government:

Collaborating with companies, Government needs to plan the role of companies in achieving Sustainable Development Goals as the former’s potential capacity is enormous (Fox et. al., 2002). As no single government, or any other organization, can easily create economic, environmental and social value through policy changes or innovative practices if global drivers and reward systems are working in the opposite direction (Bell, 2002), so it has to network with other governments, regional bodies and intergovernmental organizations. As without enforcement, the higher norms of CSR and business ethics might remain underdeveloped (Dentchev, 2015) Government should ensure that companies follow rules of the land (the Section 135 of Companies Act) in word and spirit.

In selecting policy instruments to advance sustainable enterprise, it is important to recognize that businesses vary widely regarding their knowledge of, and commitment to, sustainability. Governments need to be aware of these differences and devise appropriate ways of dealing with businesses that are at different points along the curve (Bell, 2002), for example, the MSMEs and the informal sector need to be encouraged to adopt different means to achieve sustainability. According to Rossow (2015), central policymaking will have uneven application across states, policies at state and local level that can ensure MSMEs to contribute to economic, environment and social issues.

APPENDIX: LIST OF SELECTED TOP 100 COMPANIES IN TERMS OF MARKET CAPITALISATION

1	ABB LTD	51	JAIPRAKASH ASSOCIATES LTD
2	ACC LTD	52	JINDAL STEEL & POWER LTD
3	ADANI ENTERPRISES LTD	53	JSW STEEL LTD
4	ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD	54	KOTAK MAHINDRA BANK LTD
5	ADANI POWER LTD	55	LARSEN & TOUBRO LTD
6	AMBUJA CEMENTS LTD	56	LIC HOUSING FINANCE LTD
7	ASIAN PAINTS (INDIA) LTD	57	LUPIN LTD
8	AXIS BANK LTD	58	MAHINDRA & MAHINDRA LTD
9	BAJAJ AUTO LTD	59	MANGALORE REFINERY & PETROCHEMICALS
10	BANK OF BARODA	60	MARUTI SUZUKI INDIA LTD
11	BANK OF INDIA	61	MMTC LTD
12	BHARAT ELECTRONICS LTD	62	NATIONAL ALUMINIUM CO. LTD
13	BHARAT HEAVY ELECTRICALS LTD	63	NESTLE INDIA LTD
14	BHARAT PETROLEUM CORPN. LTD	64	NEVELI LIGNITE CORPORATION LTD
15	BHARTI AIRTEL LTD	65	NHPC LTD
16	BOSCH LTD	66	NMDC LTD
17	CADILA HEALTHCARE LTD	67	NTPC LTD
18	CAIRN INDIA LTD	68	OIL AND NATURAL GAS CORPORATION LTD
19	CANARA BANK	69	OIL INDIA LTD
20	CASTROL INDIA LTD	70	ORACLE FINANCIAL SERVICES SOFTWARE LTD
21	CIPLA LTD	71	PETRONET LNG LTD
22	COAL INDIA LTD	72	POWER FINANCE CORPORATION LTD
23	COLGATE-PALMOLIVE (INDIA) LTD	73	POWER GRID CORPORATION OF INDIA LTD
24	CONTAINER CORPORATION OF INDIA LTD	74	PUNJAB NATIONAL BANK
25	CUMMINS INDIA LTD	75	RANBAXY LABORATORIES LTD
26	DABUR INDIA LTD	76	RELIANCE COMMUNICATIONS LTD
27	DLF LTD	77	RELIANCE INDUSTRIES LTD
28	DR. REDDY'S LABORATORIES LTD	78	RELIANCE INFRASTRUCTURE LTD
29	EXIDE INDUSTRIES LTD	79	RELIANCE POWER LTD
30	GAIL (INDIA) LTD	80	RURAL ELECTRIFICATION CORPORATION LTD
31	GLAXOSMITHKLINE CONSUMER HEALTHCARE LTD	81	SESA GOA LTD
32	GLAXOSMITHKLINE PHARMACEUTICALS LTD	82	SHREE CEMENTS LTD
33	GMR INFRASTRUCTURE LTD	83	SHRIRAM TRANSPORT FINANCE CO. LTD
34	GODREJ CONSUMER PRODUCTS LTD	84	SIEMENS LTD
35	GRASIM INDUSTRIES LTD	85	STATE BANK OF INDIA
36	HCL TECHNOLOGIES LTD	86	STEEL AUTHORITY OF INDIA LTD
37	HDFC BANK LTD	87	STERLITE INDUSTRIES (INDIA) LTD
38	HERO MOTOCORP LTD	88	SUN PHARMACEUTICAL INDUSTRIES LTD
39	HINDALCO INDUSTRIES LTD	89	SUN TV NETWORK LTD
40	HINDUSTAN COPPER LTD	90	TATA CONSULTANCY SERVICES LTD
41	HINDUSTAN UNILEVER LTD	91	TATA MOTORS LTD
42	HINDUSTAN ZINC LTD	92	TATA POWER CO. LTD
43	HOUSING DEVELOPMENT FINANCE CORP. LTD	93	TATA STEEL LTD
44	ICICI BANK LTD	94	TITAN INDUSTRIES LTD
45	IDEA CELLULAR LTD	95	ULTRATECH CEMENT LTD
46	IDFC LTD	96	UNION BANK OF INDIA
47	INDIAN OIL CORPORATION LTD	97	UNITED BREWERIES LTD
48	INDUSIND BANK LTD	98	WIPRO LTD
49	INFOSYS LTD	99	YES BANK LTD
50	ITC LTD	100	ZEE ENTERTAINMENT ENTERPRISES LTD

REFERENCES

57th Report by Standing Committee on Finance (2011-12) India. Available at [file:///M:/Companies%20Act%202013%20related/Companies_Bill_2011%20SC%20Report%202012%20\(1\).pdf](file:///M:/Companies%20Act%202013%20related/Companies_Bill_2011%20SC%20Report%202012%20(1).pdf) accessed on 25th January, 2016.

Albareda, L., J.M. Lozano, T. Ysa: 2007, Public Policies on Corporate Social Responsibility: The Role of Governments in Europe, Journal of Business Ethics 74: 391-407.

Bell, V. J. D.: 2002. The Role of Government in Advancing Corporate Sustainability, Background Paper. www.g8.utoronto.ca/scholar/2002/bell11062002.pdf Accessed on 7-1-2016.

- Business and Society: Developing corporate social responsibility in the UK. Accessed on 1.1.2016. <http://www.csrquest.net/uploadfiles/L1.pdf>
- Crane A, Palazzo G, Spence J.L and Matten D 2014. Contesting the Value of "Creating Shared Value". California Management Review, Winter, Vol.56, No.2, pp.130-153.
- Deegan C, Marita S: 2014, Corporate Social Responsibilities: Alternative Perspectives About the Need to Legislate. Journal of Business Ethics, 121:499-526.
- Dentchev N.A., M. v. Balen, E Haezenck: 2015, On voluntarism and the role of governments in CSR: towards a contingency approach. Business Ethics: a European Review, Vol 24, No.4, October.
- Dicken Peter, 2007: Global Shift – Mapping the changing contours of the world economy, 5thEd.The Guilford Press.
- Environics International Ltd., The Millennium Poll on Corporate Social Responsibility – Executive Briefing, Environics International Ltd., September 1999. http://www.globescan.com/news_archives/MPExecBrief.pdf Accessed on 8-1-2016
- Fox, T., H. Ward and B. Howard: 2002, Public Sector Roles in Strengthening Corporate Social Responsibility: A Baseline Study (The World Bank, Washington).
- Kansal, M., Joshi, M., Babu, S. et al. Journal of Business Ethics (2016). <https://doi.org/10.1007/s10551-016-3253-0>
- Moon Jeremy: 2002, Government as a Driver of Corporate Social Responsibility. No.20-2004 ICCSR Research Paper Series – ISSN 1479-5124.
- Rossow M Richard: 2015, Corporate Social Responsibility in India – How the Companies Act May Augment Regional Disparities. A Report of the CSIS Wadhvani Chair in U.S.-India Policy Studies.
- Steven Peck and Robert Gibson, 'Pushing the Revolution', in Alternatives Journal, Vol 26, No 1 (Winter 2000), as found in Bell, David VJ, The Role of Government in Advancing Corporate Sustainability. 27 March 2002.

RS11.1. Regional Finance, Investment or Capital Markets

1028 PUBLIC DEBT AND REGIONAL INEQUALITY IN INDIA: AN EXPLORATORY SPATIAL DATA ANALYSIS

ABSTRACT

The Indian economy has shown a high rate of growth of gross domestic product of 7.56 percent during 2015-16 relative to 6.69 percent during 2011-12. In the post-liberalization economic era the size of fiscal debt has been sky rocketing as well. The fiscal debt is defined as the difference between total government expenditure and current revenue which has been escalating to an unsustainable level in recent periods. Maharashtra the most industrialized state in Western India has the largest debt followed by Uttar Pradesh and West Bengal in Central and Eastern India. Also, Tamil Nadu, Karnataka and Andhra Pradesh in the south have witnessed the maximum increase in debt during the past five years. Although Kaur et al. (2014) suggest that debt position of states at the aggregate level is sustainable. Gupta (2001) on the contrary opined unsustainability of debt at the state level. Government borrows debt to finance plan expenditure such as building roads, dams and airports and non-plan expenditure such as paying salaries or making interest payments. While West Bengal, showed a decline in debt to GSDP ratio, Andhra Pradesh showed no increase, and Maharashtra and Tamil Nadu showed a lower than national average ratio. Debt is not bad in itself provided states are growing at a rapid economic rate to service loans. This implies the interest payment to gross state domestic product (GSDP) ratio will be a better indicator of sustainability. Using these criteria it is observed that states from all corners in India i.e. Tamil Nadu, West Bengal, Gujarat and Punjab have been consistently paying huge amounts of servicing costs. Given this brief overview this research examines the temporal and spatial patterns of state debt in India during the period 2002-16. National and state level data are utilized to study the spatial analysis of state debt in India for 30 regions comprising 28 states and 2 territories i.e. National Capital Territory of Delhi and Puducherry. The following three overarching questions are addressed in this paper: (1) What are the trends in state level debt inequality during the period 2002-16 in India? (2) What are the characteristics of spatial temporal growth dynamics in India during various periods at spatial and temporal scales? (3) What mechanism explains the persistence, mobility, polarization and stratification if any in states across different periods? Several spatial analytical methods such as Gini Coefficient, Kernel density, Theil Entropy, Markov chain and spatial Markov chain are utilized to identify and describe trends and mobility patterns of state liability and its geographical dynamics in India. Data for analysis are obtained from Planning Commission and Reserve Bank of India.

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1043 HOW DOES INSURANCE MARKET DEVELOPMENT AFFECT BANKING SECTOR DEVELOPMENT: EVIDENCE FROM GMM ESTIMATES

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ABSTRACT

Using GMM estimation, this paper examines the impact of insurance market development (IMD) on banking sector development (BSD) in presence of the other BSD determinants like economic growth, foreign direct investment, trade openness, inflation rate, government consumption expenditure, gross capital formation, gross domestic saving, urban population growth, population growth, and young dependency population. The paper shows that IMD has a positive impact on BSD and hence, the study confirms that insurance market development plays an important role in achieving banking sector development.

Keywords- IMD, BSD, GMM

1 INTRODUCTION

Both banking sector development and insurance market development play an important role in economic growth (see, Pradhan et al., 2014). However, there is scarcity of research on the linkage between banking sector development and insurance market development. In fact, the relationship between the two has been the focus of academic and policy debate, particularly since global financial crisis of 2007-2008 (see, *inter alia*, Pradhan et al., 2016; Liu and Zhang, 2016; Liu et al., 2014; Lee, 2013; Pan et al., 2012). Theoretically, there exists some interaction between insurance market activities and banking sector activities (see, for instance, Lee, 2013; Haiss and Sumegi, 2008; Webb et al., 2005). The relationship between the two can be either complementary or competitive, depending upon the scenario of economic environment (Tennant et al., 2010; Allen and Santomero, 2001).

For instance, from the view of risk compensation and management, property insurance market can have significant effects on promoting the development of credit market (Liu and Lee, 2014). According to Grace and Rebello (1993), risk protection offered by insurance companies boosts bank borrowing due to falling companies' cost of capital. Similarly, Rule (2001) suggests that insurance market development stimulates the banking activities and their customers against a range of risks, underpinning bank lending by protecting customers against risks that might otherwise leave them unable to repay their debts. Equally, there are few other studies that substantiate the relationship between insurance market development and banking sector development (see, *inter alia*, Webb et al., 2005; Adams et al., 2006). The following cases are in line with complementary between banking sector activities and insurance market activities. In the similar line, we can also justify that there are ways where both banking sector activities and insurance market activities are competitive to each other. However, one of the controversies is that how insurance market development does affect banking sector development. Therefore, the main focus of this paper is to examine the impact of insurance market development on banking sector development.

The paper is arranged as follows. *Section II* describes our model and data. *Section III* describes the results. *Section IV* offers conclusion.

2 MODEL AND DATA

Following Blundell and Bond (1998), the study uses generalized methods of moments (GMM) to investigate the effect of insurance market development (IMD) on banking sector development (BSD). The study uses following econometric model for investigating the link between BSD and IMD.

$$BSD_{it} = \beta_0 + \beta_1 BSD_{it-1} + \beta_2 IMD_{it} + \sum_{j=1}^p \lambda_j X_{jit} + \varepsilon_{it} \quad [1]$$

where, $\varepsilon_{it} = \eta_i + \nu_t + \zeta_{it}$; η_i is country effect; ν_t is time effect and ζ_{it} is independent and identically distributed among countries ($i; i = 1, \dots, N$) and years ($t; t = 1, \dots, T$). BSD_{it} is banking sector development for country i over time t and is used as a proxy for LIQ, DCP, DCF, DCB, BDG, DMA, and PCO; BSD_{it-1} entails the lagged value of banking sector development for country i and time period $t-1$; IMD_{it} is insurance market development for country i and time period t ; Z_{jit} is the other banking sector development determinants included in the model for country i and time period t ; β_1 captures the lag of BSD, β_2 captures the effect of insurance market development on banking sector development; λ_j captures the impact of other BSD determinants, and ε_{it} is the error term. Table 1 highlights a detailed description of variables used in Eq. [1]. We expect that banking sector development has a complementary role in insurance market development.

The study uses a panel dataset covering the selected 19 Eurozone countries²⁷⁵ over the period 1980-2014.²⁷⁶ The countries included in this panel are Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia, and Spain. The data were obtained from World Development Indicators of the World Bank, Washington DC.

TABLE 1.1
Arellano-Bond Dynamic Panel Data Estimates

Dependent variable: BSD							
	LIQ	DCP	DCF	DCB	BDG	DMA	PCO
BSD _{t-1}	0.855*	0.281*	0.270*	0.281*	0.883*	0.893*	0.88*
TID	0.034*	0.236**	0.242*	0.236*	0.023*	0.046*	0.07*
PEG	0.101*	0.273*	0.242*	0.274*	0.069*	0.107*	0.10*
FDI	-0.022***	-0.039	-0.039	-0.038	-0.021*	-0.038*	-0.04*
OPE	0.067*	0.192*	0.032*	0.187*	0.054*	-0.019*	-0.02
INF	-0.045*	-0.006	0.109*	-0.016	-0.067*	-0.054*	-0.06*
GCE	0.076	-0.391***	-0.309	-0.482**	-0.114*	-0.140*	-0.24*
GCF	0.159*	0.346*	0.015*	0.346*	0.146*	0.372*	0.42*
GDS	-0.007	-0.114	0.072	-0.138	-0.019	-0.148	-0.25*
URB	-0.021	0.482***	0.323	0.489***	0.148*	-0.008	-0.07***
PPG	0.027*	-0.498***	-0.314	-0.501***	-0.123*	-0.021	0.01
YDP	0.090*	-0.055	-0.161	-0.048	0.058**	0.002	0.01
Constant	-0.176	0.946	1.451	1.101	0.107	0.254	0.41
χ^2	8326*	477.14*	472.29*	16672*	26937*	27839*	27893*

Note 1: LIQ is liquidity liabilities, DCP is domestic credit to private sector, DCF is domestic credit provided by financial sector, DCB is domestic credit provided by banking sector, BDG is banking deposits, DMA is deposit money bank's assets, PCO is private credit by deposit money banks and other financial institutions, TID is total insurance density, TIP is total insurance penetration, IMA is insurance market activities, PEG is economic growth, DCP is domestic credit to private sector and is used for banking sector development, FDI is foreign direct investment, OPE is trade openness, INF is inflation rate, GCE is government consumption expenditure, GCF is gross capital formation, GDS is gross domestic saving, URB is urbanization, PPG is population growth, and YDP is young dependent population.

Note 2: The reported figures are estimated coefficients, standard errors of estimates, and the t- statistics, respectively.

Note 3: *, ** and *** indicate the statistical significance 1%, 5%, and 10% levels, respectively.

Note 4: Some of the other variables are excluded due to lower sample size.

3 EMPIRICAL RESULTS

The estimated results are reported in Tables 1.1 and 1.2. We have two different descriptions, depending upon the deployment of two insurance market indicators such as life insurance density and life insurance premium. In each case, we have six models, depending upon the deployment of six banking sector development indicators. Table 1.1 is the case of insurance market density, while Table 1.2 represents the case for insurance market penetration.

From the estimated results, the study finds that the impact of insurance market development on banking sector development is positive and statistically significant, as expected, implying that higher level of insurance market development promotes banking sector development. For illustration, a 1% increase in insurance market activities bring about an adequate banking sector development of about 2.3- 24.22%. This finding is almost uniform for all the six models and for two different cases. The impact of economic growth on banking sector development is also statistically significant and positive, as expected, for the sample of these selected European countries and for all the six BSD indicators and two insurance market indicators. This implies that a higher level of economic growth promotes banking sector in the European countries. The lagged banking sector development is also having a significant positive impact on current banking sector is observed that a 1% increase in lagged BSD brings about a promotion of current banking sector development by about 6.9-27.4%.

The impact of other determinants, such as, *foreign direct investment, trade openness, government consumption expenditure, gross capital formation, gross domestic saving, urban population growth, population growth, young dependency population*, are more or less non-uniform and have both positive and negative impact on insurance market development. However, these are not statistically significant in all the situations in models 1-6. Their impact vary from model to model.

275 Note that a few of these countries are transcontinental.

276 Since data is not available for some of these countries over the entire sample period, our panels are unbalanced.

To summarize, the consistency of GMM outputs depends upon the soundness of instruments. This study employed three specification tests in order to validate the steadiness of system GMM estimations.

First, Hansen test is deployed to recognise the over-identifying restrictions that report the p-values for the null hypothesis of validity of instrument set used by the estimator. The null hypothesis of this test is not rejected for any of the three estimations.

Second, Sargan test to confirm independence between the instruments and the error term. The null hypothesis in this case is that the instruments and the error term are independent. Like the first case, the null hypothesis of this test is not rejected for any of the three estimations.

Third, Arellano-Bond test for serial correlations [i.e. the AR (2) test]. The null hypothesis of this test is that the errors in the first-difference regression reveal no second-order serial correlation. As anticipated, the values of the test of second-order correlation present no evidence of model misspecification, indicating the acceptance of the null hypothesis of serial correlation in the first-differenced errors at order 2. The failure to reject the null hypothesis of all tests provides an evidence in support of the fact that the instruments are indeed valid.

In short, the overall performance of these model outputs is robust and consistent in terms of validity of instruments and the coefficients of variables.

To sum up, the effect of insurance market development on banking sector development is positive and significant across the six selected BSD indicators, namely, LIQ, DCP, DCF, DCB, BDG, DMA, and PCO. Additionally, the regression coefficients of other variables are mostly consistent with the standard results in the existing literature. That means the findings are consistent with theoretical arguments and quite robust to different measures of both banking sector activities and insurance market activities including the country and year fixed effects.

TABLE 1.2

Arellano-Bond Dynamic Panel Data Estimates

Dependent variable: <i>BSD</i>							
	LIQ	DCP	DCF	DCB	BDG	DMA	PCO
BSD _{t-1}	0.875*	0.324*	0.336*	0.325*	0.901*	0.919*	0.90*
TIP	0.036*	0.368*	0.271*	0.363*	0.024*	0.063*	0.125*
PEG	0.106*	0.298*	0.256*	0.30*	0.10*	0.11*	0.10*
FDI	-0.023	-0.056	-0.051	-0.054	-0.022**	-0.041	-0.043
OPE	0.079*	0.234*	0.071*	0.225*	0.061*	0.126*	0.005
INF	-0.053*	-0.011	0.079*	-0.023	-0.069*	-0.055	-0.063*
GCE	0.124	-0.189***	-0.061	-0.29**	-0.089*	-0.091*	-0.164*
GCF	0.166*	0.306*	-0.066*	0.302*	0.145*	0.371*	0.422*
GDS	0.017	0.053	0.283***	0.032	-0.007	-0.114*	-0.204*
URB	0.004	0.744*	0.670*	0.753*	0.164*	0.028*	-0.029
PPG	0.011	-0.628*	-0.473***	-0.631*	-0.131*	-0.04*	-0.013
YDP	0.032	-0.558	-0.785*	-0.553	0.012	-0.084*	-0.095*
Constant	-0.099	2.241	2.662	2.408	0.178	0.421	0.701
χ^2	8137*	433.97*	459.74*	428.42*	16280*	25966*	26849*

Note 1: LID is life insurance density, NID is no-life insurance density, TID is total insurance density, LIP is life insurance penetration, NIP is non-life insurance penetration, TIP is total insurance penetration, IMA is insurance market activities, PEG is economic growth, DCP is domestic credit to private sector and is used for banking sector development, FDI is foreign direct investment, OPE is trade openness, INF is inflation rate, GCE is government consumption expenditure, GCF is gross capital formation, GDS is gross domestic saving, URB is urbanization, PPG is population growth, and YDP is young dependent population.

Note 2: The reported figures are estimated coefficients, standard errors of estimates, and the t- statistics, respectively.

Note 3: *, ** and *** indicate the statistical significance 1%, 5%, and 10% levels, respectively.

Note 4: Some of the other variables are excluded due to lower sample size.

4 CONCLUSION

The paper started with a conceptual question, “Does insurance market development affect banking sector development?” Our answer to this question is very much convinced, as it affects the banking sector development positively and is consistent with the earlier findings of [Pradhan et al., 2015; Liu and Lee, 2014; Webb et al., 2005]. This study has examined the effect of insurance market development on banking sector development, a subject that has largely been neglected in the financial development literature. The outcomes of this research can give some clarity in existing debate on the causality nexus between the two.

REFERENCES

- [1] Adams, M., Andersson, J., Andersson L., and Lindmark M. (2006). Commercial Banking, Insurance and Economic Growth in Sweden between 1830 and 1998. *Accounting, Business and Financial History*, 19: 21-38.
- [2] Allen, F. and Santomero, A. (2001) What Do Financial Intermediaries Do?, *Journal of Banking and Finance*, 25: 271-294.
- [3] Arellano, M. and Bond, S. R. (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *Review of Economic Studies*, 58 (2), 277-297.
- [4] Blundell, R. and Bond, S. (1998). Initial Conditions and Moment Restrictions in Dynamic Panel Data Models. *Journal of Economics*, 87 (1), 115-143.
- [5] Grace, M. F. and Rebello, M. J. (1993). Financing and the Demand for Corporate Insurance. *The Geneva Papers on Risk and Insurance*, 18: 147-172.
- [6] Haiss, P. R. and Sumegi, K. (2008) The Relationship between Insurance and Economic Growth in Europe: a Theoretical and Empirical Analysis. *Empirica*, 35: 405-431.
- [7] Lee, C. C. (2013). Insurance and Real Output: The Key Role of Banking Activities. *Macroeconomics Dynamics*, 17 (2): 235-260.
- [8] Lee, C. C., Chang, C. P. and Chen, P. F. (2012). Further Evidence on Property-Casualty Insurance Premiums: Do Multiple Breaks and Country Characteristics Matter? *Japan and the World Economy*, 24 (3): 215-226.
- [9] Liu, G. and Zhang, C. (2016). The Dynamic Linkage between Insurance Activities and Banking Credit: Some New Evidence from Global Countries. *International Review of Economics and Finance*, 44: 40-53.
- [10] Liu, G. C. and Lee, C. C. (2014). Insurance Activities and Banking Credit Causal Nexus: Evidence from China. *Applied Economics Letters*, 21 (9): 626-630.
- [11] Liu, G., He, L., Yue, Y. and Wang, J. (2014). The Linkage between Insurance Activity and Banking Credit: Some Evidence from Dynamics Analysis. *North American Journal of Economics and Finance*, 29 (3): 239-265.
- [12] Pan, G., Chang, H. and Su, C. (2012). Regional Differences in Development of Life Insurance Markets in China. *Emerging Markets Review*, 13 (4): 548-558.
- [13] Pradhan, R. P., Arvin, M. B. and Norman, N. R. (2015). Insurance Development and the Finance- Growth Nexus: Evidence from 34 OECD Countries. *Journal of Multinational Financial Management*, 31: 1-22.
- [14] Pradhan, R. P., Arvin, M. B., Bahmani, S., Bennett, S. E. and Hall, J. H. (2016). Insurance-Growth Nexus And Macroeconomic Determinants: Evidence From Middle-Income Countries. *Empirical Economics*, 52 (4): 1337-1366.
- [15] Rule, D. (2001). Risk Transfer between Banks, Insurance Companies and Capital Markets. *Financial Stability Review*, 11: 127-159.
- [16] Tennant, D., Kirton, C. and Abdulkadri, A. (2010) Empirical Exercises in Estimating the Effects of Different Types of Financial Institutions' Functioning on Economic Growth. *Applied Economics*, 42: 3913-3924.
- [17] Webb, I. P., Grace, M. F. and Skipper, H. D. (2005). The Effect of Banking and Insurance on the Growth of Capital and Output. *SBS Revista De Termas Financieros*, 2 (2): 1-32.

**1064 REGIONAL INEQUALITIES, PUBLIC INVESTMENT AND CONVERGENCE
ACROSS MAJOR INDIAN STATES**

ABSTRACT

Recent literature on regional inequalities is thwarted by increasingly complex regional economic changes. It has been observed that both in developed and developing countries, regional inequalities have widened over last couple of decades. Thus, it is imperative to investigate the factors that lead to region-specific economic growth and subsequently the impact of specific regional/spatial public investments towards reducing regional inequalities. The policy construct was based on the proposition that regional inequalities may decline as a result of a public investment, encouraging regional economic convergence. In Indian context there is a growing concern that the rapid economic growth since the initiation of reforms in India have been unequally distributed, as reflected by the increased growth difference and income disparity across various states. Number of studies had observed that growth across various states was not even and income was a critical contributor towards increasing regional inequalities in India. In other words, inequalities had widened and more so during the post reform period. This study intends to look for answers for the following questions: What are the major factors that drive high economic growth in certain states and certain states to lag behind? Are income levels across states converging or diverging after the reform process in India? Whether specific types of public investment (infrastructure or social investment) impacts income across states. Does public investment influence the productivity across states?

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1259 MEASUREMENT POSSIBILITIES OF THE TYPES OF FINANCIAL DISTANCES - THEORIES AND THE EVIDENCES

ABSTRACT

The dual banking system – for example the Central and Eastern European countries’ banking sector – which can be characterized by the foreign banks’ dominance with less and small market weight of domestically owned local small banks, shows less lending propensity towards the SME sector and peripheral and rural areas. Dual banking system strengthens the process of financial exclusion, i.e. the exclusion of certain social groups (social exclusion) or areas (rural peripheries, small settlements, urban districts) from financial services. In these structures, the geographical diffusion of banking structures and instruments increased the operational (geographical) proximity between banks and borrowers, so the financial exclusion can decrease, but the concentration of bank decisional centres widened the functional distance between banks and local communities. Operational distance is a rate, what shows how many people served by a bank branch in a city or region, so this can be used the measurement of the degree of concentration of financial institutions or financial exclusion. However, the functional distance is a complex indicator of differences between the area of examined branches and their headquarters. For this, we can use three groups of data, firstly, the physical distance and the extension of branches, secondly, some economic indicator of relevant areas (distribution of economic activity, GDP, etc.) and thirdly we use some social data for example unemployment rate, social capital, and so on. Therefore, the main goal of this study is the examination of functional distance of the different types of the banks in Hungary. Our geographical focus is a multilevel approach, because we examined the county, regional and county levels of differences between the foreign and domestic commercial banks, and the cooperative savings banks. Our findings show that the financial exclusion is a real problem and the differences of financial distances of the analysed institutions is measurable in Hungary.

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RS11.2. Regional Finance, Investment or Capital Markets

1740 PUBLIC DEBT. A TRAGEDY OF THE COMMONS FOR BORROWERS AND CREDITORS

ABSTRACT

Indebted entities and respective creditors are victims of a typical tragedy of the commons. On one side the credit is granted in excess to states with the price near to the discount rate. On the other hand, when the prospective of default appear, the spread raises to very high values because creditors try to save as much of the debt incurred before the collapse of the borrower. The result is bankrupt or dilapidated borrowers and partially reimbursed creditors. This paper addresses this problem with a simple model that relates, on the one hand, a borrower that evaluates and choses his investments in joint sets of minor investments. On the other hand, a number of creditors have that have free access to possible payments generated by the borrower. The debts models are reviewed and related to with open access models. Then a debt model is transformed into an open access model and used to understand the reality from this perspective. Finally some recommendations are derived based on the assumption that debt markets are open access markets.

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1776 THE ECONOMIC IMPACT ON THE GREATER PEARL RIVER DELTA (GPRD) AREA OF THE HONGKONG-ZHUHAI-MACAO BRIDGE

ABSTRACT

Since the implementation of the Reform and Opening-up policy in mainland China, the Pearl River Delta (PRD) region has naturally enjoyed the first chance of economic development due to its predominantly location to Hong Kong. After decades of complementary cooperation and economic integration started in the 1980s, the regional agglomeration in the entire Pearl River Delta including Macau has witnessed a rapid development under the impetus of Hong Kong's inter-regional industrial transfer and export-oriented trade. However the development of the east and west banks of the Pearl River Estuary has always been in a state of imbalance due to the geographical advantage of the east bank which is connected to Hong Kong while the west bank is across the sea, and this has gradually become an obstacle to the balanced and integrated development of the PRD. With the expectation to promote the rebalancing of the east and west banks of the Pearl River, the construction and opening of the Hong Kong-Zhuhai-Macao Bridge is therefore become a strategic channel for GPRD areas to ease the traffic inconveniences. This paper attempts to capture and decompose the economic integration of the Bridge before and after its completion through building Multi-Regional Input-Output (MRIO) model for GPRD areas which including Hong Kong, Macau, the nine cities in PRD and the rest of China. With the tool of GIS network analysis on the true roads network, we respectively calculate the economic accessibility for each area in the MRIO table before and after the completion of the Bridge. Then based on gravity model, we use Poisson regression to estimate the parameter of the separation between any two areas in the MRIO table to interpret how the difficulty decreases along with the improvement of the economic accessibility. Lastly applying this parameter as the "accessibility adjustor" with holding price elasticity constant, the new MRIO is computable so to reflect the industries linkages after the accessibility improved. The preliminary results firstly show that the new IO multipliers of each region in GPRD get smaller while the total spillovers of each region do increase unanimously, and so do the total multipliers of each region. While the other major finding is a little contrary to the expectation of a large-scale regional economic take-off on the west of the Pearl River Estuary, as the finding shows Macau become the biggest trade import/inflow region with the principle and largest purchase from Hong Kong comparing to other cities locate in the west bank. Moreover, Hong Kong is still the leading economy in terms of its largest export earnings. The results also shows PRD would experience significant export growth to meet the demand from Macau and Hong Kong. Meanwhile, as the economy out of GPRD, the Rest of China is observed a trade surplus only with Macau. This could be interpreted that the general pattern of economic strength in the east bank dominated by Hong Kong will not change even after the connection of the Bridge, but the intensity of economic ties between the east and west of the Pearl

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1783 ECONOMIC DETERMINANTS OF COUNTRY RISK IN SOUTH ASIAN COUNTRIES

Sudhir P R, Debasis Patnaik

ABSTRACT

The industries in the developing world are hugely diversified borrowers of funds. The growth of lending is accompanied by analytical methods to measure risk associated with such lending. These methods provide an indication of debt servicing difficulties associated with the borrowing nation. Meldrum defines country risk as 'risk involved in business transaction which are not present in domestic transactions'. Country risk ranking are an important factor in global asset allocation. Aspects of country are transfer risk and political risk. The indicators analyzed for assessment country risk are economic growth, inflation, foreign exchange reserves to GDP ratio, current account deficit relative to GDP, Exports, Imports, and foreign debt.

Key words: Country risk, Currency risk, South Asian countries, economic growth, Currency risk, Political risk and transfer risk

INTRODUCTION

The country risk rating is beneficial to borrowing countries and to the banks of lender countries and is also a challenging research area for institutions specializing in International finance and economics. Borrowing countries economic and political Indicators assumes greater significance in the decision making process of creditors [1]. The country risk encompasses the uncertainty of achieving expected financial results depending on factors unique to the project located in the target country [2]. Country risk analysis is based on the increasing imbalances in economic, social, or political factors which may increase the risk of negative return on an investment [3]. Meldrum defines country risk as 'additional risk not present in the domestic transactions. These additional risk arise from variety of national differences in economic structure, policies, socio political institutions, geography and currency' [3]. Country risk exists irrespective of the state of economic development even the most developed nation may generate a substantial degree of country risk [4].

In this paper we seek to calculate country risk of some of the south Asian nations and south eastern nations. The indicators used to arrive at the country risk of each country are economic growth, inflation, foreign exchange reserves to GDP ratio, current account deficit relative to GDP, Exports, Imports, and foreign debt. We analyze these factors based on their relevance and arrive at the country risk ranking of the respective countries. The paper consists of five sections. The section 2 provides a brief background to lending to developing countries and the country risk assessment system. Section 3 briefly reviews all relevant segments of the literature on country risk assessment. In section 4 the methodology followed and finally the presentation of results and conclusion in section 5.

BACKGROUND AND BEGININGS

Prior to oil price shock of 1973 the international lending to developing countries was in the form of long term project finance in a bilateral or multilateral arrangements [5]. External borrowing increases the rate of investment resulting into stronger economic growth in respect of the borrowing country. The pace of development depends on the size of capital inflow and the productivity of the capital [6]. The desirability to borrowing to accelerate economic development raised the concern to service this debt. The analysis identified short term and long term indicators. The short term indicators were (1) export growth rate (2) the ratio of debt to exports (3) lastly the ratio of foreign exchange reserves to imports. The long term indicators playing vital role in determining the economic growth which can provide for the servicing of external debt are (1) Growth rate of GDP (2) the ratio of investment to GDP (3) the ratio of exports to GDP, and (4) the rate of price increases [8].

The role of commercial bank lending to developing countries expanded rapidly to meet the increasing demands of developing countries. The sharp rise in commercial bank lending to developing countries led to formalization of procedures for monitoring, evaluation and assessment of risk [7]. In late 1980s the bank lending from OECD banks to East Asian countries tripled reflecting the initiatives by these countries to liberalise their banking sector. The increase in lending was in the shape of short term liabilities involving growth in trade financing and the creation of offshore banking centres [16]. Banks hold sovereign risk for variety of reasons such as diversified asset portfolios, as a collateral for interbank refinancing operations, as a means to generate liquidity or as due to moral suasion of governments [9].

LITERATURE REVIEW

Meldrum categorised country risk into six main categories of risks. They include Economic risk, Transfer risk, Exchange rate risk, location or neighbourhood risk and Political risk. Economic risk signifies change in the economic structure. Economic risk often overlaps with political risk. A growing current account deficit implies a greater need for foreign exchange to cover that gap. Exchange rate risk is an unexpected movement in the exchange rate. The country risk analysis rests on weighted index using the weighing scheme dictated by the relative importance of each risk category [3].

Country risk can be defined as the probability of particular future events with in a state that could have an adverse effect on the functioning of a given organisation, whether that organisation be a business, government agency or a non-governmental agency or other type of body. What is significant risk factor to one agency or business may be an

opportunity for another. This lack of specificity has posed to conceptualize and measure country risk both broadly as well as with respect to a specific organisation [10].

Oral et al, 1992, argued that G-LOGIT that is generalized logit model is a better performer for country risk analysis based on following indicators. The said indicators are reserves to import ratio, net foreign debt to exports ratio, GNP per capita, current account balance to GNP ratio, investment to GNP ratio, export variability, export growth rate, political insatiability and country group indicator [1].

Nunnenkamp et al, 1995, argued that debt overhang discouraged further lending and foreign investors were mainly concerned about the sovereign risk in host countries with restrictive FDI policies [11].

Quer et al, 2007, found that greater country risk and greater cultural distance reduce the likelihood of using higher commitment entry strategies. When faced with higher levels of risk and greater cultural distance, firms tend to choose entry modes with fewer committed resources [12].

The internalisation theory suggests that to internalise international transactions through FDI depends on the ratio between the profit obtained from minimising transaction costs and the actual cost generated by the internalisation process itself. The political risk and the uncertainty associated with foreign ownership are precisely some of the possible cost that will be assumed in the case of internalisation, foreign enterprise will be reluctant to commit many resources through FDI [13].

Meldrum contends that country specific country risk assessment should focus on the factors that produce the most uncertainty for the company's business [2].

Alan Shapiro investigated the role of currency and country risk in International banking. The exchange rate fluctuations affected the ability to service their debt to a large extent. The exchange risk on this debt transforms to credit risk. In his opinion the bank must identify the real cost of repayment of loan against the real wealth the nation has to draw on. Currency risk depends on exchange rate changes, which, affect the borrower's real cost and hence likelihood of servicing the debt. Country risk, the credit risk on government loans is dependent on nation's terms of trade its adaptability to adjust standard of living with respect to changing economic fortunes [14].

Claude B Erbe et al, 1995, analyzed the correlation between country risk and equity market indexes. A negative relation exists between currency returns and country rating because foreign currency changes are related to credit than with the underlying equity markets. Lower credit ratings are associated with higher average returns. The highest credit risk nations have high dividend yields and the lowest risk have the lowest dividend yields. There is a positive relation between credit risk rating and beta. Highest credit countries have lowest betas. The country risk rating has substantial predictive power in discriminating between high and low expected return countries. It is also successful in identifying high and low return portfolios. Adding emerging markets to a globally diversified portfolio reduces overall risk and increases expected return [15].

Siregar and Choy, 2010, examined the factors behind international lending to nine East Asian economies by private banks of seven OECD countries in the 1990 - 2004 periods. Their finding suggests that political instability and weaknesses in the legal, judicial and bureaucratic systems are responsible continued stagnation in the international lending. Institutional reforms are critical to successfully compete for international bank financing [16].

Longstaff et al, 2011, investigated the relation between sovereign credit risk and global macroeconomic factors. The sovereign credit risk appears to be strongly linked to global factors, risk premiums, and investment flows than by country specific fundamentals. There is a significant risk premium embedded in sovereign credit spreads. This risk premium represents about one- third of the total credit spread. Sovereign credit risk is much more correlated across countries than are equity index returns for the same countries [17]

Frank and Cline investigated the ability of eight indicators to identify debt servicing problems. The variables selected were, debt service ratio, index of export fluctuations, compressibility of imports, imports to GNP ratio, per capita GNP, and growth of exports [18].

DATA COLLECTION

Secondary data has been collected from the World Bank website. The pertaining to South Asian countries, Australia, Saudi Arabia and some Asean countries. The variation in countries is to carry out comparative analysis about the country risk of south Asian countries with other developed and developing countries.

NEPAL

Year	Growth Rate (%)	GDP (US \$ bn)	Inflation	Current Acct to GDP ratio	Exports (US \$ mn)	Imports (US \$ bn)	Foreign exchange Reserves US \$ bn
2008	4.5	12.545	5.62	2.9	937	2.56	2.46
2009	4.8	12.855	15.908	4.8	845	3.6	2.77
2010	3.4	16.003	15.147	-2.4	971	5.01	2.94
2011	4.8	18.914	10.811	-0.9	939	5.87	3.63
2012	4.1	18.852	6.635	5	585	5	4.31
2013	6	19.271	6.577	3.4	894	6.42	5.29

2014	3.3	20.003	9.352	4.6	1060	7.75	6.03
2015	0.4	21.411	4.943	5.1	910	6.61	7.94
2016	7.5	21.132	5.072	6.2			8.68

(Source World Bank)

BANGLADESH

Year	Growth Rate (%)	GDP (US \$ bn)	Inflation	Current Acct to GDP ratio	Exports (US \$ mn)	Imports (US \$ bn)	Foreign exchange Reserves US \$ bn
2008	6.19	91.63	8.9	0.9	16.6	17.8	5.79
2009	5.05	102.63	4.9	2.7	17	17.5	10.34
2010	5.57	115.28	9.4	3.7	20.3	24.9	11.17
2011	6.46	128.64	11.5	-1.3	26.4	29.8	9.17
2012	6.52	133.36	6.2	-0.35	26.8	27.9	12.75
2013	6.01	149.99	7.5	1.5	31.1	32.9	18.09
2014	6.06	172.85	7.0	0.8	33.4	36.9	22.32
2015	6.55	195.08	6.2	1.5	35.7	38.3	27.49
2016	7.2	221.42	5.7	1.9			32.28

(Source World Bank)

SRILANKA

Year	Growth Rate (%)	GDP (US \$ bn)	Inflation	Current Acct to GDP ratio	Exports (US \$ bn)	Imports (US \$ bn)	Foreign exchange Reserves US \$ bn
2008	5.95	40.72	22.6	-9.5	10.11	14.2	2.62
2009	3.54	42.07	3.5	-0.5	8.97	9.84	5.35
2010	8.02	56.73	6.2	-1.9	11.09	13.1	7.2
2011	8.4	65.29	6.7	-7.1	13.64	20	6.74
2012	9.14	68.43	7.5	-5.8	13.56	17.7	7.11
2013	3.4	74.32	6.9	-3.4	15.1	18.4	7.5
2014	4.96	79.36	2.8	-2.5	16.74	21.4	8.21
2015	4.84	80.61	2.2	-2.3	16.94	21	7.3
2016	4.38	81.32	4	-2.4	17.44	19	6.01

(Source World Bank)

AFGHANISTAN

Year	Growth Rate (%)	GDP (US \$ bn)	Inflation	Current Acct to GDP ratio	Exports (US \$ mn)	Imports (US \$ bn)	Foreign exchange Reserves US \$ bn
2008	3.61	10.19	30.6	-66.5	421	5.18	3.04
2009	21.02	12.49	-8.3	-59.6	1.24 bn	7.19	4.27
2010	8.43	15.94	0.9	-42	555	9.97	5.16
2011	6.11	17.93	10.2	-40.7	531	12.5	6.34
2012	14.43	20.54	7.2	-44.6	468	8.92	7.15
2013	3.9	20.26	7.7	-43	722	7.97	7.29
2014	2.69	20.62	4.6		770	6.42	7.53
2015	1.31	19.22	-1.5	-22	866	7.63	6.98
2016	2.37	19.47	2.2	-20			7.28

(Source World Bank)

MALDIVES

Year	Growth Rate (%)	GDP (US \$ bn)	Inflation	Current Acct to GDP ratio	Exports (US \$ mn)	Imports (US \$ bn)	Foreign exchange Reserves US \$ bn
2008	9.49	2.11	6.8	-32.3	187	1.44	0.24
2009	-7.23	2.15	4.5	-11.4	119	1.03	0.28
2010	7.27	2.32	6.1	-8.9	139	1.16	0.36
2011	8.57	2.45	12.9	-15.6	189	1.52	0.35
2012	2.52	2.52	10.9	-6.4	237	1.67	0.32
2013	7.28	2.8	3.8	-3.9	214	1.84	0.38
2014	7.44	3.09	2.1	-3.2	175	2.11	0.63
2015	2.25	3.44	1.0	-7.6	228	2.08	0.58
2016	6.16	3.59	0.5	-24.5			0.48

(Source World Bank)

INDIA

Year	Growth Rate (%)	GDP (US \$ bn)	Inflation	Current Acct to GDP ratio	Exports (US \$ Bn)	Imports (US \$ bn)	Foreign exchange Reserves US \$ bn
2008	3.89	1186.95	8.352	-2.28	211	299	257.432
2009	8.48	1323.94	10.872	-2.8	166	250	284.603
2010	10.26	1656.62	11.992	-2.81	205	324	299.464
2011	6.638	1823.05	8.858	-4.29	275	421	298.739
2012	5.456	1827.64	9.312	-4.8	274	449	300.426
2013	6.386	1856.72	10.908	-1.74	290	420	298.092
2014	7.505	2035.39	6.65	-1.31	292	422	328.081
2015	8.01	2089.87	4.907	-1.058	276	369	353.319
2016	7.108	2263.29	4.941	-0.7	257	345	3651.694

(Source World Bank)

AUSTRALIA

Year	Growth Rate (%)	GDP (US \$Tn)	Inflation	Current Acct to GDP ratio	Exports (US \$ Bn)	Imports (US \$ bn)	Foreign exchange Reserves US \$ bn
2008	3.698	1.055	4.353	-4.9	211	189	32.924
2009	1812	0.92716	1.82	-4.6	168	153	41.742
2010	2.006	1.143	2.845	-3.6	224	184	42.268
2011	2.373	1.391	3.304	-3	275	230	46.714
2012	3.634	1.538	1.763	-4.3	250	241	49.138
2013	2.57	1.567	2.45	-3.2	265	225	52.837
2014	2.609	1.46	2.488	-2.9	244	219	53.91
2015	2.422	1.345	1.508	-4.7	191	193	49.261
2016	2.766	1.205	1.277	-2.7	159	182	55.035

(Source World Bank)

BIBLIOGRAPHY

1. Muhittin Oral, Ossama Kettani, Jean-Claude Cosset and Mohammad Daouas, 1992, An estimation model for country risk rating, International Journal of Forecasting 8, pp 583-593.
2. Duncan H Meldrum, 1999, Country risk and a Quick look at Latin America, Business Economics, Vol 34, No3, pp 30-37.
3. Duncan H Meldrum, 2000, Country risk and FDI: Customized, Systemized country risk assessment is critical for companies that contemplate activity abroad, Business Economics, Vol 35, No1, pp 33-40.
5. Behram Nowzad and RC Williams, 1981, External Indebtedness of Developing Countries, IMF Occasional papers 3.
7. Briance Mascarenhas and Ole Christian Sand, 1985, Country risk system assessment in banks: Patterns and Performance, Journal of International Business studies, Vol 16, No 1, pp 19-35.
8. Krishna G Saini and Philip S Bates, 1984, A survey of the Quantitative approaches to Country risk analysis, Journal of Banking and Finance 8, 341-356.
11. Peter Nunnenkamp, Michael Semple and Mike Semple, 1991, Developing countries attractiveness for FDI- Debt Overhang and sovereign as major impediments, The Pakistan development review, Vol 30, No 4, pp 1145-1158.
12. Diego Quer, Enrique Claver and Laura Rienda, 2007, The impact of country risk and cultural distance on entry mode choice, Cross Cultural management: An International Journal, Vol 14, No 1, pp 74-87.
13. YS Pak and YR Park, 2004, Global ownership strategies of Japanese multinational enterprises: a test of Internalization theory, Management International Review, Vol 44, No 1, PP 3-21

1791 ANALYSIS OF INVESTMENT PATTERNS BASED ON SP/A THEORY

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ABSTRACT

This paper analyzes the risk appetite of investors by observing their behavior towards different options of lending and borrowing. The analysis, according to the responses received, has been done in four ways and focuses on diversification of portfolio, nature of assets and risks involved. The first analysis talks about how framing of questions affects the choices of investors. Second analysis is about the investment pattern and risk capacity according to demography. Third analysis studies the effect of the job type on shaping the ideology of the investor. Finally, the kind of employment and the associated risk appetite has been studied. Assets mainly considered for survey include stocks, bonds, derivatives, mutual funds and saving accounts.

1 INTRODUCTION

Behavioural portfolio theory (BPT) (Shefrin & Statman, 2000), provides an alternative to the assumption that the ultimate motivation for investors is the maximization of the value of their portfolios. It suggests that investors have varied aims and create an investment portfolio that meets a broad range of goals. The first part of Behavioural portfolio theory is the **Safety-First Portfolio Theory (SFPT)** which posits investor motivation to be to avoid ruin. An extension to SFPT was introduced in 1987 by Lola Lopes, named **SP/A Theory**. The letters in its title can be summarized:

S = security, a general concern about avoiding low levels of wealth

P = potential, reflects the general desire to maximize wealth

A = aspiration, the desire to reach a specific goal, such as achieving no less than the subsistence levels.

In Lopes' framework, risk-taking is balanced between **fear** and **hope**. Lopes posit that *fear* is such a strong factor because fearful people overweight the probability of the worst outcomes, underweight those for the best outcomes. This leads individuals to understate the probability of achieving the highest level of **expected wealth E(W)**. In other words, fearful individuals are pessimistic. *Hope* has the inverse effect on individuals – optimism causes hopeful investors to overstate the probability of achieving the highest level of expected wealth. Lopes contend that *fear* operates through an *overweighting of the probabilities attached to the worst outcomes*. (Lopez, 2013)

Therefore, risk aversion is motivated by a desire of security while risk seeking is rationalized by a desire to achieve maximum (He & Xun Yu Zhou, 2012)

The qualitative lesson from SP/A theory is that you should establish a portfolio in which you have reigned in your emotions of fear and hope, so that neither dominates.

2 METHODOLOGY

OBJECTIVES

1. Analyzing the effect of framing of questions and options on individual's choices
2. Analyzing the responses of the questionnaire by bifurcating them into the following three groups to reflect the key points of SP/A theory
 - i) On the basis of Demography
 - ii) On the basis of Type of Job (government / private)
 - iii) On the basis of Nature of Employment (full time/ part time)

Scope of the Study

- The research has been conducted on the people residing in India and investing in various financial instruments.
- This research involves people of all age groups above 15.
- The research involves people working across various domains like public sector, private sector and self-employed businessmen.
- Full time employed, part time employed as well as on call employed are covered under this study.

SUBJECTS

The subjects were 120 people of different age groups, having entirely different professions and having entirely different sources of income. The subjects included men as well as women, employed as well as unemployed people and people with prior knowledge about financial instruments as well as people who did not have knowledge about these financial instruments.

DATA COLLECTION

The study is based on Primary data. The main source of data used for this study is primary and it has been derived from a structured Questionnaire.

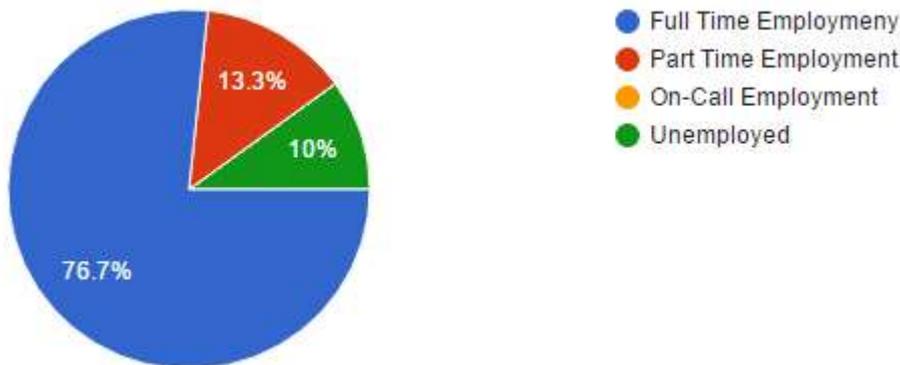
ANALYSIS TOOLS

The data has been collected via questionnaires and has then been plotted on pie charts and bar graphs which are subsequently analyzed

3 DATA ANALYSIS AND INTERPRETATION

3.1 Kind of Employment:

The Trend suggests 76.7% of the subjects were full time employed while 13.3% Part Time employed and only 10% Unemployed. The Part Time Employed were mainly the subjects of age bracket 15-25. This conforms to the ongoing scenario where a person works at multiple jobs at a time. Thus each one specialises in a particular aspect and is called upon to do that particular job. The entire business strategy is not disclosed to them and there’s a separate core team for all the business planning. The 25-40 age bracket subjects are all full time employed. This conforms to the old time scenario where an employee was considered as an asset by the firm and had to spend the full time in the office irrespective of the amount of work he had to perform.



3.2 Do you have a savings account?

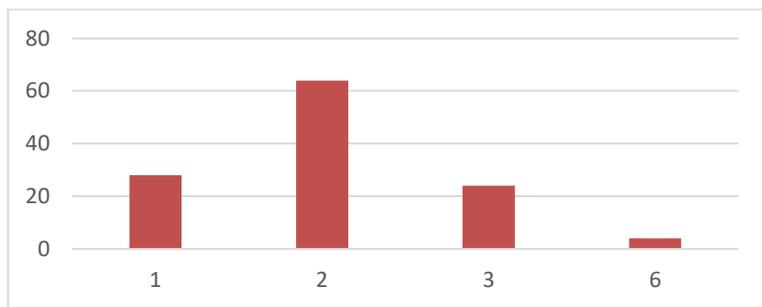
All the subjects have saving accounts in bank. This shows people trust banks and are risk averse as very less risk is involved when funds are invested in bank. Indians have trust in banks unlike Americans (Edelman Trust, 2015) where their banks have failed. This also reflects the response of Jan Dhan Yojana that was started by The Prime Minister Narendra Modi (Günther, 2017). Moreover, these days people have more awareness of banks rather than stocks, mutual funds, bonds and derivatives.



3.3 In how many banks do you have a savings account?

The majority of responses were recorded for 2 banks. This shows that the people do not completely trust a single bank. Another reason for such response may be due to the fact that most of the people put their money in public banks because it is less risky and in private banks because the facilities they provide is better than the public banks.

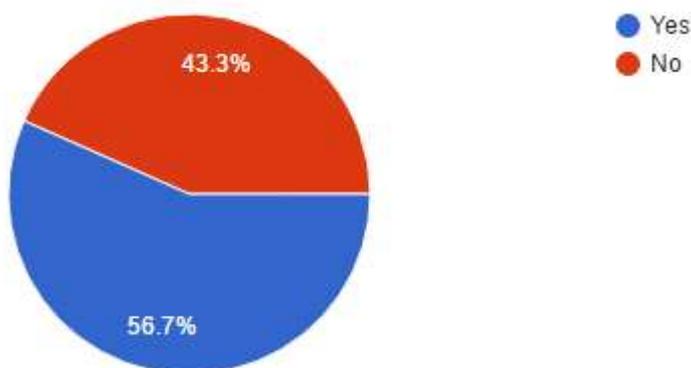
The response for 1 bank is just 23 % thus rest of the subjects keep their money in more than one bank which shows that people know the benefits of diversification. They know that if they will keep their money in one bank there is a higher risk as if that particular bank fails then they will lose their money. This shows that majority of the people are risk averse.



3.4 Have you ever taken a Loan?

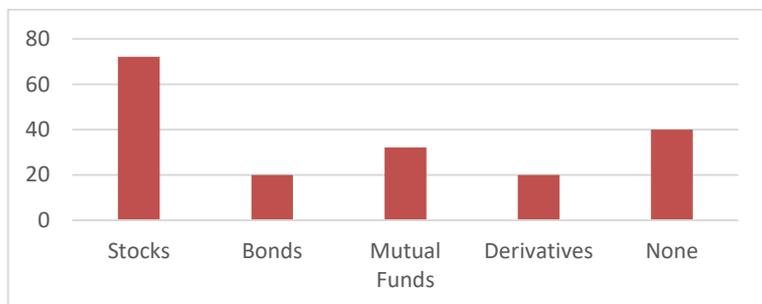
Only about 57% people said that they had at one point or the other taken a loan from the bank. This percentage is very low as compared to what we would expect in a developing country. The reason for not taking a loan could be many.

- a. People might be self-sufficient and hence do not require extra loans to be taken to fulfil their necessities or even their luxuries.
- b. Another reason can be that people still have less faith on banks and hence borrow money from their relatives only.
- c. Also, banks generally look at your previous financial record, whether you have a guarantee or not, whether you have something to be mortgaged or not. They also check your money inflow pattern is steady or not and whether you will be able to repay the loan or not (Chaplinska, 2012). Due to these reasons, many people are not given access to loans and hence they have never taken a loan.



3.5 What type of Securities have you invested in?

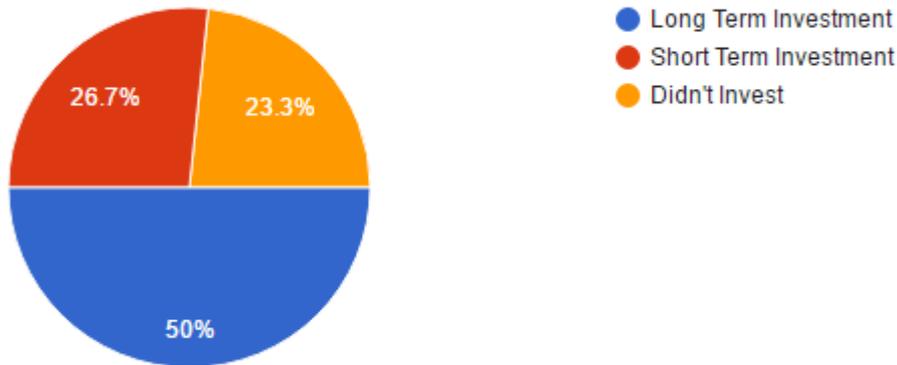
Majority of the subjects has invested in stocks followed by mutual funds. This reflects they have more risk appetite as stock market is high risk high return while Bonds are low risks low returns. Therefore, bonds are not much preferred. Risk appetite of investors gives an insight that most of them are in younger demographic group and thus seek risks while investing funds. Comparatively lower investment in Derivatives also suggests the lack of knowledge (Saroaha & Yadav, 2013) of these as Securities. People generally are unaware of these avenues and flock to stock markets, mutual funds or prefer investing in the real estate markets.



3.6 What is your investment pattern in the Stock Market?

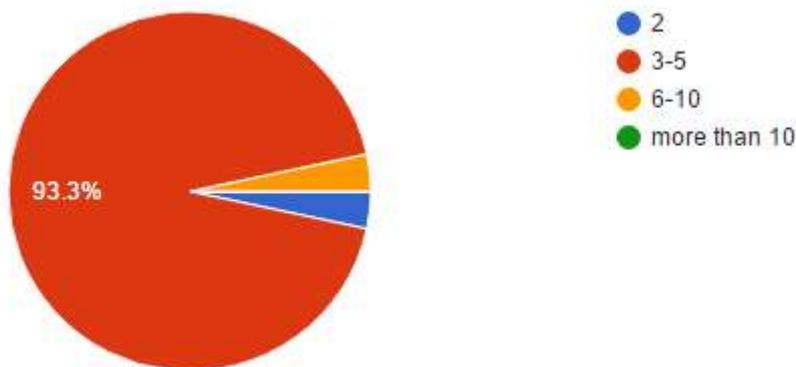
- d. The responses for long term investment is the highest (50%) which shows the risk averse nature of the people because if you do long term investment then you don't have to worry about the daily fluctuations in the stock market because the market recovers over the time.
- e. People invest less in short term investments (26.7%) because they are riskier than long term investment but the gains are higher than long term investments.

- f. Rest of the people do not invest in stock market may be because they don't have much knowledge about stocks or they don't want to risk their money.
- g. Overall this shows us that most of the people have risk averse natures but there are still certain sections which prefer higher returns over risk.



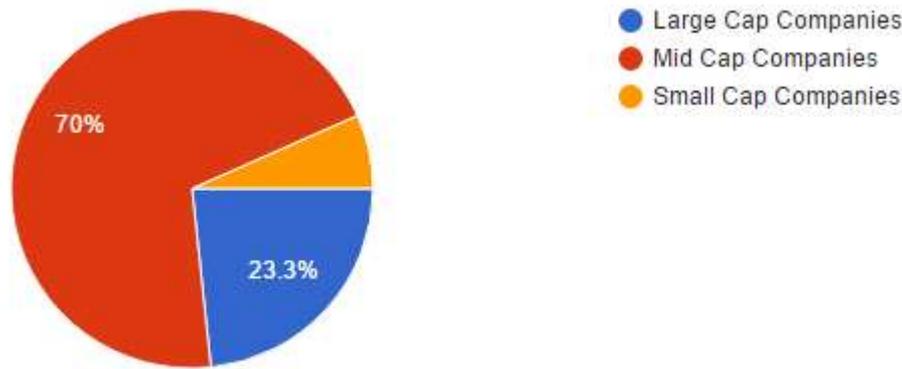
3.7 How many members are there in your family?

Approximately 93% people have 3-5 people in their family which means that nowadays more and more families are converting into nuclear families which might be because people have started understanding that money can be better managed if the number of people to feed are less.



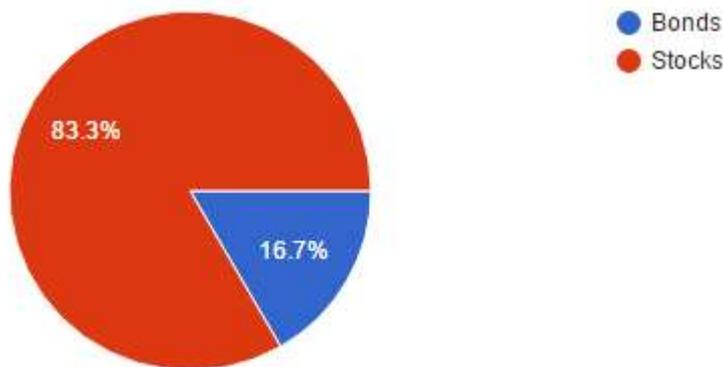
3.8 What kind of companies do you prefer holding stocks in?

- h. Large Cap Companies: Only 23.3% of the total subjects preferred holding stock in Large Cap Companies. The stocks of such companies are already appreciated a lot and a prospective investor doesn't expect much high returns from them. If a person invests in stocks for dividend yields, these are the companies he's looking for. On the other hand some people prefer investing in a big brand irrespective of the returns which the stock of that company has to offer.
- i. Mid Cap Companies: 70% of the investors preferred to invest in Mid Cap Companies. These companies are the ones that attract the maximum people and are the most traded (Tony Massena et al, 2015). The investor might gain much but at the same time might lose much as well.
- j. Small Cap Companies: Not much subject preferred to invest in Small Cap Companies. These also include the penny stocks which might die all out or might give a significant return if invested in heavily. This sector is the one which is easily manipulated by some big players.



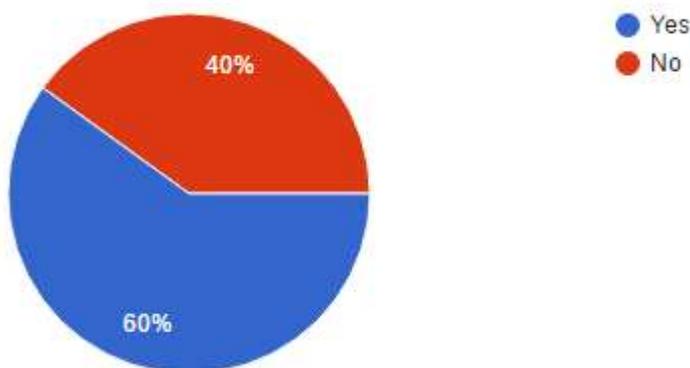
3.9 Do you prefer bonds or Stocks?

83.3% of the subjects prefer stocks over bonds. They expect better returns even if they have to take more risk. Aspirations of investors are high. Moreover, investing in bonds blocks the money for a certain time period and thus the liquidity decreases.



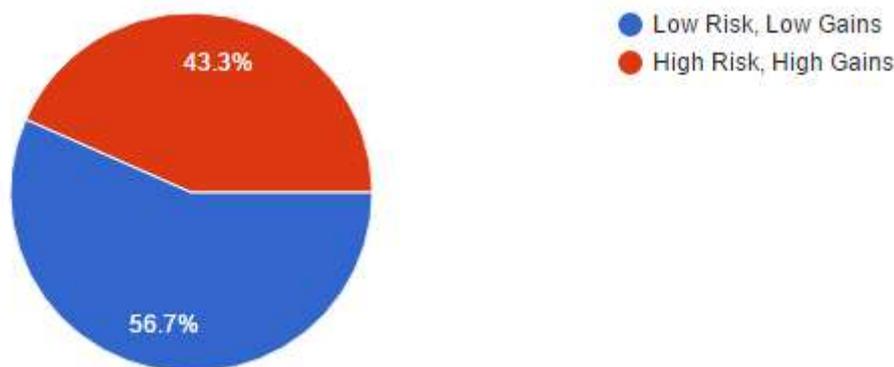
3.10 Did you have any prior knowledge related to investment in Banks, Stock Market or Corporate?

60% of the people agreed that they had prior knowledge about Banks, Stocks and Corporate. This may be due to the various initiatives taken by the government of India towards Financial inclusion (Günther, 2017). One such initiative is PRADHAN MANTRI JAN DHAN YOJNA which is a National Mission on Financial Inclusion which has an integrated approach to bring about comprehensive financial inclusion, provide banking services to all the households in the country, make them aware of the various schemes, banking facilities etc.



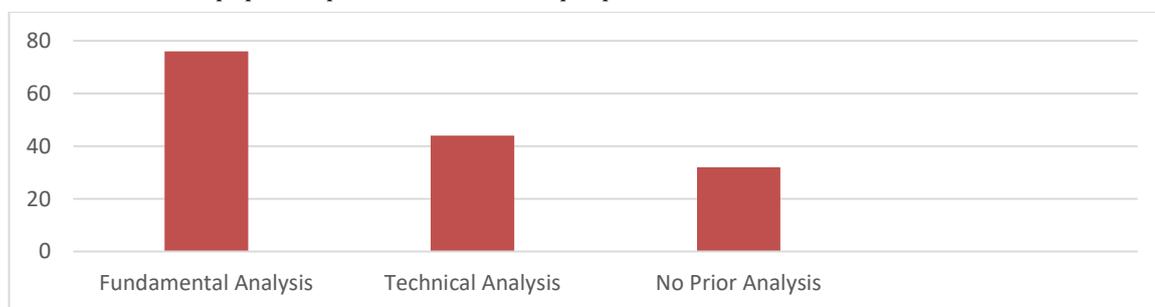
3.11 What would you prefer? Low Risk, Low gains or High Risk, High Gains?

Nearly equal percentages indicate that it generally differs from person to person and there is no generalized trend for the same.



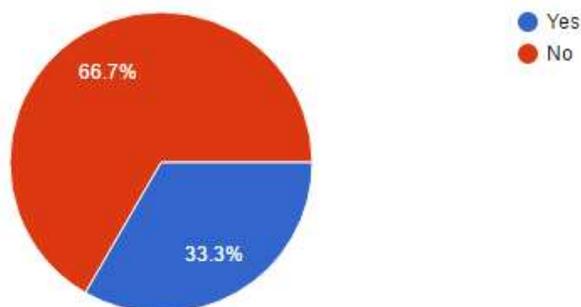
3.12 How do you analyse a stock before investing?

Mostly people prefer looking at the fundamentals of the company which include analysing the ratios, balance sheets, company's goals, vision etc. The ideology behind this is that if the fundamentals of a company are strong, one or the other day the share prices of company shall definitely rise one or the other day. With the availability of modern tools like charts, models etc. one can compare the performance of the company over a wide time range. This is called Technical analysis. Not much people prefer this. One must have a proper know how of the charts and techniques to use them properly. Thus this is not a much popular option with the older people.



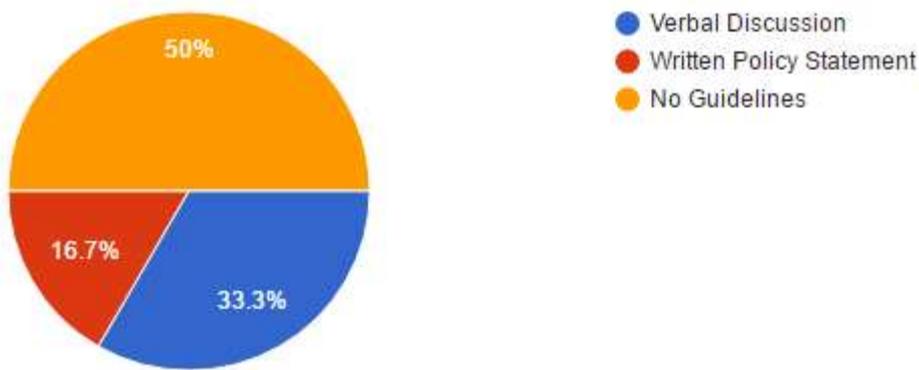
3.14 Do you hire a professional to manage your portfolio?

66.7% of the subjects do not hire manager for portfolio management. From this we can conclude that either they are well informed and updated regularly and know the investment procedure very well or people avoid risking their money at the hand of someone else.



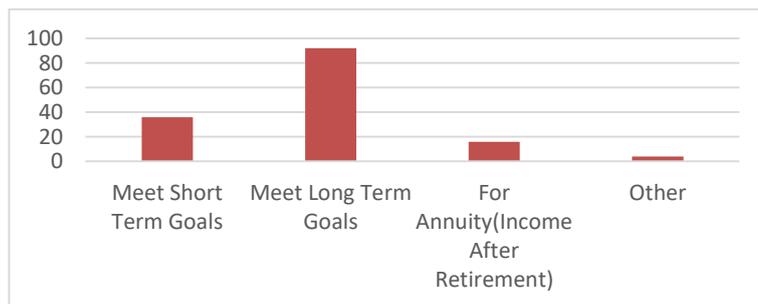
3.15 What kind of guidelines did you give to your Portfolio Manager?

Maximum response (50%) was recorded for no guidelines, which shows that either the people do not have any knowledge about investment and therefore they leave everything on their portfolio manager or people trust their portfolio manager more than themselves. This also depicts the carelessness of people depending only on the investor because without any guidelines, the investor cannot sue the manager for any losses. This shows that they want to take help of someone having more technical knowledge which is again a reflection of their risk averse nature. People prefer verbal discussions more than written policy statement which again shows their trust on their portfolio manager



3.16 What's your Investment Goal?

- k. Only 30% people invest for meeting short term goals. This means that there are very few people who do not keep in mind the future before investing. Short term goals are usually kept by people who are deeply engrossed in these financial instruments and can keep a check on how much they are gaining from them.
- l. Approximately 77% people invest for meeting long term goals is a clear indicator of the fact that people generally invest keeping in mind issues like education (especially children's higher education), health care, marriage, etc. Long Term investments also include the fact that people want to be ensured in case any unexpected problem comes up.
- m. Only 13 % people think about annuity. They would most probably be in a Gifting Stage of life (elderly people)



4 ANALYZING THE EFFECT OF FRAMING OF QUESTIONS AND OPTIONS ON INDIVIDUAL'S CHOICES

According to prospect theory, "risk attitudes change as a function of the valence or sign of outcomes. Risk aversion is shown towards gains and risk seeking tendency for losses.

There is a conflict between choices for subjects while setting their aspirations. A sure thing can be satisfactory for some while the same thing cannot be 'good enough' for another. Schneider explains the aspiration contingency with SP/A theory. "With the low aspiration levels postulated in the positive domain, both the need for security and the modest aspiration level can be satisfied by selecting a sure thing. With high aspiration levels in the negative domain, however, conflict ensues as security needs favor a risk-averse choice but the stringent aspiration level favors a risk-seeking choice" (Schneider, 1992).

According to the responses to the questionnaire, there are two instances where people have given contradictory responses to the same question framed in different ways:

1. 83.3% of the subjects preferred stocks over bonds. But when asked if they would prefer low risk, low returns or high risk, high return more than 50% of those subjects preferred low risk, low returns. This contradiction in response reflects how choice is dependent on the way question is framed. People don't feel the intensity of risk involved when the word 'stock' is mentioned but when asked directly, they exhibit risk averse behavior. In the second instance, two similar questions were posed: "What is your investment pattern in stock market?" and "What is your investment goal?" In both these scenarios, people had to choose if they prefer short term goals or long term goals. Responses show that 16.67% of the subjects shift from short term to long term goals if the framing of question avoids the term 'stock market'. This is a clear indication of the fact that people assume that the stock market is riskier and hence can fulfill only their short term goals.

Thus, it is evident from the two prior instances that people are sensitive to the way questions are framed and options are posed.

5 ANALYZING THE RESPONSES OF THE QUESTIONNAIRE BY BIFURCATING THEM INTO THE FOLLOWING THREE GROUPS TO REFLECT THE KEY POINTS OF SP/A THEORY

i. On the basis of Demography

- If we consider the **age group of 15-25**, there are 5 questions which give a striking result.
 1. The main striking similarity between people of age group 15-25 is that 44/44 people preferred stocks over bonds. This gives an insight about the fact that people in this age group are young and risk seeking. They prefer stocks because stocks are high risk high return instruments.
 2. Another striking answer is that 36/44 people responded that they had prior knowledge before investing in stocks. This means that people now-a-days are more acquainted with the stock market and other financial instruments and hence prefer investing on their own, rather than being dependent on someone else.
 3. On similar lines, out of 44 people in this age group 36 people responded that they do not hire a professional to manage their portfolio. This gets us inclined to the fact that people now-a-days are self-sufficient in knowledge and hence do not require a professional. Another reason is that people now-a-days do not want have faith in any other individual and hence want to work a way to invest on their own.
 4. For investing in stocks, 4/44 people use fundamental analysis or technical analysis, a wholly 40/44 people use both fundamental and technical analysis and only 4/44 people invest based on an expert's opinion. This means the younger generation believes that although fundamental or technical analysis cannot beat the market but it gives a picture of what is going and helps them to be prepared for the same (Suresh, 2013).
 5. To support the fact that people in this age group are more risk seeking, 28/44 people invest in mid cap companies as they have higher fluctuations which means higher returns.
- If we consider the **age group of 25-40**, there 4 questions which give a striking result.

NOTE: All 36 subjects under this category were full time employed.

1. 36/40 people in this age group invest in mid cap companies. These people are in the accumulation-spending stage of life. Hence they are risk seeking and want to grow as much as they can. Mid cap companies have more fluctuations in their stocks. Hence people in this phase prefer high risk high returns.
2. Another striking result is that people in this group are highly averse to technical analysis. 0/40 responses take into account technical analysis before investing in a stock which can be due to lack of knowledge or lack of belief in mathematical analysis.
3. The responses also show that due to less awareness among individuals, only 4/40 people give a written policy statement while hiring a professional for managing their portfolio. Rest of the subjects either gave no guidelines or gave guidelines only as a mode of verbal discussion.
4. Another feature is that subjects in this group fulfill to invest long term goals like buying a house, children's education, children's marriage, etc. Hence all 10 subjects said that they invest to fulfill long term goals.

- If we consider the **age group of 40-60**, there 2 questions which give a striking result.

NOTE: All 36 subjects under this category were full time employed.

1. 32/36 people in this age group preferred low gains, low risk over high gains high risk. This is because at this stage people are almost in the gifting stage of their life (Frank K. Reilly, Keith C. Brown) and hence do not want to risk losing the money that they earned by putting in a lot of hard work. Hence risk appetite of people in this age group is very small.
2. Another striking feature is that the investment goals of people in this age group are long term goals or investment for annuity. This phase of people is where they are stable and hence planning for the future. So, these responses are justified.

ii. On the basis of Type of Job (government / private)

- If we consider **private job**, there are 3 questions which give a striking result.
 1. 52/68 respondents preferred investing in a Mid Cap company while 16 chose to invest in a Large Cap Company and no one was keen on investing in Small Cap Companies. This reflects the prominent ideology of high riskiness of Small Cap Companies which may offer very good returns or be doomed thereby exposing to a greater risk than Mid Cap Companies. Investors seems to be aware with the rather steadiness of Mid Cap over Small Cap thereby offering still better returns but with relatively less risk. Large Cap are the most stable but don't have as high returns as the other two.
 2. 36/68 chose to invest in Securities and the rest chose not to invest in securities. This clearly shows the Risk Averse behavior of the subjects. When interviewed about the risk pattern. With a lot of pink slips being given nowadays and the instability of jobs seems to have influenced the investors to (Frank K. Reilly, Keith C. Brown n.d.)be rather Risk Averse.

3. 44/68 chose Long Term Investment over Short Term Investment. Private Jobs don't have the perks of the Government jobs like pensions etc. The subjects are wise enough to save for fulfilling their Long Term Goals and also to support them after retirement.
 - If we consider **government job**, there are 5 questions which give a striking result.
1. 20/24 people had invested in Stocks. This is because these people are relatively stable with secured and definite earnings and seek to make better returns on their Savings.
2. When interviewed about the preference over Stocks and Bonds. 20/24 people preferred Stocks over Bond. Because of stable earnings from job they chose better returns over total safety of money. The risk bearing attitude might also arise from the fact that if they bear a loss in Stocks, they'll still have their monthly salary to make up for it. (Market Capitalisation: Large Cap Mid Cap Small Cap, n.d.)
3. Though the subjects preferred bonds over stocks yet they stuck to the ideology of low risk low gains. They preferred to invest in a company with strong fundamentals (because they relied on Fundamental Analysis) and having a long term position in these industries thus enjoying on the dividends and reap the tax benefits on the proceeds of selling the stocks in the long run.
4. All the subjects had prior knowledge of investing in Securities. This shows that people now-a-days are more acquainted with the stock market and other financial instruments and hence prefer investing on their own, rather than being dependent on someone else (16/24 chose to rely on their own than hiring a professional to manage their portfolio).
5. All the subjects chose to invest for fulfilling Long Term Goals. They seek for a comfortable life post retirement and bridge the gap left by the Salary and the Pension Salary.
 - If we consider people having their own **business**, there are 3 questions which give a striking result.

Note: There were 8 subjects of this criterion, all in the age group 40-60 having a Savings Account

1. All the subjects preferred Stocks over Bonds. Thus indicating that though Stocks being a little risky over Bonds but offer a bit higher liquidity and better returns over Bonds is well perceived by these people. In Business cash crunch might arise at any point of time, thus an investment offering better liquidity was preferred.
2. All the subjects had no prior knowledge about the Analysis of Stocks. Therefore, half of them preferred investing in a mutual fund and relied on the technical analysis provided by the mutual fund company.
3. The investment pattern of the subjects is long term. This phase of people is where they are stable, probably well established and hence saving for the future.
 - If we consider **other types of jobs**, there are 4 questions which give a striking result.

Note: All the subjects were in the Age Group 15-25

1. The Investment pattern was strikingly different than those observed in other types of Employment. The subjects conform to the ideology of 'High Risk High Gains'. The subjects are still in the accumulation phase (Frank K. Reilly, Keith C. Brown) of their lives and have sufficient time ahead to help them recover from a major loss(if any).
2. All the Subjects preferred investing in stocks and relied on Fundamental Analysis as a mode of analysis to select a suitable company to invest in.
3. All the subjects had prior knowledge of investing in Securities. None of the subjects preferred hiring a Professional to manage their portfolio. They rather preferred relying on their own efforts to manage their portfolio. This clearly shows the growing awareness among individuals and an increasing want to understand these financial instruments thereby becoming self-reliant when coming to investments.
4. The subjects invested for meeting both their Short Term as well the Long Term Goals. This clearly shows the ideology of being self-reliant rather than relying on anyone for fulfillment of needs. By seeking to be able to satisfy their Short Term Goals the subjects want to be independent and not dependent on their families for their needs.

iii. On the basis of Nature of Employment (full time/ part time)

- If we consider **people who are unemployed**, there are 5 questions which give a striking result.

NOTE: 10% of the subjects are unemployed. The responses that we got from them are as follows:

1. All of them have a savings account which shows that the people are aware of the benefits of saving money in banks. 8/12 people who are unemployed have 2 savings bank account which shows that not only they know the benefits of saving money in a bank but also they know the benefits of diversification.
2. 8/12 of the subjects did not take any loan which may be due to the reason of lack of a fixed income.
3. All the subjects preferred high risks, high gain and if they are ready to invest they prefer to go for a long term investment. This shows that the firstly unemployed people are not ready to invest may be due to lack of money, however if they invest they prefer long term investment in order to meet their long term goals. This shows that

all the subjects have knowledge about the benefits and low risks related to long term investments and also shows that these people are security minded.

- If we consider **people who are part time employed**, there are 4 questions which give a striking result.
 1. All the part time employed subjects are paid on a monthly basis where 75% of them work in private sector and 25% work as a consultant. They all have a savings account and they all have account in more than one bank, this shows that these people are well aware of the benefits of saving money in a bank and diversification.
 2. None of the subject shave taken a loan which may be due to lack of a fixed source of income.75% of the subjects wanted to go for short term investment and only 25% for long term investment which may be due to the fact that 75% of the subjects have short term goals and since all the partly employed people belong to age category of 15-25 years their age might be a factor of their risk taking attitude.
 3. They all said that they have a prior knowledge of the market and therefore this might be the reason that none of them wants to hire a professional. It has been analyzed from the response of the partly employed people that those who want to go for high risks, high gain preferred both technical as well as fundamental analysis. This might be due to the higher risks involved, however those who are going for low risks, low gains preferred only fundamental analysis.
- If we consider **people who are full time employed**, there are 4 questions which give a striking result.
 1. 26% of the fully employed people have a government job, 4% have their own business while rest of them work in private sector. They all are paid on monthly basis and people of all age group are present in this category. They all have a savings account and most of them keep their money in more than one account. There are people in this category who have more than 2 bank accounts. Therefore, the people in this category know how to reap the benefits of diversification and saving money in a bank.
 2. 74% of the subject in this category have taken a loan, 17% of them have paid it earlier while the rest of them have paid it on time. None of them have delayed the payment which may be due to regular source of income.

6 CONCLUSION

Situational factors reflect the needs of an individual while making choices. Most of the investors are very sensitive about safety of their investment. They want more safety and reliability. Fearful investors are worried about *security* and hopeful investors are looking for maximum *potential* reflecting the relative strength of each. Further, *aspiration* levels are determined by keeping in mind that 'No Change' is the benchmark. People tend to be averse to the change pulling them out of their comfort zone.

REFERENCES

- Bhatt, K. A. (2013). Investment and Trading Pattern of Individuals Dealing in Stock Market. *The SIJ Transactions on Industrial, Financial & Business Management (IFBM)*.
- Chaplinska, A. (2012). Evaluation of the borrower's creditworthiness as an important condition for enhancing the effectiveness of lending operations.
- Daly, K., & Mishra, A. (2013). Geographical Trade Structure and Patterns of International Portfolio Investment – The Case of Australia.
- Edelman Trust. (2015). *Edelman Trust Barometer*. Edelman Trust.
- Frank K. Reilly, Keith C. Brown. (n.d.). Investment Strategies over an Investor's Lifetime. In K. C. Frank K. Reilly, *Investment Analysis and Portfolio Management*.
- Günther, M. K. (2017). The Progress of Financial Inclusion in India: Insights from Multiple Waves of Survey Data.
- He, X. D., & Xun Yu Zhou. (2012). Hope, Fear and Aspirations.
- Lopez, L. (2013). Goals and the Organization of CHOICE Under Risk. *The university of Iowa*.
- Market Capitalisation: Large Cap Mid Cap Small Cap*. (n.d.). Retrieved from <https://financialengines.com/education-center/small-large-mid-caps-market-capitalization/>
- Saroja, P., & Yadav, S. (2013). Derivative market in India: Prospects & Issues. *The International Multi Disciplinary Journa*.
- Schneider, S. L. (1992). Framing and Conflict: Aspiration Level Contingency, the Status Quo, and Current Theories of Risky Choice. *Journal of Experimental Psychology*, 18.
- Shefrin, H., & Statman, M. (2000). Behavioural Portfolio Theory. *The Journal of Financial and Quantitative Analysis*.
- Suresh, A. (2013). A study on financial and technical analysis. *International journal of Marketing, Financial Services & Management Research*.
- Tony Massena et al. (2015). Mid Cap: The Goldilocks Asset Class. *Arnerich Massena*.

APPENDIX

• Questionnaire

Securities & Aspiration

Your identity will not be captured and all the data will be confidential.

* Required

1. What is your Age Group *

- 15-25
- 25-40

- 40-60
- 60 above

2. Type of Job *

- Government Job
- Private Job
- Business
- Unemployed
- Other :

3. Source of Income *

- Paid on Daily Basis
- Monthly Pay
- Unemployed

4. Kind of Employment *

- Full Time Employment
- Part Time Employment
- On-Call Employment
- Unemployed

5. Do you have a Savings Account *

- Yes
- No

6. In how many Banks do you have a Savings A/c *

-

7. Have you ever taken a Loan? *

- Yes
- No

8. How fast did you repay the loan? *

- Prepaid the Entire Amount
- Paid as per the Schedule
- Extended the Loan Period
- Did not Take a loan

9. What type of Securities have you invested in?(More than one can be selected) *

- Stocks
- Bonds
- Mutual Funds
- Derivatives(Options, Futures)
- None

10. What is your investment pattern in the Stock Market? *

- Long Term Investment
- Short Term Investment
- Didn't Invest

11. How many members are there in your family? *

- 2
- 3-5
- 6-10
- more than 10

12. What kind of companies do you prefer holding Stocks in? *

- Large Cap Companies
- Mid Cap Companies
- Small Cap Companies

13. Do you prefer Bonds or Stocks? *

- Bonds
- Stocks

14. Did you have any prior knowledge related to investment in Banks, Stock Market or Corporates? *

- Yes
- No

15. What would you prefer? *

- Low Risk, Low Gains
- High Risk, High Gains

16. How do you analyse a Stock before investing?(More than one can be selected) *

- Fundamental Analysis
- Technical Analysis
- No prior Analysis (Invest as per the Expert Opinion)

17. Do you hire a Professional to manage your Portfolio? *

- Yes
- No

18. What kind of guidelines did you give to your Portfolio Manager? *

- Verbal Discussion
- Written Policy Statement
- No Guidelines

19. What's your Investment Goal?(More than one can be selected) *

- Meet Short Term Goal
- Meet Long Term Goals
- For Annuity (Income after Retirement)
- Other:

RS12.1. Rural Development

1142 AN IMPACT EVALUATION OF INDIRA AWAAS YOJANA (IAY) PROGRAMME INDUCED TRANSFORMATION OF RURAL DWELLING ATTRIBUTES UNDER SOUTH TRIPURA DISTRICT, TRIPURA

ABSTRACT

The study of settlement is basic to human Geography as the form of dwelling in any particular region not only reflects man’s response to his environment but also an asset which supports livelihood, symbolises social position and bears expression of cultural ethos of society. Indira Awaas Yojana (IAY), a flagship scheme of the Ministry of Rural Development has since inception provided assistance to BPL families who are either houseless or having inadequate housing facilities for constructing a safe and durable shelter. It is for all these reasons that a genuine effort has been made for empirical study of rural households through collection of primary data by structured schedule. During field survey using random sampling techniques, ten percent of households were visited and interviewed in order to gather knowledge about different dimensions of IAY homestead characteristics and investigate its impact in seven Autonomous District Council (ADC) administered villages and eight Non-ADC villages in South Tripura District. The analysis of data revealed that the quality of the house depends on the type of building materials used for the construction of the floor, wall and roof etc. In seven villages, use of thatch as roofing material for IAY dwellings is observed led by ADC villages of Paschim Takka Tulsi (34%) followed by Laxmichara (31%) and Tairumachara (18%) reflecting the survival of folk houses in the advent of cheap durable Tin. Under IAY developmental impact huge transformation is observed as folk huts with thatched roof are converted to metal Tin roof house due to its long durability and less maintenance cost. A cursory look at the IAY dwelling highlights the fact that out of 15 villages more than 60 per cent of household ownership is entitled to female members of the families reflecting change in socio-economic ethos of traditional societies in the rural human landscape of the study area providing sort of female empowerment. To sum up, the IAY as development scheme intended to providing housing to rural poor is not immune to the impact of physico-cultural setting and thus its implementation have given rise to varying distinguishable layout of IAY housing attributes in the study area.

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1152 RURAL NON-FARM ECONOMY

ABSTRACT

India is still an agrarian nation, almost two-third of workforce are engaged in agricultural activity. Although there has been shift from agricultural activity to non agricultural activity especially into rural non-farm activity. It has resulted in degradation of agricultural activity in the country bringing negative and positive impacts on economies of nation. Rural non-farm activities has given some relief in providing the employment in rural areas as there is increase in percentage share of workers in rural non-farm activities from previous census years. So the farm and non-farm linkage is an important issue. Rural non-farm sectors have come up, especially in the regions where the agricultural activity has not been supportive enough for the economies of life. Making an inverse relation between agricultural and rural non-farm sectors. Whereas various literature talks about expansion of agricultural activity leading to demand of local inputs and thus better rural non-farm sectors. A large section of rural population has got indulged into the local non-farm activities. Working on the data of census and NSSO has given a vivid result and different perspective of rural non-farm economy (RNFE). There is a huge shift in the percentage share of workers both male and female in the rural non-farm activities from the previous census years. Composition of work force share has increased especially in the southern states. But the composition of workers in the agricultural activities have come to a stand-still indicating that agricultural activity has become stagnant. As many literature talks about shift of agricultural activity to rural non-farm economy (RNFE) through crop diversification and land convergence for better economy but when there is no accumulation of surplus in the country then what about better rural non-farm economy. Agricultural activity and rural non-farm economy are inter-related (backward and forward linkages) but in recent times agricultural activities is becoming stagnant then how can we talk about rural non-farm economy. Crop diversification lead to increase of rural non-farm economy but it has not proved to be fruitful considering the demand for food crops and herby raising question over food security in order of non generating surplus. As the literature argues that the expansion of agricultural activity leads better rural non-farm economy growth but an inverse relation has come between agricultural activity and rural non-farm economy.

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1536 CHILD MALNUTRITION IN UGANDA: REGIONAL DISPARITIES AND SOCIO-ECONOMIC INEQUALITIES

ABSTRACT

While hospital records in Uganda do not show a significant reduction in the prevalence of nutrition related diseases, the lack of a comprehensive national survey since 2011 to measure child nutrition and household conditions poses a significant challenge in assessing the prevalence and determinants of child undernutrition. In this paper, we assess malnutrition prevalence in six districts of Uganda's Karamoja region using recent survey data for the year 2014. Variance analysis at different levels shows that there are significant differences between districts with respect to the prevalence of malnutrition. Gender-wise disparities in malnutrition exist where boys are in a disadvantaged position compared to girls. The variation in malnutrition can be attributed to the differences stemming from different regional characteristics at different levels (village, parish and subcounties). The finding of no variation attributable at the parish level for boys but for girls needs further investigation with regards to parish level characteristics that may affect malnutrition. However, the greatest variation is observed at the household level. We also find wealth related inequality in malnutrition where the poor are in a particularly disadvantaged position. Wealth-related inequality in malnutrition shows that malnutrition is concentrated highly among the poor with wasting showing greater inequality than stunting.

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1559 MIGRATION INDUCED FEMINIZATION OF AGRICULTURE IN SELECTED AREAS OF INDIAN SUNDARBANS

ABSTRACT

The agrarian livelihoods pattern in Sundarbans has undergone various socioeconomic, political and environmental changes in recent times. An increasing trend of women’s involvement in agriculture, alongside their male counterparts, has become common in these regions and their critical role in agricultural development has also been recognised and documented. Women of rural households perform significant and diversified roles in agriculture such as farmers, co-farmers, family labours, and wage labours in spite of lower existing wage rates. The lack of wage employment opportunities from farming in rural areas in one hand and higher wage rate in cities and outside the country on the other, have influenced a major out flow of rural youth from rural areas. Despite of being an important livelihood strategy of rural households, labour migration has impacted agriculture in these areas especially in terms of women’s engagement as decision makers. The left behind women in rural areas now shoulder the added responsibilities of farming along with the archetypal gender roles in a traditionally male- dominant management of agriculture. This increasing dependency of agriculture on women is known as ‘feminization of agriculture’, which may either be manifested as the feminization of agricultural labour (labour feminization) or the feminization of farm management (managerial feminization). While labour feminisation often leads to increasing drudgery and vulnerability of the left behind women, managerial feminization tends to expanded participation of women in household as well as community decision making process. The present paper investigates the nature of migration and its impact on the ‘feminization of agriculture’ in selected areas of IndianSunderbans where prevalence of migration is reported to be high. This study employs a mixed method approach of data collection, using household survey followed by in-depth interview, key informant interview and gender analysis. Examining the data from both migrant and non-migrant households in terms of women’s engagement in farming activities and perceived drudgery, the paper tries to understand the nature and extent of feminization in agriculture and identify the factors associated with it. This study also explores the role of remittance in the feminization process and thus impacting women’s drudgery at origin. The study outcomes will be of particular use in formulating gender sensitive livelihood support programmes and agricultural research and extension strategies. : Migration, Livelihoods, Feminization of Agriculture

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RS12.2. Rural Development

1584 SPATIAL SIGNIFICANCE OF MARKETS FOR RURAL DEVELOPMENT: AN INTRA- DISTRICT STUDY OF SANGLI

ABSTRACT

Regional disparities in development of a district are the outcome of discrepancy in socio- economic conditions. For the formulation of a development plan for a district with regional disparities, it would be necessary to make a critical assessment of present economic trends. Regional markets are one of the contributors to economic trends. Market is commonly viewed as a space for economic exchange of goods achieved by monetary transactions. Thus Market plays a progressive role in regional development especially ,in the rural areas where the location and spatial connectivity of the market institutes the overall impact on economy These exchanges in market not only influence the local economy but regional development as well for identifying spatial significance of markets in development. Sangli district is predominantly a rural area, an agricultural sector with more than seven hundred villages actively participating in weekly hats, monthly markets or agricultural market societies. The district is one of the significant regional market places in Maharashtra, where wholesaling and trading of agricultural goods take place such as Turmeric, Sugarcane, and grains like Jawar. Pomegranates and grapes produced in this district are exported to foreign markets as well. However inadequate rainfall of monsoon and frequent drought conditions hampered the development of agriculture, particularly in the drought prone areas of district. As a result economic activities and economic development are very unevenly distributed in the space economy of Sangli. Certain areas in district have relatively high levels of development while others have low levels of development or no development at all. The paper would inquire in the contribution of Sangli in development of economic space for development. The study would also highlight the role of markets as an indicator of development and the connectivity of markets as trading posts.

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1572 EMPOWERING STAKEHOLDERS FOR IMPROVED WATER GOVERNANCE: A STUDY OF WEST BENGAL, INDIA

ABSTRACT

The world is facing a global water crisis challenged by increased demand, pollution of water resources and poor water management. Many districts in West Bengal, India including South 24 Parganas and Birbhum, are affected by diminishing water reserves and exposure to contaminants like arsenic, salinity and fluoride in the groundwater system. While the Public Health Engineering Department, Central Ground Water Board, United Nations Children’s Fund are already working on improving the condition, it is important that the community and stakeholders take up the responsibility of accessing safe drinking water. Stakeholder empowerment and risk communication are essential for successful participatory water governance. It dates back to the Dublin Principle at the International Conference on Water and the Environment, 1992 and stakeholder engagement preserved in the concept of integrated water resources management. The prerequisites towards effective stakeholder empowerment include stakeholder mapping, risk communication and information sharing. Governments, citizens, end users, private actors, donors and financial institutions, as well as infrastructure and service providers, all have a stake in the outcome of water policy and projects. Because of the highly fragmented nature of the water sector, the role of water governance and stakeholder engagement in formulating and implementing solutions to the world’s criticalwater challenges is receiving increasing attention. The objectives of this research include creating awareness about the spatial dimensions of water insecurity, both qualitative as well as quantitative, stakeholder mapping to identify core stakeholder functions, information sharing amongst all stakeholders, designing solutions involving the local communities and the local governance to resolve water issues. The methodology consists of questionnaire survey in sample households to assess water problems, enlisting water sources and water quality parameters, information sharing, focus group discussion involving various stakeholders to design and develop solutions to resolve water issues. The paper would thus highlight the importance and scope of stakeholder empowerment for effective water governance.

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1649 PARTICIPATION OF TRIBAL WOMEN IN SELF HELP GROUPS FOR THEIR SOCIO-ECONOMIC DEVELOPMENT AND WOMEN EMPOWERMENT IN HEZAMARA R.D.BLOCK OF WEST TRIPURA DISTRICT: A GEOGRAPHICAL ANALYSIS

ABSTRACT

Self-Help Groups (SHGs) under Swarnjayanti Gram Swarozgar Yojana (SGSY) is one of the important poverty suppression programmes in India. It helps the women to realize and exercise their inner strength as well as to directly address rural poverty. Basically in tribal community the poverty level is too high than the other community. Tripura is a tiny and hilly state in the North-East India with an area of 10,491.69 sq.km of land. The total population of the State of Tripura is 36, 71,032 as per 2011. About 31.1 percent of the total population of the state belonged to tribal population as per 2011 census. Diverse 19 (nineteen) ethnic groups have been residing in the State of Tripura. Recently the tribal population of the state were engaged in economic activities by forming SHGs in Tripura. The present study tries to find out the impact of tribal women participation in Self Help Group (SHGs) with empowerment indicators i.e. economical, social and cultural aspect. The study has been conducted in Hezamara R.D. block selected in West Tripura District. A Random sampling techniques have been used for the study. A total of 558 members from 55 SHGs 10 Per cent have been randomly selected for this purpose. From the study it was found that participation of tribal women in SHGs directly help in their socio-economic development and also enhanced empowerment in all respects.

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RS12.3. Rural Development

1647 EMPOWERMENT OF POOR RURAL TRIBAL WOMEN THROUGH SELF- HELP GROUPS: AN APPRAISAL OF MANDWI RURAL DEVELOPMENT BLOCK, TRIPURA, INDIA

ABSTRACT

Achieving equal participation of Women in the national development is not merely a question of providing some special concessions or launching of some special programmes for them, rather facilitating their collective action on issues of relevance for their empowerment is sought to be the key factor around which every women movement and empowerment practice has to be organized and directed. In this context SHG as a strategy has been proved to be an effective alternative not only to facilitate women to realize and exercise their inner strength but also to directly address rural poverty. The group serves as a basis of mutual help, cooperation and joint action. The members, gradually, in the process of SHG’s functioning, gain confidence to turn their group strength into individual strength to deal with their marginalization and vulnerability. Present study would highlight the structure, functions and activities of SHGs as an instrument of women empowerment operating in tribal poor women of Mandwi block and at the same time the socioeconomic background of the members of SHGs and the impact of SHGs on the member’s life. The present study followed both exploratory and descriptive research method. The unit of analysis for the present study is the women members of SHGs. The method adopted for data collection is interview method and tools adopted are Interview schedule was used for primary data collection from members of the SHGs. Access to credit can help in expansion of material base of women by enabling them to start and expand small businesses, often accompanied by market access; the women also experienced ‘Power within’: feelings of freedom, strength, self identity and increases in levels of confidence and self-esteem.

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RS13.1. Social Integration

1194 STUDY ON THE BARRIERS AND CHALLENGES FACING THE MOST VULNERABLE PEOPLE INCLUDING ETHNIC MINORITIES TO ACCESS SSNPS IN BANGLADESH

ABSTRACT

Social Safety Net Programmes (SSNPs) are defined as non-contributory cash and in-kind transfers that aim to reduce and prevent vulnerabilities of the poor people. SSNPs are recognized as an important tool for reducing extreme poverty and vulnerability in Bangladesh. SSNP beneficiaries are mainly the poor segments. The nine SSNPs i.e. Old Age Allowance (OAA), Allowances for Financially Insolvent Disabled (AFID), Allowances for Widowed, Deserted and Destitute (AWDD), Vulnerable Group Development (VGD), Vulnerable Group Feeding (VGF), Food-for-work (FFW), Monthly Allowance for Poor Lactating Mothers (MAPLM), Primary Education Stipend Project (PSEP) and Female Secondary School Allowance Programme (FSSAP) are very important in Bangladesh. Social Protection is a constitutional obligation for Bangladesh. As the constitution illustrate it shall be a fundamental responsibility of the state to attain the basic necessities of life including food, clothing, shelter, education and medical care (Article 15 [a]). But a significant number of poor citizens are still facing troubles to access the SSNPs. So, for better management of SSNPs in Bangladesh, an in-depth investigation about the barriers and challenges facing the most vulnerable people including ethnic minorities to access SSNPs in Bangladesh is needed. Considering these circumstances a study was conducted at the Bangladesh-India border district Dinajpur and Joypurhat during January to April 2017. The major objectives of the study were - to identify the gaps in and barriers which vulnerable people face in accessing the selected SSNPs due to systems, structures, and practices; to formulate the recommendations for reducing or removing the barriers. Therefore, to meet the objectives of the study both qualitative and quantitative methods were used for data and information collection. The broadly used methodologies were included: (i) comprehensive literature review of all relevant documents and policies; ii). Focus Group Discussions (FGD), iii). Key Informant Interview (KII), and iv) Case studies. The study conducted 32 KII, 20 FGD with 200 adults and collected 5 case stories. The study exposed that the status of accessing SSNP supports by the poor indigenous communities of the study areas is not reasonable up to now. Poor people, especially those, belong to the indigenous communities were still facing huge problems in getting enrolled in the SSNP schemes. The challenge lies in the targeting and selection of the beneficiaries, participation of the indigenous communities in the overall SSNP process, and budget allocation. The lack of appropriate policy and rules for the indigenous community in accessing SSNPs along with the role of the duty bearer in-terms of accountability and transparency were also considered as the important determinant in this regard. The SSNP services should be implemented at field appropriately following the guidance of policies, involving the representative from CSOs, NGOs, Ethnic group and beneficiaries. The selection process should be transparent and target people should be well informed timely. The SSNP services should have free from any political influences and nepotisms. Considering market price and demand, the rate of allowances should be increased. Moreover, Government of Bangladesh should properly follow National Social Security Strategy 2015 for ensuring the social security of vulnerable peoples.

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1195 SPATIAL PATTERNS OF HOUSEHOLD ENERGY POVERTY DYNAMICS IN MOZAMBIQUE, 2002-2015

ABSTRACT

We analyze the spatial evolution of household energy consumption patterns in Mozambique, a typical low-income, high-growth country in Africa. To this aim, we use 3 extensive household surveys, covering about 7.500-10.000 households over the period 2002 – 2015, to describe changes in energy consumption behavior under influence of income growth, electrification and urbanization. In addition, we use newly collected micro data for 2015, covering almost 1000 households across 19 neighborhoods within the Maputo metropolitan area, to analyze with more detail the dynamics of energy consumption, including the role of urban mobility in energy poverty incidence. We provide descriptive statistics to describe the evolution of energy poverty in relation to income poverty, we analyze spatial patterns of energy poverty and we identify the role of urbanization in the observed trends. We develop poverty lines based on the energy expenditure share, energy consumption in physical quantities and share of modern energy fuels. We calculate poverty incidence curves (i.e. cumulative distribution functions) for each of these poverty lines, while distinguishing between urban and rural areas. We calculate the degree of energy poverty inequality across the country by means of Gini and MLD coefficients. Furthermore, we calculate the evolution of spatial variation in energy poverty incidence over time by means of a sigma-convergence analysis. We use regression analysis to explain (changes in) energy poverty incidence across space by exploring spatial variation in household income (expenditures), population density and distance to larger cities, roads and the coast. We find that, in general, energy poverty incidence levels are lower for energy poverty than for income poverty, except for energy poverty measured in terms of modern energy, which is still extremely high in Mozambique. Over time, energy poverty is decreasing when measured in terms of energy consumption and modern energy share, but increasing in terms of energy expenditure shares. The latter is especially manifest in rural areas. Comparison of the results based on national data and with own survey for Maputo, reveals that the national households surveys grossly underestimate urban energy poverty incidence by largely ignoring the substantial role of fuel consumption for urban transport in energy poverty incidence rates. Finally, we find that spatial variation in energy poverty is larger than in income poverty, and that spatial variation in energy poverty is higher across urban than across rural areas. Spatial variation in both energy and income poverty increases over time, except for energy poverty in terms of expenditure shares. The decrease in spatial variation of energy poverty in terms of expenditure shares is especially strong across rural areas. Key words: Energy poverty, residential energy use, spatial patterns, developing countries, urbanization.

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1268A SPATIAL PERSPECTIVE ON INCOME INEQUALITY DYNAMICS IN DECENTRALIZING INDONESIA

ABSTRACT

This paper studies income inequality dynamics in Indonesia since 1960, with a focus on the period 1987-2015. We do so at different levels of spatial aggregation: i) national level (in international perspective); ii) regional level (islands and provinces); iii) individual level (income classes). Our analysis at the (cross-)country level and province level covers the period 1961–2015, while our analysis for income classes is based on micro data (Susenas) for the period 1987-2015. This approach allows us to present new insights into the story of inequality dynamics in Indonesia. Indonesia is the 4th most populous country in the world and currently undergoes rapid socio-economic changes. In recent years, economic development in Indonesia is characterized by high economic growth and a rapid increase of overall income inequality. However, we show that from an international perspective, inequality in Indonesia – as measured by the Gini ratio – used to be exceptionally low and relatively stable for a long period of time, until about the year 2001. Also, we show that in terms of the Gini index, the degree of inequality in Indonesia still is much lower than the leading ASEAN countries, emerging countries and African countries. We argue that this historical low level of inequality is (partly) caused by government interventions in the economy, which continued until at least the liberalization era of the early 1980s. Meanwhile, we find that Indonesia is catching up to ASEAN and emerging countries in terms of per capita GDP. From a regional perspective, we measure income inequality in terms of expenditure per capita, expenditure for food per capita and expenditure for non-food per capita using four indicators: Gini index, Theil index, Ratio P90/P10 and Decile Dispersion Ratio. Interestingly, we find that – despite the increasing inequality at the national level – the spatial variation of inequality across provinces is persistently decreasing over time. In contrast, variation in income inequality across Indonesia’s islands is increasing over the last decade – suggesting the existence of increasing spatial disparities along a geographical dimension. From the individual perspective, we find that the rapidly increasing interpersonal inequality in Indonesia is mainly driven by strong income growth at the top of the income distribution – and this is true for all provinces and islands. In other words, we find that the rich, rather than the middle class, gained most from globalization and decentralization processes in Indonesia during the observed period of 1987 to 2015. The middle class grew only relative fast during 2005–2015, while the poor are persistently left behind in terms of income growth. We also find that the highest income classes in the relative poor provinces experienced a substantial higher income growth than the lowest income classes in the relative rich provinces. Together, these trends lead to the conclusion that on average the relative poor provinces catch up to the relative rich provinces, while at the same time interpersonal inequality in Indonesia is rising at all levels of spatial aggregation – with individual income growth being strongly positively correlated to individual income level.

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1315 SHARING ECONOMY, HOUSING RIGHTS AND SUSTAINABLE DEVELOPMENT

ABSTRACT

Sharing economy platforms like AirBnB have caused an enormous shift in tourist habits as well as in housing prices in some cities. The impact of house sharing in housing rights because of the rise of rental prices in tourist places has moved several cities to find solutions that try to balance the potential of peer-to-peer economy with urban planning to preserve housing rights, urban mobility and social integration. The technological and transnational dimension of sharing platforms call for new approaches to urban planning capable for dealing with the issues that arise. Also differences in the type of offers (individual or multiple owners, occasional or professional operators...) require different approaches. Some cities are starting to study and plan how to deal with gentrification and housing rights, specially those of vulnerable groups (elderly, low income...), facing with an exponential increase of houses used for tourist purposes that change neighbourhoods and economic activities expelling traditional dwellers. This paper tries to identify the problems for urban planning that come from house sharing and how legal changes have to be put in place in order to balance the different stakeholders. Cities are looking for innovative solutions to the challenging triple-crisis of economy, social division, and environment and an insight in the benefits and difficulties of some of the proposed measures will be given (registration, limitation in the number/days of offer, taxing...).

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RS13.2. Social Integration

1166 INTEGRATING RURAL WOMEN THROUGH SELF HELP GROUPS IN ASSAM

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ABSTRACT

Self Help Groups have emerged as a significant collective microfinance unit of economic production in rural areas. It has been seen as a common source of economic stability for rural women across the state of Assam, India. With changing socio-economic systems women tend to lose their traditional economic role in the agriculture and other handicrafts and handloom production in the neo-liberal market. An effort has been created for collective assistance to promote traditional and rural based products to balance economic prosperity and environmental sustainability. Through the initiatives of the state, micro-financing through self help groups has gained a momentum in securing the lives of rural women and integrating her into the contemporary economic system. The paper is an attempt to observe micro-financing rural economic activities of women through self help groups and its effects in creating better socio-economic and political conditions for rural women. The study examines the access to the financial benefits provided by the state through self help groups by women and its utilization on economic liabilities and assets. It surveys the engagement of rural women into various activities like handloom and food processing and acquiring material assets for living. The study observes the process of rural women creating her identity as an economic asset and also a political significance to the society.

Key words: Self help groups, rural women, microfinance, economic stability, identity, integration, liabilities and assets.

INTRODUCTION

Rural women in Assam have been traditionally engaged in both household activities and agricultural activities (Saikia, Gogoi & Lekharu, 1986, pp.12-13). These include domestic chores like cooking, cleaning and washing to working in the fields. The productive significance of an Assamese rural woman is seen in both non-economic (domestic chores) and economic activities, which not only comprise of being an agricultural labour but in various other activities like weaving, sericulture, food processing, liquor processing and other allied agricultural and animal husbandry activities. However, there has been a transformation in these roles played by the rural women with changes in the market systems, including education levels, socio-economic levels and technology (Baruah, 1992, pp.22). There is constant effort hence to provide a platform to enhance traditional rural activities and empower rural women into the contemporary economic system.

The role of Self Help Group (SHG) comes here as a boost to the rural economy empowering especially women through the help of micro-financing or a small credit based system. This concept of small credit to tackle poverty especially in the rural areas was first introduced by Prof. Md. Yunus who pioneered the first Grameen Bank in Bangladesh. The effect of SHGs on women has been seen throughout Bangladesh in examples like the Jobra Mahila Samity, a cooperative effort through which banks provided reasonable credit and further providing assistance in organizational framework for collective action and self realization (Chowdhury, 1989, pp.147). Another such credit distribution was seen in Jamalpur Women’s Programme which gave small credits and necessary training to the disadvantaged landless women to become economically self-reliant and socially stable (Chowdhury, 1989, pp.98). A similar structure of microfinance was adopted in India too to reduce poverty and to mobilize women to achieve self reliance. In the case of Assam this movement observed a trace in the group approaches like the Development of Women and Children in Rural Areas (DWCRA), Integrated Rural Development Programme (IRDP) and most importantly the initiatives of National Bank for Rural Development (Devi & Upadhyay, 2008, pp.825). NABARD was set up as a development bank under the Md. Yunus Model to tackle rural poverty (Shandilya and Kumar, 2012, pp.22).

Micro-financing in India had a variety of government and non government organizations practicing micro finance schemes and in spite of all failures and success stories the main objective of empowering the poor and mainstream into development has grown significantly (Shandilya and Kumar, 2012, pp.5). The NABARD was formed to refinance rural financial institutions for promoting rural economic activities and in 1992 it further launched the active partnership of SHG-Bank Linkage Programme with the help of RBI (Chauhan, 2004, pp.14). This saw major rise in number of SHGs nationwide (Selvam, 2005, pp.113). Although, the SHG-Bank linkage models are broadly of three types, i.e. NGO based SHG model, the Bank-NGO based SHG model and the Bank based SHG model (Chauhan, 2004, pp.34); the study area comprised only of the third category.

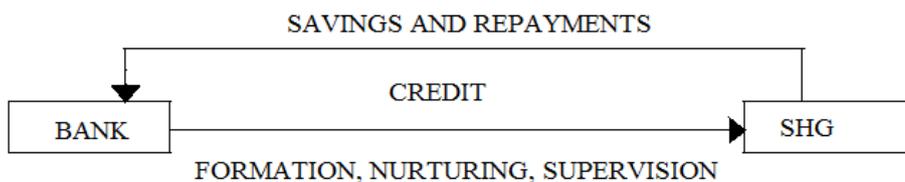


Figure 1: Bank based SHG model (Chauhan, 2004, pp.34)

A self help group has been defined as a small and informal association of poor having preferably similar socio-economic back ground and who have come together to realize some common goals based on principles of self help and collective responsibility. There are two major roles of a SHG. These are firstly to establish credit worthiness by poor especially women and secondly the ability and potential to empower the women members (Shandilya and Kumar, 2012, pp.39-40).

OBJECTIVES OF THE STUDY

To analyze the existing poverty through the socio-economic conditions of the women in Self Help Groups (SHGs) and their consequent pattern in the credit and repayment of loans through micro-finance.

To observe the growth in empowerment of women through economic stability and further promoting social and political participation.

STUDY AREA

The study was undertaken in two villages namely Duliajan village and Joypur village located in Dibrugarh district of Assam, India. These villages were chosen due to their locational value of Duliajan village to be in the periphery of Duliajan OIL Town, a growing industrial area and Joypur village in Naharkatiya which is 13kms away from Duliajan. Both the villages are 42kms and 58kms from Dibrugarh town which is the second largest town in Assam.

DEMOGRAPHIC INDICATORS	DULIAJAN	JOYPUR
Total Population	2529	3833
Sex Ratio	964	932
Total Literacy	86.11%	89.24%
Female Literacy	81.39%	84.85%
Female Work Participation	13.59%	16.03%

Figure 2: Demographic Indicators of Duliajan village and Joypur Village (Census, 2011).

METHODOLOGY

A purposive random sampling was used to collect responses from members of women SHGs in both the villages. The study sample targeted all rural women who were an active member of any SHG for a period of at least 5 years. In Duliajan village from a total of 10 SHGs, catering to 148 women a total sample of 75 was collected. Whereas, in Joypur village out of a total of 7 SHGs, catering to 83 women a total sample of 42 was collected. Thus, the sample had a total of 117 responses.

The study was collected through a prepared questionnaire which was held on the months of Dec’17 to Jan’18. The responses were collected from door to door and at monthly meetings all SHGs of the village which was held on the 8th of Jan in Duliajan village and 16th of Jan in Joypur village. Attending weekly gatherings and conducting participatory rural appraisal (PRA) on Wednesdays and Saturdays gave more insights on the daily activities of the groups.

ANALYSIS AND FINDINGS

Socio-Economic Profile of women in SHGs

The study observed a difference in socio-economic conditions prevailing in Duliajan and Joypur villages, which was perceived by taking selective indicators of housing (building materials), land owned (in husband’s name), monthly income of the respondent, monthly income of the family, level of education and health status in the past one month. These indicators were selected and modified from the study taken by Frances Sinha’s poverty assessment (Sinha, 2009, pp.9). The poverty assessment from these indicators showed that women under SHGs in Joypur village lived in more poverty than Duliajan village. There was significantly higher percentage of women living in very poor, poor and marginal groups in Joypur, compared to Duliajan. However, Duliajan had more women in the group of “not poor”.

POVERTY CONDITIONS	1. VERY POOR		2. POOR		3. MARGINAL		4. NOT POOR	
	DULIAJAN	JOYPUR	DULIAJAN	JOYPUR	DULIAJAN	JOYPUR	DULIAJAN	JOYPUR
HOUSING	Mud walls, mud floors, thatched roof		Mud wall, concrete floor, tin roof		Semi pucca wall, concrete floor, tin roof.		Pucca House	
	14 (18.67%)	8 (19.05%)	6 (8%)	7 (16.67%)	10 (13.33%)	12 (28.57%)	45 (60%)	15 (35.71%)
LAND (husband owned)	Landless		1-2 bigha		2-5 bigha		More than 5 bigha	
	8 (10.67%)	10 (23.81%)	21 (28%)	21 (50%)	12 (16%)	8 (19.05%)	34 (45.33%)	3 (7.14%)
SELF INCOME (Rs per month)	No Income Or upto 500		500- 1000		1000-5000		more than 5000	
	37 (49.33%)	10 (23.81%)	22 (29.33%)	15 (35.71%)	14 (18.67%)	17 (40.48%)	2 (2.67%)	0 (0%)
FAMILY INCOME (Rs per month)	Less than 5000		5000-10000		10000-20000		more than 20000	
	6 (8%)	9 (21.43%)	15 (20%)	12 (28.57%)	26 (34.67)	16 (38.18%)	28 (37.33%)	5 (11.90%)
EDUCATION	Upto primary		Upto secondary		Upto higher secondary		Higher education	
	5 (6.67%)	8 (19.05%)	38 (50.67%)	24 (57.14%)	24 (32%)	7 (15.67%)	8 (10.67%)	3 (7.14%)
HEALTH (last one month)	Any birth diformity or disorder		More than 7 days illness or fever		1-2 days Chronic fever, flu, etc		No illness	
	0 (0%)	0 (0%)	9 (12%)	12 (28.57%)	20 (26.67%)	12 (28.57%)	45 (61.33%)	18 (42.86%)

Figure 3: Poverty conditions of women in SHGs of Duliajan village and Joypur village by their socio-economic profile.

The housing conditions of Duliajan village and Joypur village was observed by the building materials of the walls, floors and the roof. Although, this may not directly reflect on the poverty conditions of the woman, but it gives an idea of the family’s living infrastructure. It was observed that household usually tend to concretize their floors first and then proceed to build concrete walls, thus the classification of poor and marginal housing conditions have been categorize accordingly. Thus, it was seen that houses in Dualiajan had a slightly skewed difference of pucca houses (60 per cent) and poor mud houses (18.67 per cent). This was however not the case in Joypur village as the houses fairly distributed among the categories , with only 35.75 per cent with pucca houses, 28.57 per cent in marginal semi pucca houses having concrete floors and 19.05 per cent in mud houses. The housing condition in Joypur village was more homogeneous than the skewed differences in Duliajan village, where many had build pucca houses. This difference can also be observed in case of land

ownership. But, since no women had land in their own name, the study took the amount of land owned by her husband or her father. Land ownership in a village is an important economic condition as villages mostly indulge in agriculture. A similar skewness was observed in Duliajan village indicating better economic conditions of the people here. Landlessness was observed to be 23.81 per cent in Joypur and households here concentrated at 28 per cent having 1-2 bighas of land. While, households in Duliajan face 10.67 per cent landlessness there is a striking concentration of 45.33 per cent which owned more than 5 bighas.

The economic stand of these household could be measured by the income of the family and also the individual's income which shows her own economic significance in the household. Interestingly, women in Duliajan were majorly (49.33 per cent) not involved in any economic activity, 5000/ per month, but with a mere 2.67 per cent even earning more than Rs5000/ per month. But in case of Joypur women were 40.48 per cent were involved with some kind of activity earning between Rs1000/- Rs5000/ and another 35.75 per cent between Rs500- Rs1000/ per month. However, there was not a single case earning over 5000/ and 23.81 per cent wasn't involved with any economic activity. Nevertheless, it was observed that the same household income varied when it came to family income as a whole. Here, 8 per cent and 21.43 per cent households earned less than Rs 5000/ in Duliajan and Joypur respectively, with 37.33 per cent and 11.9 per cent earning more than 20000/ per month and falling in the non poor category. Though, a significant number of 34.67 per cent and 38.18 per cent households were observed in the marginal category respectively.

Educational level of women in both villages seems to have only a negligible difference in all categories, with a major population of women studying up to secondary level of education. This comprised 50.67 per cent and 57.14 per cent in Duliajan and Joypur respectively. In the rest of the categories of educational level Duliajan fares slightly better results. It was seen that in spite of a very few women completing their higher education, neither of them were illiterate and at least had some kind of primary education. The health conditions of all women surveyed majorly had no illness in the last one month, which are seen to be 61.33 per cent in Duliajan and 42.86 per cent in Joypur. Also, neither case had any kind of birth deformity or disorder. However, the conditions of women in Joypur had a poorer health in comparison in all categories.

Thus, it can be said that socio-economic conditions of women in SHGs of Duliajan village was much better in comparison to Joypur village. Accordingly, a poverty index is calculated from the z-scores of all six indicators the scenario to see these differences more clearly. Here, it shows a high of 30.97 of Duliajan village as not poor, with Joypur village only 5.43. Both the villages have significant and almost equivalent scores in poor and marginal category. Joypur village has its highest of 19.02 in poor category. However, in the category of very poor conditions Duliajan village has a slightly higher score of 6.56 than 5.72 of Joypur village.

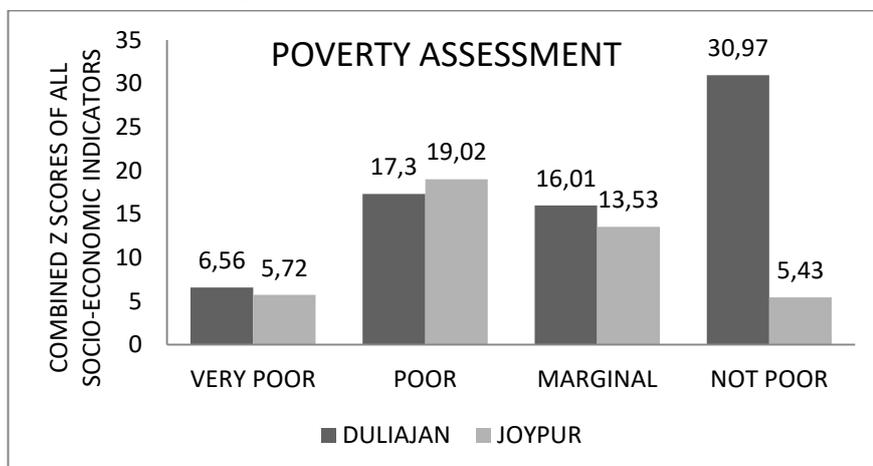


Figure 4: Poverty Assessment of women in SHGs of Duliajan village and Joypur village by calculated z-scores of all socio-economic indicators.

Reasons for credit and Repayment of Loans

The role of SHGs is to forward small amount of credit to needy borrowers, here women members of SHGs. These women form groups of 5 to even 30 members to accumulate some kind of wealth and use to lend to each other. Since, all the SHGs in the study follows the Bank based SHG model, here the SHG themselves conduct regular and orderly meetings where views are represented, decisions are taken for mechanism of financial and social discipline and implementation of the decisions made (Chauhan, 2004, pp.35). This involves the amount of loan, savings and interest of the money dealt among them. In the case of loan repayment there are two ways or stages of the SHG- internal borrowing (within the group members) and external borrowings (loan from banks) (Sinha, 2009, pp.119). External borrowings are often received as micro finance credits through banks under the supervision of NABARD, when the SHG reaches a self sustaining level or point. These borrowings by the SHG women are mostly (95 per cent) repaid on time as per NABARD annual reports (Sinha, 2009, pp.121).

With rise in micro-financing women have been encouraged to take loans in small amount and repay in time with minimum interest values (Premchander, 2003). Hence, all women surveyed during the study had once or the other taken some kind of loan after becoming a member of some SHG. However, this study puts focus on the reasons for taking this

credit, i.e. where is it invested or used. The responses varied vastly across village economic activities, some non-traditional activities and some even for emergency or personal development. The study identifies these reasons for credit into two categories namely investment in assets and investment in liabilities. Credit used for investing in something or some purpose which shall generate income or maximize the credit value to gain profit output may be termed here as assets, while investing in those activities which has no output and may burden the individual under debt maybe considered as liabilities. Nevertheless, not all investment in economic activity or assets may necessarily increase income (Mayoux, 2003, pp.31). Assets included investment in poultry, animal husbandry, buying seeds/ plant saplings for cultivation, buying sewing/weaving products, learning and setting up beauty parlours and also inputs in some kind of trade. Liabilities included repayment of former loans, paying bills, education fees of children, any health crisis, building house, buying household goods and conducting any ceremonies or rituals.

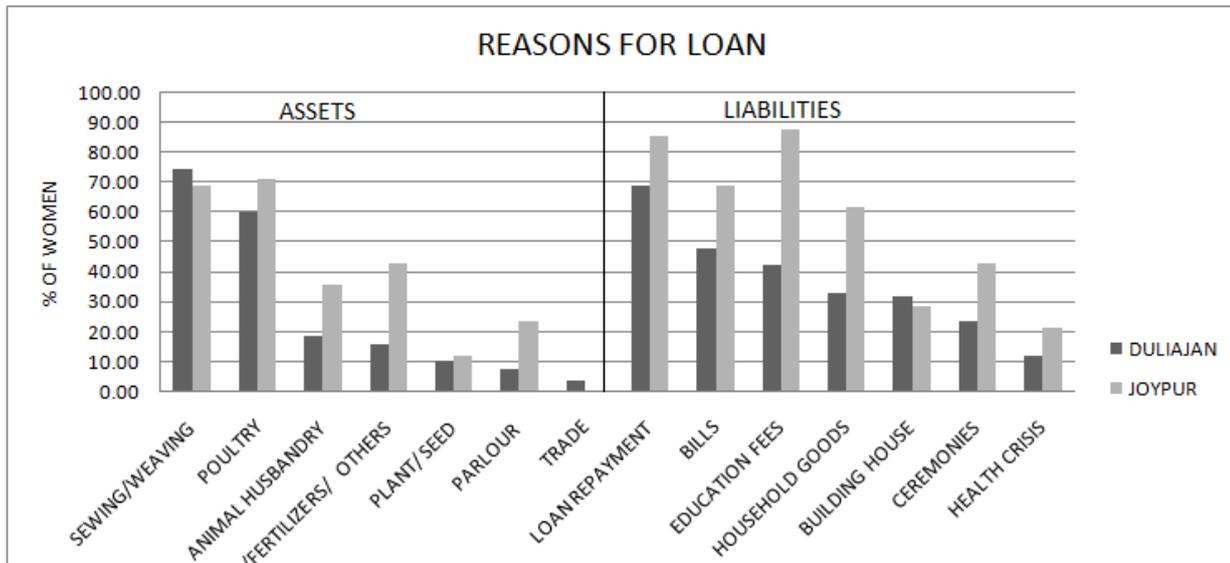


Figure 5: Reasons for Loan taken by women in SHGs of Duliajan village and Joypur village.

It is observed that more number of women especially in Joypur village was using their loan money in liabilities like education fees of children, repaying former loans from bank or other informal sources, electricity and water bills and other daily uses. In Duliajan women were comparatively using less of their loan money in these activities of which repaying loans was the highest and similarly other uses too. However, in case of building houses women here was somewhat utilizing her loan money more than in Joypur village. Nevertheless, in case of asset investment the engagement of women in weaving and sewing, poultry farming and animal husbandry was significantly high in both the villages. More so, women in Joypur village invested more in assets too. As economy here is more traditional and rural based women are significantly engaged in investing in agricultural inputs like pesticides and fertilizers and also animal husbandry than in Duliajan village. However, in case of Duliajan investment was prominent in weaving, which was observed to be more professional and practiced in collective way. Due to the potential urban market for traditional clothing women of the neighboring Duliajan village has managed their weaving activities for commercial gain and enjoy better profits. However, an overall observation shows that loan credited is significantly higher in Joypur, both for utilization in assets and liabilities.

The purpose of credit taken may directly affect the existing poverty level of the women or it can also be a result of the level of poverty she is already in for which she has taken credit from the institution. However, regression values for showing dependence of the amount of loan taken to the income of the family may be positive yet with a little significance. In the case of Duliajan the amount of loan taken by women in last 6 months had a positive relation of 0.35, while in the case of Joypur it had a poorer relation of 0.29.

Credit taken from any institution which can be from SHGs collection or directly through bank (SHG-Bank linkage) must be repaid with minimum interest in some given time which usually ranges from three month to twelve months according to the amount of loan take. These can be paid through installments or whole. Portfolio At Risk (PRA) is the standard measure indicating risk of default (Sinha, 2009, pp.135). The observed PRAs were not more than two month for all the cases. Out of 5 defaulters 2 in Duliajan village had said the delay was caused as their houses were being constructed. These two women were building pucca houses and had a month family income of more than Rs15000/-. Their husbands were employed in the neighboring Oil India Limited. However, the other 6 defaulters including the 3 from Joypur village were unable to pay as they had taken the loans to cover a medical emergency or a pending loan repayment. These women belong to families of agricultural labourers, small farmers and construction labourers. Thus, there are those that willfully default and those that find it difficult to repay due to poverty (Sinha, 2009, pp.121). As most of the respondents agreed to have paid all their loans and some were due and delayed to pay in time, the study put focus on the source of repayments of loans. This way it could observed economic expansion of wealth and reduction of poverty of the respondent.

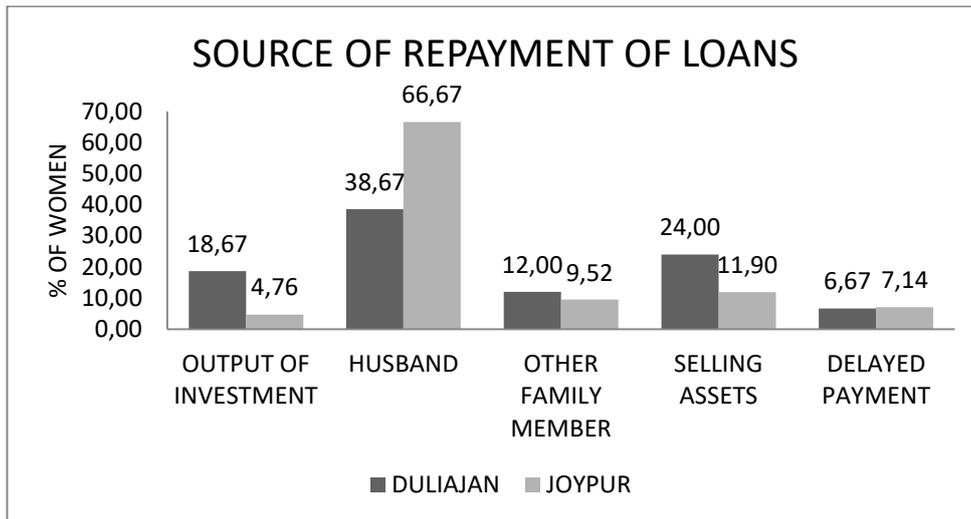


Figure 6: Source of repayment of loans by women in SHGs of Duliajan and Joypur villages.

Source of repayment of loans were identified as repayment from the output of investment, borrowed from husband, borrowed from other family members or relatives and friends, selling assets and the rest had delays in their payment. It was clearly observed that a majority of the women had repaid their loans by borrowing money from their husbands which was 38.67 per cent in Duliajan and a very high of 66.67 per cent women in Joypur. Meanwhile, repayment through output of investment was only 18.67 per cent in Duliajan village and 4.76 per cent in Joypur village. A 24 per cent and 11.9 per cent women from the villages accordingly sold off their acquired assets to pay off the SHG loan.

This suggested that loans taken were not being able to generate wealth among women those had taken loan under SHGs. They had to rely upon their husbands or any other relative or friends for repaying any of these loans. There is a heightened stress among women resulting to turn to assistance from husbands (Kabeer, 2010, pp.223). Retrospective of the earlier finding that many of the women had invested their credit loans to spend on liabilities, it is answerable that money taken as loan is utilized to cover for earlier debts and day to day spending. And at the time of repayment these borrowers rely on others especially husbands to repay their debts. This should further suggest the dominance of the husband upon the wife due to her economic dependence, but observations spoke of a mutual economic understanding between the husband-wife and the economic significance of the women with rest of the family. Loans granted to the women was used to fulfill the current needs of the household which included a vast array of day to day necessities from household goods to paying bills and fees and to contribute in building a house for the family. In many cases where the family income may not be stable or fluctuate due to delay of wages and salary, loans generated through SHGs have kept families surviving even in the worst situations. Thus, wealth flow to run the household is not just brought in by the male head but also the earlier dependent women who were not incurring any income into the family. As a result, there are many families where the male heads have encouraged the women of their household to join SHGs. The women may not be a direct generator of wealth in the family, but through SHGs she has integrated herself to the economy of the contemporary market and elevated her economic significance in both family and society.

Another observation projects those women in collective effort of commercializing their activity here 20 women involved weaving and 10 women selling momos in Duliajan had agreed to have repaying their debts through profit maximization. Therefore, collective efforts were seen to have fared better economic expansion than individual undertakings. Thus, according to Chauhan SHGs in a collaborative effort can be more sustainable and successful than those formed for shorter gains or here individual uses (Chauhan, 2004, pp.25and65).

Empowerment through Self Help Groups

The question of empowerment can be a debatable issue depending on the definition used. Women empowerment is defined as “a bottom-up process of transforming gender power relations, through individuals or groups developing awareness of women’s subordination and building their capacity to challenge it” (Reeves and Baden, 2000, pp.35). As per the Beijing declaration, “women empowerment and their full participation on the basis of equality in all spheres of society, including participation in the decision making process and access to power are fundamental for the achievement of equality, development and peace”. It is seen that empowering rural women is frequently generalized with poverty alleviation, while gender issues are overlooked as mere cultural (Mayoux, 2003, pp.13-14). Accessing micro-finance by rural women contributes to the household by adopting an economic activity or by becoming a financial channel for her household, which signifies her increased role in decision making.

However, empowerment in patriarchal rural circumstances would mean women hardly have any control over deciding and directing the loans she obtains and its purpose, which only enhance individual economic position over those dictated by familial requirements. The goal of SHGs in enhancing credit access and savings among rural women have not necessarily resulted in wealth expansion, but have provided her to take up day to day household economic activities and subsequently economic significance in the household. At times of need her credit money acts as a current monetary backup to tackle daily financial crisis. Thus, repayment by her husband’s or other family member’s money is a circulation finance within the household. Even though, micro-financing through SHGs have mainly taken care of the practical need

and not strategic needs; women have gain a significant productive status within the household but not necessarily empowerment (Shandilya and Kumar, 2012, pp.194). Moreover, increased income not necessarily empower women but may simply add more hours of work to her already burdensome domestic work and also have no control over her earnings (Dixon-Mueller, 2013, pp.5). Thus, the status of women is elusive in nature and can be defined as women’s access and control over material resources of food, income, land, wealth and also social resources like knowledge, power and prestige (Dixon-Mueller, 2013, pp.194) within family and society.

The study asked the following question to get a brief idea of the empowerment that women in SHGs had in the two villages. The following questions were answered in Yes or No.

- i. Does your husband or any other family member give you suggestion or decide upon the usage of your loan credited?
- ii. Have you taken loan on the say of your husband or any other family member?
- iii. Does your family encourage your involvement in SHG?
- iv. Does your family give you time for attending SHG meetings and activities?
- v. Does your family give you time for attending any training programmes?
- vi. Do you sell your product by yourself?
- vii. Have you/ do you plan to take part in political activities- like village panchayats and women’s organizations?
- viii. Does your family support your involvement in politics?

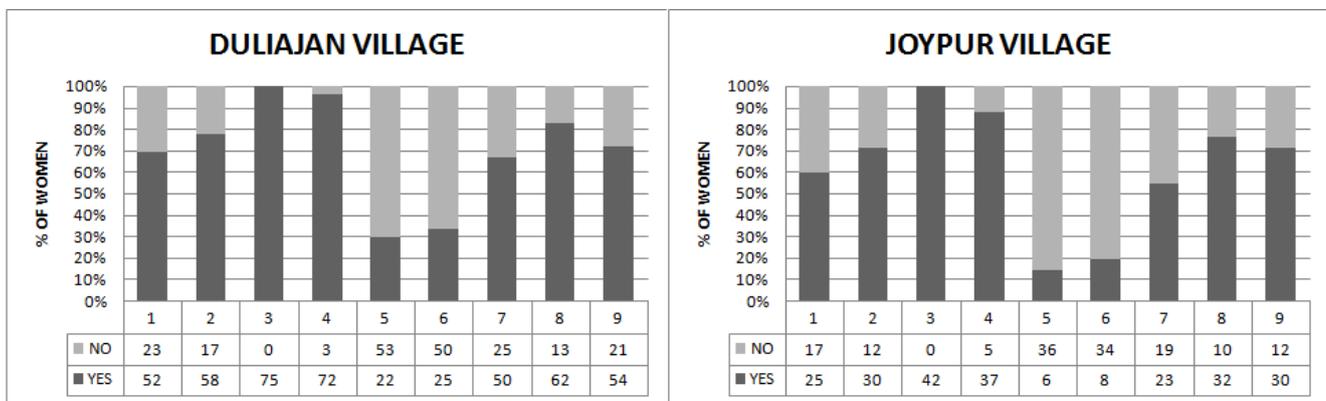


Figure 7: Responses to empowerment by women in SHGs in Duliajan village and Joypur village.

Both villages show a similar pattern overall with marginal differences. 69.33 per cent and 59.52 per cent of women in Duliajan village and Joypur village take opinion of their husbands and other family member for the purpose of utilization of loans given to her and more over 77.33 per cent and 71.43 per cent women in each of these villages are insisted to take loans from SHGs. They are persuaded by other members of the family to access these benefits given through SHGs. So is the case that everyone of the respondents were encouraged by their family members to be actively involved in the activities of the SHG like weekly meetings, gatherings, etc. and a major of 96 per cent and 88 per cent families of the women had given the time to participate in them. However, when asked about the time given by the family to be involved in training activities, they were considered unnecessary and time consuming. In Duliajan village only 29.33 per cent had allowed their women to attend training programmes, including 33.3 per cent had some form of training. This was poorer in Joypur village with only 14.29 per cent women allowed for training programmes including just 19 per cent with some training. Further, it is observed that all women may not be involved in selling their own produce that she has generated by SHG activities. The sale of products like milk, eggs, meat or cloth involves taking them to market or negotiating with buyers. Even though, a 66.67 per cent in Duliajan and 54.76 per cent women in Joypur village have been selling their own product, but the rest still relies on the male members of the family to do the negotiations especially in activities like selling woven clothes and seasonal food processing. The role of SHGs is not just to make a woman economically and socially stable but further promotes political status. Thus, a good number of women- 82.6 per cent and 76.19 per cent in Duliajan and Joypur village accordingly have shown some interest or actively participating in political activities of the village panchayats or other women’s organizations. However, only 72 per cent and 71.43 per cent women in these villages have the support of their family members to be involved in any kind of political activities.

According to Amartya Sen “Women are less likely to secure favourable outcomes for themselves in household decision making process. They feel that their long term security lies in subordinating their well being to that of male authority figures” (Shandilya and Kumar, 2012, pp.128). The observations show that women have been greatly encouraged by members of her household to be involved in SHG activities. But autonomy of the woman may not prevail as the access and purpose of utilization of the loans are often decided or influenced by the male members of the family, especially the husband. The support to women in SHGs may only be for financial gains for current monetary help for household or expand wealth which is too controlled not by the women but by her husband/ male family member. This is evident by the sale of produce by them and as found earlier in the utilization of credit in household activities and liabilities. Mayoux in her study too observes that even those who have profited out of their invested activity were not necessarily actual users of loans accessed in their names (Selvam, 2005, pp.128). If encouraging women in SHG was done for empowering women’s

capabilities than they would have also supported and promoted some form of training programmes for more efficiency. Studies explain that entrepreneurial skills achieved from skill training and counseling input promotes progress and success (Chauhan, 2004, pp.10). However, the study area showed poor interests in any such kind of training for women.

Thus, empowering women in a patriarchal society is of greater challenge than simply giving financial aids. In the process of change towards women empowerment there is a need for participatory process of not just women but the support of men too in ensuring flexibility for women's aspirations and loosen the constraints of contextual and organizational processes (Mayoux, 2005). The first priority must now be more on to bring women out of the vicious cycle of poverty or more specifically put forward by Mona Khare as "vicious cycle of economic status"(Shandilya and Kumar, 2012, pp.217) of Low income generation to Low savings to Low Investment Capacity to again Low income generation. SHGs have been in a way helping women to be engaged in daily financial struggles, but through proper management, training and education of both men and women the goal of empowering women shall be fulfilled.

CONCLUSION

Rural women have always been a part of the village economy, but recognizing and valuing their work in economic terms has become difficult in the contemporary market system. SHGs have now attempted to capture these activities and channelize them into economic strength of these women and integrating into the system as well. This is through micro-financing with other self managerial ability to be an independent as well as a collective economic unit. However, there are various disparities formed in this process by the existing economic status within these women and differential pattern in integration is thus observed.

The poverty assessment of the two villages shows that poverty level of Joypur village was higher than Duliajan village. Duliajan village which lie in the periphery of an industrial town gets the benefits of urbanization, with many of residents employed in the town. There is a rapid construction of houses and a flourishing market for home produce. However, there is an observation of increasing disparity in poverty levels with many women either falling in the "not poor" category and others in "very poor" category. This is not in case of Joypur village though, as women have been more or less equally distributed in the three poor categories and very few only being "not poor". Women in SHGs here have seen a boost in weaving in a collective and commercial arrangement. Weaving is also popular among women in Joypur village, but have not been managed efficiently to gain proper returns. This results from the poor training experience achieved by the SHG women as these may hamper their time for other household chores. Even though women have been encouraged to be involved in SHGs they are not provided the time needed for professional caring out of activities. Training opportunity gives women a secondary chance to complete their education or knowledge (Kabeer, 2010, pp.78). Those few women who have organized themselves and are caring out professional weaving have received training to do so and they basically come from "not poor" category of Duliajan.

Furthermore, loan utilization in assets and liabilities also decides growth of wealth. As a majority of women use their loan money in household financial necessities like education fees of children, bills and earlier loan repayments, the loaned money doesn't grow with profit. Although, women tend to invest loaned money into assets and profit expansion activities, the money used for liabilities exceeds the wealth growth in most cases. And these cases often live in the vicious cycle of poverty. With no profit, repayment of loans are repaid by husband's/ other family member's money or by selling assets. Moreover, many a times these loans are taken in the suggestion of the husband/ other. The flexibility in autonomy of the woman is lost in control over loan and its repayment. Yet still empowerment can be accounted in the emergence of the woman being a significant mode to access finance to run the household. Even if so she is not fully empowered to have total autonomy, she is an economic asset to the household. There is first a need to bring women out of the vicious cycle of poverty to enable her to become economically viable.

Integrating rural women would necessitate her to establish her importance in her household and then in the market. SHGs have enabled women to provide the current money to afford the emergency needs or investing in small scale economic activities. They are assisted by their male members of the family for overall household gains, but the need to expand for profit would need training and management. Due to lack of time for such training programmes women usually lack the skill to carry out these activities. Household support only for monetary gains hampers women's empowerment to access these skills. She is burdened by chores and with no support these economic activities would only add to her work hours. Thus, integrating women through SHGs would require the cooperation of both men and women. Micro-financing women through SHGs is gradual but effective process, as there are different women in different economic categories and each need to be addressed separately to nurture them for growth and empowerment.

REFERENCES

- Baruah, S. L. (1992). *Status of women in Assam*. OMSONS Publication. New Delhi.
- Chauhan D.S. (2004). *Community administration in self help groups success defined*. Army Printing Press. Lucknow.
- Chowdhury, A.N. (1989). *Let grassroots speak: people's participation, self help groups, and NGOs in Bangladesh*. Manohar publications. New Delhi.
- Devi, T. M., & Upadhyay, N. (2008). Social Mobilisation for Empowering Rural Poor through SHGs: A Study in Assam. *Indian Journal of Public Administration*, 54(4), 823-849.
- Dixon-Mueller, R. B. (2013). *Rural women at work: Strategies for development in South Asia*. Routledge.
- Kabeer, N. (2014). *Gender & Social Protection Strategies in the Informal Economy*. Routledge. New Delhi.
- Karmakar, K. G. (1999). *Rural credit and self-help groups: micro-finance needs and concepts in India*. Sage Publications India Pvt Ltd.
- Mayoux, L. (2005). *Sustainable Learning for Women's Empowerment: Ways Forward in Microfinance*. Practical Action Publishing. Rugby.

- Premchander, S. (2003). NGOs and local MFIs—how to increase poverty reduction through women's small and micro-enterprise. *Futures*, 35(4), 361-378.
- Reeves, H., & Baden, S. (2000). *Gender and development: Concepts and definitions* (Vol. 55). Brighton: Institute of Development Studies.
- Saikia, P. D., Gogoi, K., & Lekharu, A. (1986). *Indian Rural Women: A Study on Role and Status of Rural Women in Assam*. Mittal Publications. New Delhi.
- Selvam, S. (2005). *Empowerment and social development: Issues in community participation*. Kanishka Publishers. New Delhi.
- Shandilya T.K. and Kumar A.(2012). *Micro Finance and Rural Development*. Deep and Deep Publications, New Delhi.
- Sinha, F. (2009). *Microfinance Self Help Groups in India: Living Up to Their Promise?*. Practical Action Pub. Warwickshire.

1369 URBANIZATION AND FEMALE WORKFORCE PARTICIPATION RELATIONSHIPS IN INDIA

ABSTRACT

Introduction: The process of urbanization can be termed as the process of transforming agricultural economy into non-agricultural economy as well as transformation of rural cultural setup to urban cultural setup. This transformation effects different group of people differently. Traditionally females are backward in terms of social freedom and employment. As economic freedom and social freedom are deeply interconnected thus participation of females in economic activities is important for their social status. **Need for the study:** In India, studies analysing the census data conclude that female workforce participation in urban areas is lower than in rural areas but theoretically it should be opposite one. The studies which correlates the urbanization rates to female work participation rates lack in two more ways: one, they do not show the variability of female work participation rates given the same amount of urbanization at different regions and secondly, what are the different variables that explain this variability. Our study will try to fill up this knowledge gap. One aim of the study is to develop new statistical techniques of measurements to analysis such datasets. The study combines a spatial dimension to the demographic analysis by showing spatial distributions of the facts. **Objectives:** Three objectives have been chosen and they are; first, to study the correlation between urbanization and female workforce participation at different states; second, to identify the impacts of some factors (regarding female demographic characteristics) which may have played some role on the extent of female participation in urban workforce thirdly, the spatial distribution of the above mentioned factors. **Data base:** The study has been done at national level taking district as study unit. Districts have been taken for the study based on the same amount of increase in urbanization from census 2001 to census 2011 (within 99% confidence interval). **Methodology:** In the first stage, Correlations between temporal increase in urbanization and temporal increase in female workforce participation for each study unit have been calculated. This shows: 1% increase in urbanization in a particular district is associated with how much amount of change in female workforce participation within that district. In the second stage, it was tried to analyse the different levels of change in female workforce participation rates (given the same amount of change in urbanization rate) with the help of four factors namely, sex ratio (a crude indicator of female status in society), female literacy rate, marital status and fertility rate. Correlations will be calculated between female work participation rate on the one hand and sex ratio, female literacy rate, marital status and fertility rate on the other hand respectively. In the third stage, Spatial distribution of all the above results was plotted on maps to observe spatial pattern of distribution. **Findings:** The conclusion is that the levels of female work participation increase with the same amount of urbanisation increase can be explained by other female demographic variables. But the impacts of different demographic variables on work participation rate given the same amount of urbanization are not same all over India.

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1635 EARMARKING/ IDENTIFY PARAMETERS OF JUDGEMENT FOR ENHANCING LIVABILITY OF URBAN SPACES IN CITY REGIONS

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ABSTRACT

To map and augment the liveability of urban spaces, different sets of judgment parameters have been identified and applied since the history of urban planning initiated. Since 5th century BCE, applied by Hippodamus, diverse pool of elements have been identified to augment the liveability of urban spaces. These spaces have been examined, organized and reorganized in the works of F.L Wright, Ebenezer Howard, Fredrick Olmsted, and in the early 20th century, all the ideas culminated in the Work-Folk-Place triad of Sir Patrick Geddes. But till date, very few researches have been done in tapping Indian context of urbanization and liveability. India, as the fastest urbanizing country, need to have identified parameters of judgment, corresponding to the urban context of developing countries. Thus, contextualizing recipes of happiness as per the urban scenarios of Indian cities can help to tap the current scenarios and also enables to come up with the prospects to augment urban spaces. Moderation of 6 recipes of happiness, namely, **Joy** can be explained as the basic ability to survive delightfully, **Health** as the ability to live based on sustained survival, **Freedom** as the ability to exercise self-autonomy and self-respect. As the cumulative result of the first three elements can help to achieve the fourth parameter **Resilience** which denotes the ability to reach a higher threshold of self-security and to move further, thus, paved the way for implementation of the fifth element called **Equity**, which denotes the ability of the society itself to realize and co-share self-esteem. Securing all these five elements leads to the final stage of social connection, which promotes to establish transparent networking and enhanced **social connectivity**. The first three elements Joy, Health, and Freedom act as a tool to secure the basics of survival and advances towards securing liveability. Finally, a livable resilient urban space can march towards enhancing livelihood through the rhythm of equity and transparent networking.

Key words: Liveability, Parameters of Judgement, Urban Happiness, Urban space

1 INTRODUCTION

21st century witnesses the wave of urbanization in developing countries of the third world. Rapidly urbanizing countries like India witnesses spreading of the cities in the form of conurbation, organic and hardly planned development. Gradually, protruding city sphere encroaches lands towards the village areas. Expansion of the city sphere attracts human resources migrating towards the CBD and increasing population pressure on urban space became the reason behind the haphazard growth of the city or vice-versa. Discrepancies in managing the growth of the urban sphere further acts to hinder the development of the emerging societies. These rapidly emerging urban areas receives minimal attention to its physical and social infrastructure and also in maintaining the livelihood. In developing countries like India a very brief study has been done on maintaining the liveability of the chosen city sphere that reflects directly on the emerging urban spaces.

Thus to tap the liveability conditions of these rapidly expanding cities, this paper revisits different concepts of urban planners elucidated and sieved through the urban scenario of India. The exploration of ideas, started from the grid city planning of Greek city Miletus by Hippodamus, through various proliferations like the ideologies of 'form follows functionality' of F.L. Wright, concept of 'Garden city' of Ebenzer Howard, Frederick Olmsted's 'Ecosystem planning' and all these ideas matures in the hands of Sir Patrick Geddes's 'Work-Folk-Place' triad. Finally, in case of judging contemporary urban spaces and the liveability parameters of rapidly growing and transforming cities, 6 principles of urban happiness by Charles Montgomery has been moderated as per the context of Indian cities. Hence, this paper will evaluate the existing urban planning concepts and parameters and therefore moderated the 6 recipes of happiness to best fit to explore the liveability conditions of Indian cities.

2 LITERATURE REVIEW (CONCEPT OF LIVEABILITY AND URBAN SPACE THROUGH THE AGES)

In literature review, planning and mapping for liveability concepts are revisited and elucidated as per the contemporary context. To reach the ideology of recipes of urban happiness, varied earlier approaches are probed into depth to find the solution for the contemporary urban spaces. Since history of urban dwelling and planning has developed, western countries shows their inclination towards approaching their space in a more scientific and organized manner. Managing of urban space in order to optimize locational facilities like solar power, wind power, optimization of connectivity as per the best purview of geo-terrestrial positions put forth for implementation.

2.1 Hippodamus (Greece)

The very first instance of urban planning in order to secure the liveability and happiness of the citizens found in the city Greece.

Hippodamus arranged the buildings and the streets of Miletus around 450 BC such that the winds from the mountains and the sea close to Miletus could flow optimal through the city and provide a cooling during the hot summer (refer figure 1). Hippodamus first applied the grid plan which he had developed on inspiration from geometrically designed settlements, and that later many cities were laid out according to this plan. Miletus, is a fine example of the grid plan, comprises houses on blocks created by streets and side streets crossing at right angles, with public buildings in the city center, This plan retained in the Hellenistic period, however in the Roman period it began to deteriorate gradually and inevitably (Lahanas, 2002).



Figure 1. Grid plan of the city Miletus conceptualized by Hippodamus

2.2 F.L Wright

Initiated in 450 BCE, urban planning has matured in pre-modern and modern period in the ideologies of Frank Lloyd Wright, Fredrick Olmsted, and Ebenezer Howard. All these ideas promote the relationship between urban spaces, man and nature has reached its zenith in the ideas of Patrick Geddes. Concepts of nature into design and considering man nature and their economic activity in nurturing urban space design was addressed by Geddes. F.L Wright's idea of sustainable urban design has initiated the idea of incorporating nature into urban design.

F.L. Wright's concept of sustainable design starts with revisiting the idea or the philosophy of Organic Architecture, which maintains that 'the building must develop out of its surroundings and blends well in the environment.' The philosophy emerges from Sullivan's believe 'form follows function'. He tried to integrate space into a unified whole (Jain, 2012). He believed that, – association with nature aided to personal, spiritual and even physical well-being. Described as having an intuitive understanding of social and human needs; designed to human scale. He put forth nine principles of architectural design (New Architecture: Principles) for sustainability and livelihood that consists of nature, organism, forms and functionality, beauty, tradition, ornamentation spirit etc.

Nature is the first component towards building a happy urban space. Here, nature not only means –landscape clouds, trees, storms, the terrain and animal life, but refers to their nature as to the nature of materials or the –nature of a plan, a sentiment, or a tool. A man or anything concerning him, from within (Kimberly Elman).

Organic refers to entity, integrated to the natural inlay of the space itself and thus entity reflects through organic components indigenous to the space Organism further promotes the forms to follow functions to make the space pulsating and dynamic.

The component **beauty**, refers to a quality. Organic architecture sees actuality as the intrinsic romance of human creation or sees essential romance as actual in creation. So romance is the new reality. Creativity divines this.

Different trajectories of tradition proceed to retain a sense of socio-cultural continuity. It bears the creative capacity as tradition is derivative of the first and original style.

Ornament as an integral element of architecture efflorescence of a tree or plant is to its structure. It binds the emotionality and if ornament is well-conceived the character of structure can be revealed and enhanced.

Combination of all the above elements invokes spirit to the concrete. Spirit is used in reference to the inner not the outer substance. Hence, created lively, pulsating, acceptable and sustainable spaces.

2.3 Ebenezer Howard

Ebenezer Howard came up with the idea of Garden cities in 19th century London (and other cities) which bears the marks of industrialization, and the cities were exerting massive forces on the labour markets of the time. Massive immigration from the countryside to the cities was taking place with London compared to "a tumor, an elephantiasis sucking into a

gorged system[s] half the life and blood and the bone of the rural districts" (Lord Rosebery). Thus, Howard...sought "how best to provide the proper antidote against the greatest danger of modern existence" (St. James's Gazette, 1892).

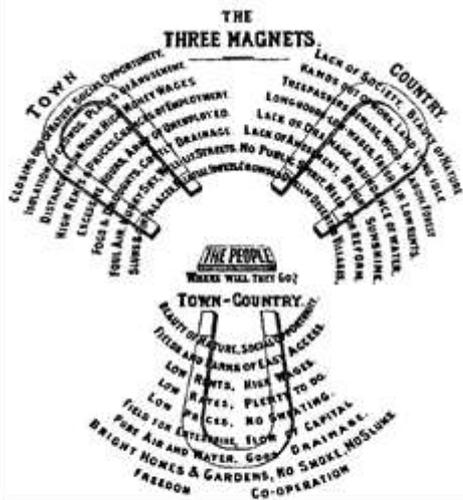


Figure 2. Concept of three magnets Town, Country, and town-country of Howard

His idea of The Three Magnets compares the 'town and country magnets' as shown in figure 2, but decided that neither were suitable attractors for his utopian vision. Instead he believed that "Human society and the beauty of nature are meant to be enjoyed together" – his solution "the two magnets must be made one."

He believed that "Human society and the beauty of nature are meant to be enjoyed together" – his solution "the two magnets must be made one." His idea of de-centralization promotes the principle of "always preserving a belt of country". Hence a city has reached capacity a new one must be founded outside the agricultural belt. The off-shoot city would grow organically, a ward at a time. Eventually there a central city (of perhaps 58,000 inhabitants) would be surrounded by a number of smaller off-shoot cities, connected by railroad and canal infrastructure.

2.4 Fredrick Olmsted

On the other, to illustrate the points Olmsted's belief, three points can be mentioned, namely,

- A. Contemporary green infrastructure theory and practice: ecosystem services and human well-being;
- B. Environmental restoration
- C. Comprehensive planning.

Identified by the President's Council on Sustainable Development as one of the five strategic areas providing a comprehensive approach to sustainable community development, green infrastructure encompasses both natural and engineered green space across spatial scales (Dunn, 2010)

Sustainable urban space design demands green infrastructure encompassing both natural and engineered green space, resulting in "an interconnected network of natural areas and other open spaces that conserves natural ecosystem values and functions, sustains clean air and water, and provides a wide array of benefits to people and wildlife . . . in short, our natural life-support system." The idea of green infrastructure networks are natural, social, cultural elements that juxtaposed to ensure the comprehensive ecosystem services, which also ensures support, regulation, and cultural benefits to people.

2.5 Patrick Geddes

Patrick Geddes promotes the ideology of combining work, folk and place (refer figure 3) to assure successful integration of man, nature and ways and means of their livelihood closely knitted to that particular space. Patrick Geddes explained an organism's relationship to its environment as follows:

"The environment acts, through function, upon the organism and conversely the organism acts, through function, upon the environment." (Cities in Evolution, 1915). In human terms this can be understood as a place acting through climatic and geographic processes upon people and thus shaping them. At the same time people act, through economic processes such as farming and construction, on a place and thus shape it. Thus both place and folk are linked and through work are in constant transition. He adopted Spencer's theory that the concept of biological evolution could be applied to explain the evolution of society, and drew on Le Play's analysis of the key units of society as constituting "Lieu, Travail, Famille" ("Place, Work, Family"), but changed the last from "family" to "folk". In this theory, the family is viewed as the central "biological unit of human society" from which all else develops.

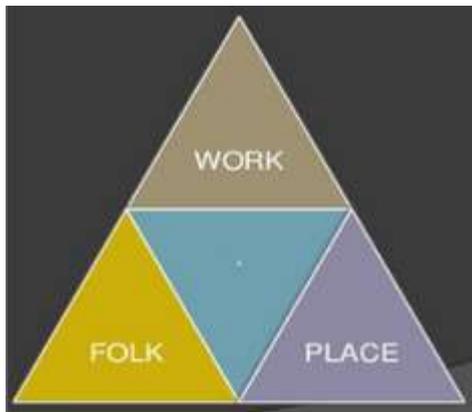


Figure 3. Work-Folk-Place triad of Patrick Geddes

According to Geddes, it is from “*stable, healthy homes*” providing the necessary conditions for mental and moral development that come beautiful and healthy children who are able “*to fully participate in life*”. Assuring the presence of all the three elements promotes space a plot to synthesize human aspirations, his activities to maintain livelihood by retaining the originality of the space.

3 LIVEABILITY AND URBAN SPACE DESIGN IN DEVELOPING COUNTRIES

Considering all the philosophical notions, proliferated and implemented to some extent to make a space better for the stakeholders and to enhance the liveability of urban space mostly done considering the context of the developed countries. To deal with the rapid urbanization of the third world developing countries like India, the present imageability, background and regulations needs to be studied in light of their socio-cultural and economic set-up. Only a proper involvement with the current scenario will enable to moderate the ideas of urban planners to mitigate urban dichotomies.

To cope with the growing urban issues The Government of India along with the various State and Local Governments is implementing several flagship Urban Missions. An overarching goal of the various missions and schemes is to make Indian cities more ‘Liveable’. As can be seen in figure 4 that the Ministry of Urban Development (MoUD) has developed a set of ‘Liveability Standards in Cities’ to generate a Liveability Index and rate cities. Figure 4 shows the index where liveability standards are bifurcated into four pillars, namely, Institutional, Social, Economic and Physical, which shares the weightage of 25%, 25%, 5% and 45% accordingly.

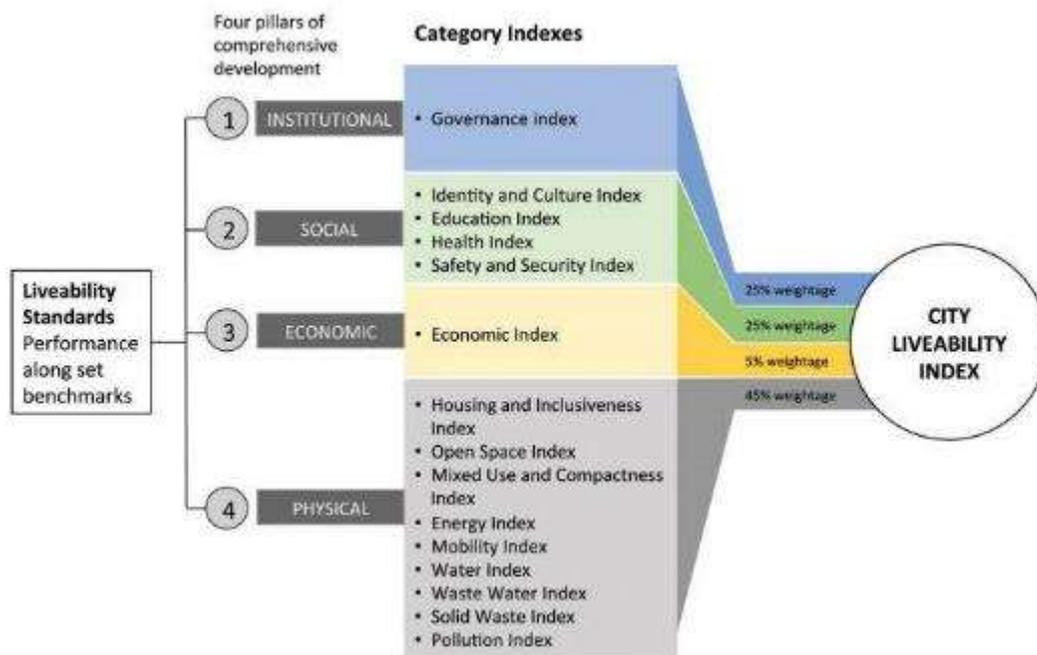


Figure 4. Liveability pillars and category Index

According to Ministry of Urban Development (MoUD) cities are comprised of more than just buildings and people. The most “liveable” cities in the developed countries are now concentrating on conforming green zones, water bodies, and public spaces as the parameters of urban design – and to preserve and promote their culture. As the world’s cities continue to grow, continuing to value green space in cities is vital: but is also a challenge, particularly in developing nations where there is pressure for space, resources and development. Therefore, a set of categories have been identified under the four pillars of Institutional, social, economic, physical levels of comprehensive development to address all the spheres of urban development.

As the physical infrastructural pillar in India has received the highest weightage of 45%, it also assures the most affectability on judging the liveability of a space. Various steps can be taken to enhance the physical indicators that directly affects imageability. Hence, restoration and reuse of historic buildings, promoting and maintaining ecologically important areas, availability of green spaces, availability of public and recreational places, share of mixed land use area in overall city land use, density of the place defines the liveability of the space.

4 URBAN SPACE AND LIVEABILITY IN INDIA: PROBLEM IDENTIFICATION

Rapid and haphazard growth of most of the Indian cities destabilized the bearing capacity of urban areas and created the problem like space crunch and influx of huge population and thus, social-cultural-infrastructural collapse.

Studies been done on the major problems of rapidly increasing Indian cities identifies the critical areas that demands immediate consideration. It aims to focus on some critical areas which have a close connection with the concepts of inclusion, indigenoussness, resilience and authenticity of the city. Physical infrastructural issues have consistently been of concern to policymakers (e.g. urban housing, services and transport), as well as issues which have recently emerged (or, re-emerged) and captured the imagination of urban stakeholders (e.g. revitalization of historic districts within cities, security and social inclusion). The major concerns of present urban places of developing countries like India includes the problems with urban infrastructure, urban housing, inadequate transport system and retaining the historic connection and tradition of the places.

Urban housing, infrastructure and service delivery report says, over 80 million poor people live in the cities and towns of India. This is mainly a result of heavily distorted land markets and an exclusionary regulatory system that fails to accommodate the needs of the poor, or adequately address the challenges of slums, informal settlements and pavement dwellings.

Next, mobility is a serious challenge in most Indian cities and towns, mainly due to inadequate transport infrastructure, and an unbalanced economic structure aided private transport to grow, and little integration between land use and transport planning. However, public transport is increasingly coming into focus, with a range of options being tried, from improved and environment-friendly bus services, introduction of bus rapid transit, and the development of metro rail systems. National Urban Transport Policy adopted in 2006 has focused on the integration of transport and land use planning and Transit-Oriented Development is slowly becoming a strategic focus in several key cities, such as Delhi.

Pressure of urbanization on urban land and services, also has a significant bearing on the older/historic areas within cities, often leading to deterioration and decay, as well as the loss of harmony and a sense of place. Unfortunately, this dimension of live ability is frequently neglected by Policy-makers as developments in the countries of the third world only concentrates on monuments, or remains of monuments, or at the most, sites or complexes containing a number of monuments or other historic structures (Steinberg 1996).

5 PARAMETERS TO JUDGE LIVEABILITY AND URBAN HAPPINESS

To judge the liveability and condition of urban happiness a set of parameters can be identified through investigation of its social, cultural, physical and institutional sphere. A happy place is a space that can transmit a feeling of happiness to anyone who uses it. Both tangible and intangible characters of the place can make a place liveable and happy to the stakeholders. Physical and socio-cultural rootedness of a space have created its tangible and intangible characters accordingly and both of these are equally important to retain the sense of place. The identity of a place means – as defined by Kevin Lynch – a set of characteristics that make the place unique and recognizable. The uniqueness of an urban space and architectonic elements are attributed by – namely tangible – and by elements connected to the perceptions.

- i. It is important to be a space 'age-friendly', encourage the use of the place by people of different age groups.
- ii. A public space should allow and encourage different types of functions (games, breaks, walking, etc.). A particular area can be designated for such activities.
- iii. The possibility of performing actions that normally are not permitted, such as walking barefoot in the water or in designated public areas, creates a feeling of freedom and joy.
- iv. The composite elements of the space should have an appropriate balance between the elements of nature, landscape and equipment.
- v. The presence of water in different shapes (e.g. fountains) promotes the vitality and create emotions in a place.
- vi. The presence of art in its different forms is desirable. Art constitutes a factor that is able to cause emotions favoring a condition of happiness.
- vii. A public space should have natural lighting during the day and artificial at other times, it is associated with different actions and allow a condition of safety.
- viii. An adequate state of cleanliness and maintenance must be maintained
- ix. A public space has to give a sense of security and safety to those who walk in it.
- x. The possibility of perceiving naturally occurring smells – e.g. wood, grass, sea – provides a feeling of happiness. Beyond the sound and visual perceptions, the ones of smell also are important for urban happiness.
- xi. The possibility of using the space in different seasons and weather conditions improves its liveability and increases willingness to contribute to its good state of maintenance.

xii. The possibility of using new technology to increase the knowledge about its intangible values and history can offer a more profound experience of the place. The new technologies for Internet constitute adding value to support the knowledge about a place and its use.

6 CONTEXTUALIZATION OF RECIPES OF HAPPINESS

Considering the parameters of livability and happiness in the earlier discussion, contemporary urban spaces can be tapped for betterment of imageability of the spaces. To identify, to promote and to secure happiness, Charles Montgomery's idea of 6 recipes of urban happiness, elucidated in the book called "Happy City" (2013) can be moderated as per the Indian context. Therefore the paper attempts to present the 6 recipes as the parameters to secure and judge the liveability of urban spaces. Montgomery, in his book "Happy City" (2013) explains 6 elements, namely, Joy, Health, Freedom, Resilience, Equity and Social Connection.

Joy is the first elementary variable to initiate the journey from dystopia or sorrow to achieve Happiness. Urban happiness is a concept which can be defined through the observation both of many tangible and intangible aspects of a place and the activities carried out by the people who live and use it. The intangible qualities of a place consist of all the elements that can be perceived by the senses – smell and noise, but also sensations of Visual sight and taste, of its memory, cultural tradition, etc. The tangible elements are related to the urban fabric and a series of morphological, natural, and historical invariants as, colours, shapes and materials become an inseparable part of any one spot in the city, and thus components of the urban happiness.

Health is the element of happiness can be defined as an artificial body of Man, as they no longer use their legs, enclosed in automobiles, perched on escalators. Therefore, Human being as a component of urban space and environment as the larger paradigm need to secure its health. To assure an overall well-being, as psychological, physical, economic development is needed, art is equally a necessity for mental health.

The third element Freedom indicates freedom of choice and the power of control have a deep psychological rootedness in predicting happiness. An empirical investigation that covers over 260,000 individuals from 84 countries during a period of 25 years finds evidence in support of this hypothesis. Democracy and the freedom to choice is important for securing happiness. This freedom can be achieved only if the first two recipes, i.e. Joy and Health is secured.

Combination of the first three elements lead to achieve the fourth parameter called urban resilience. It has conventionally been defined as the "*capability to prepare for, respond to, and recover from significant multi-hazard threats with minimum damage to public safety and health, the economy, and security*" (Wilbanks, T. 2007), or the environmental hazards. Thus, only when the first three Elements of Happiness are achieved, i.e. Joy, Health and Freedom, then only planning for resilience can be successful, as it includes the component of human capability as the core. According to figure 5, individual human capability leads to community resilience and aided to curb vulnerability of a space.

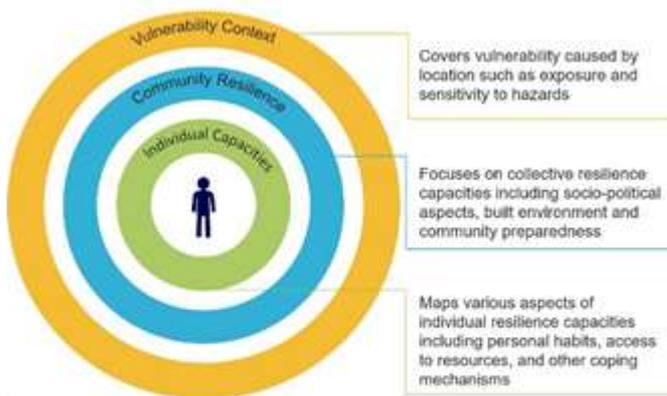


Figure 5. Layers of resilience, from individual, community and vulnerability context

The fifth element, Equity has become an indispensable element of the environmental movement. It helps cities spur development that meets the economic, health, and transportation needs of low-income communities (Martin, Amanda W. 2011). Equity in democracy ensures choice of people, and the major scope to secure the needs.

Finally, humans are social creatures who require connections with other humans in order to thrive. Social connections, such as friendships, relationships with family members and closeness to community, are so closely related to well-being and personal happiness the two can practically be equated.

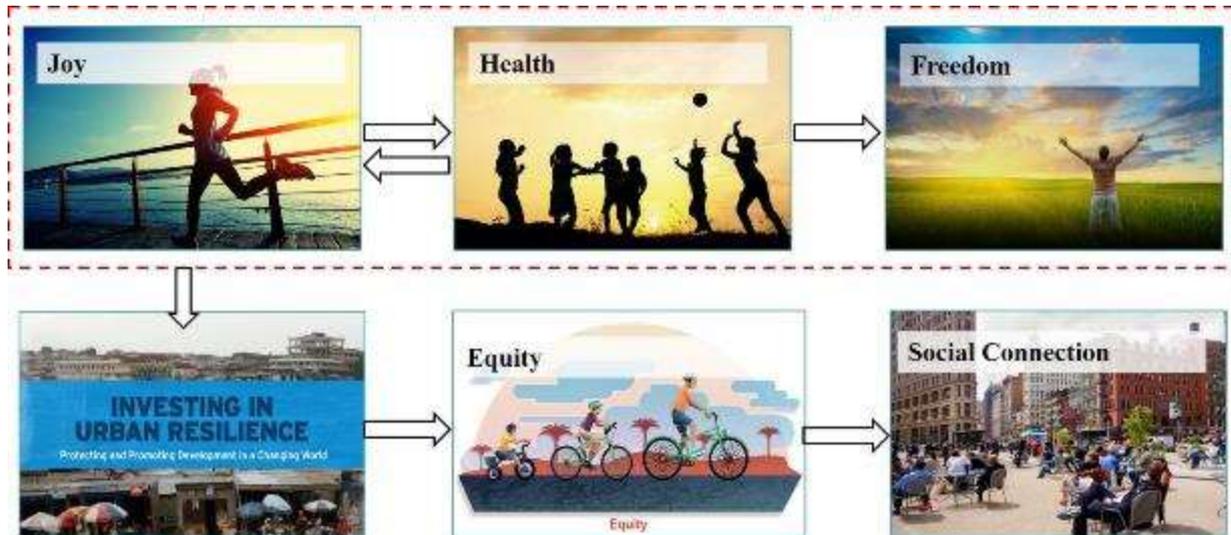


Figure 6. Journey of the six recipes to secure liveability and urban happiness

Thus, contextualizing recipes of happiness as per the urban scenarios of Indian cities can help to tap the current scenarios and also enables to come up with the prospects to augment urban spaces. Moderation of 6 recipes of happiness, namely, **Joy** can be explained as the basic ability to survive delightfully, **Health** as the ability to live based on sustained survival, **Freedom** as the ability to exercise self-autonomy and self-respect. As can be seen in figure 6, the cumulative result of the first three elements can help to achieve the fourth parameter **Resilience** which denotes the ability to reach a higher threshold of self-security and to move further, thus, paved the way for implementation of the fifth element called **Equity**, which denotes the ability of the society itself to realize and co-share self-esteem. Securing all these five elements leads to the final stage of social connection, which promotes to establish transparent networking and enhanced **social connections**. The first three elements Joy, Health, and Freedom act as a tool to secure the basics of survival and advances towards securing liveability. Finally, a livable resilient urban space can march towards enhancing livelihood through the rhythm of equity and transparent networking.

7 CONCLUSION

Despite different positive impacts like, growth, opportunities, job etc. urbanization often brings challenges like infrastructural, operational, maintenance and security. In India, like many other countries, the most obvious one is the increasing vulnerability of urban areas. To cope with the increasing crumbling scenarios, different approaches can be implemented, especially fusing nature into design, introducing green belt, public spaces and by endorsing local socio-cultural phenomena. Publicizing tradition and culture imbue social solidarity to the place and its people, hence, helps to reflect its indigenous character. Therefore to make urban spaces livable and happy presence of visual aesthetics, such as, sculptures, games, or other elements and amenities can be promoted that bring smile to a person's face promotes and indicates the state of happiness. The use urban sculpture in its value for socialization, favors the atmosphere of happiness of the place. The possibility of having direct contact with natural materials, preferably local, used in the design of the space gives a sense of well-being. The possibility of doing actions – such as walking, watching, etc. with a moderate or slow pace promotes opportunities to take breaks in the space. The feeling of being able to contribute to the life of that place increases the sense of belonging. Community activities can be encouraged that allow to vitalize the place and people mutually, creating a perception of happiness and well-being in people who perform the activity as well as in those who observe it.

Place of happiness is sustainable and is not used for the sole purpose of rapid consumption of cultural resources. The principles should not be considered static, but dynamic, in keeping with the increasingly rapid rates of change in a place, which leads to a continually expanding concept of happiness. Public places need to be flexible for adaptation, alteration as per the opinions of the stakeholders, practitioners and administrators to guide the creation or enhancement of happy and sustainable places.

REFERENCES

- Dunn, A. D. (2010). "Siting Green Infrastructure: Legal and Policy Solutions to Alleviate Urban, Poverty and Promote Healthy Communities. Boston College Environmental Affairs Law Review
- Jain, M. (2012, 3 11). Philosophies of F L Wright. Retrieved from <https://www.slideshare.net/fdjaipur/philosophies-of-f-l-wright>
- Lahanas, M. (2002). Town (or Urban) Planning in ancient Greece. Retrieved from Hellenicaworld: <http://www.hellenicaworld.com/Greece/Technology/en/CityPlan.html>
- Alexandra Dapolito Dunn, "Siting Green Infrastructure: Legal and Policy Solutions to Alleviate Urban Poverty and Promote Healthy Communities," Boston College Environmental Affairs Law Review 37, no. 1 (2010): 41–66.
- Mark A. Benedict and Edward T. McMahon, Green Infrastructure: Linking Landscapes and Communities (Washington, DC: Island Press, 2006), 1.
- The Conservation Fund, "What is Green Infrastructure?" 2011, <http://www.greeninfrastructure.net/content/definition-green-infrastructure>.
- Millennium Ecosystem Assessment, Ecosystems and Human Well-being: Synthesis (Washington, DC: Island Press, 2005).

- Michael Hough, "Looking Beneath the Surface: Teaching a Landscape Ethic," in *Ecology and Design: Frameworks for Learning*, ed. Bart Johnson and Kristina Hill (Washington, DC: Island Press, 2001), 245–67;
- John Randolph, *Environmental Land Use Planning and Management* (Washington, DC: Island Press, 2003).
- Sandstrom, "Green Infrastructure Planning in Urban Sweden."
- Benedict and McMahon, *Green Infrastructure*.
- Eugenie L. Birch, "From Townsite to Metropolis," in *Local Planning: Contemporary Principles and Practices*, ed. Gary Hack, Eugenie Birch, Paul Sedway, and Mitchell Silver (Washington, DC: ICMA Press, 2009), 3–22.
- Government of India (2005b). *Jawaharlal Nehru National Urban Renewal Mission (JNNURM): Overview*. New Delhi, Ministry of Urban Development, Ministry of Housing and Urban Poverty Alleviation.
- Government of India (2006). *A supplement to Toolkit on formulation of City Development Plan: Focus on Heritage*. New Delhi, Ministry of Urban Development, Ministry of Housing and Poverty Alleviation.
- Government of India (2005a). *Formulation of a City Development Plan*. New Delhi, Ministry of Urban Development, Ministry of Housing and Urban Poverty Alleviation.
- Montgomery, C., *Happy City*, Penguin: London, 2013.
- Sepe, M., Improving sustainable enhancement of cultural heritage: smart placemaking for experiential paths in pompeii. *International Journal of Sustainable Development and Planning*, 10(5), pp. 713–733, 2015. <http://dx.doi.org/10.2495/SDP-V10-N5-713-733>Lynch, K., *The Image of the City*, Mit Press:Cambridge, 1960.
- Jacobs, J., *The Death and Life of Great American Cities*, New York: Random House, 1961.
- Appleyard, D., *Livable Streets*, University of California Press: Berkeley, 1981.
- Rose, G., Place and identity: a sense of place, In *A Place in the World? Place, Cultures and Globalization*, eds. D. Massey & P. Jess, Oxford: Open University/Oxford University Press, 1995.

1715 SOCIAL INTEGRATION AND SUSTAINABLE REGIONAL DEVELOPMENT THROUGH DESIGN

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ABSTRACT

Throughout this paper we try to understand the way how Design, as a meta-discipline with transdisciplinary skills, may become a useful instrument in the creation and promotion of new practices based on craftsmen and industrial workers skills, achieving design sustainability, social integration and regional development.

We analyze two examples of design practice in Portugal from the seventies to the present, in industrial and handcraft areas. Projects that focus on sustainability with fixation of the local population and even constitute a form of local attraction with the ability to give visibility to the distinctive values of the territory.

Perhaps we do not need special technological know-how to achieve sustainable design, we just need to look at ways that have worked in the past and adapt them to current needs and conditions. We can apply successful examples that can socially and economically transform people, adapting them to other regions or realities.

We can conclude that we need to cross over the new ideas that designers can bring to the skills of workers and craftsmen and find new forms of sustainable design artifacts. The goal is to contribute for the construction of a partnership model between Design, Handcraft Skills and Industrial Techniques that may lead to an increase in the value of local identities, achieving sustainability, social integration and regional development.

Keywords: Design, Sustainability, Social Integration, Regional Development.

INRODUCTION

As Design is about solving problems of different nature, designers can take advantage of the cross-over between "thinking" and "doing", between their design ideas and the skills of artisans and industrial workers. Integrating knowledge of materials from their own experience, approaching vernacular design to material use without nostalgia, creating a sustainable future. In the examples we focus on this paper, designers are finding ways of crossing-over new ideas with old skills and making the best of it: achieving sustainability, social integration and regional development.

Nowadays we speak of cultural diversity and not of globalization when we want to define authentic and non-standardized material culture as being constituted by the dynamics of traditional and popular cultures, erudite and non-erudite, contemporary or vernacular, constantly mobile and cross fertilized. As if we all have a unique and specific contribution to a global culture, to a collective imaginary that does not necessarily want to be 'modernized'.

The following examples of design practice in Portugal go from the seventies to the present, both in industrial and handicraft areas. This projects are based on sustainability with fixation of the local population and some even constitute a form of local attraction with the ability to give visibility to the distinctive values of the territory.

LONGRA INDUSTRY: A SUSTAINABLE ACHIEVEMENT BY DACIANO DA COSTA

We can't speak about Portuguese Design without referring Daciano da Costa (1930-2005). Daciano conceived numerous interior and product design projects of outstanding quality from the early 60's onwards until 2003. His work made him one of the most relevant figures of the twentieth century Portuguese Design. Daciano's interior design and equipment projects already followed sustainability values anticipating one of the main transversal aspect of nowadays design: sustainability.

He has played a pioneer role on design's theory fundamentals in Portugal and an important pedagogic role as teacher. In those days, Daciano brought innovation to the practice and teaching: a modernization of processes, a new perspective on the emerging themes of design such as social commitment and sustainability.

Daciano da Costa believed that designing was providing a service to the community and so designers should assume new social roles towards a sustainable development. On his own practice and teaching he implemented a design process which deals with sustainability and social commitment, searching for simple long-term solutions that could last and fulfil human needs, causing minimum material waste.

Design projects developed by Daciano da Costa can prove that the real dimension of his work greatly exceeds its strict physical function as objects and they take on an eminently social dimension implementing interaction between the interests of the industry and his workers needs and skills, but also with the local resources in a sustainable way. His design thinking successfully operates the mediation between the designer, the industry and the society. Since the early sixties he always tried to develop a close relationship between human systems integration and production systems engineering when dealing with the Portuguese industry.

We can considerer Daciano's working solutions for Longra Industry as 'sustainable' achievement (we must point out that in the sixties this concept was not yet established and meaningful), an innovation anticipating one of the main transversal aspect of nowadays design: sustainability.

Daciano da Costa considered that one of the goals of the designers' practice was to design and produce products that would last in time both for the durability of their materials and for their formal characteristics.

In the example of Longra we can also find its concern with social sustainability through the creation of a new line of furniture that allowed to keep the jobs, thus avoiding the unemployment of many workers by the closure of a section of this factory. Metalúrgica da Longra (1919-1995) was a Portuguese company located in Longra, Felgueiras region, which produced hospital and office equipment. In the 1970s, this industry became a pioneer in the application and development of industrial design in Portugal, a fact that is not unrelated to the close collaboration of designer Daciano Costa (Lage, 2007). For Longra, Daciano was able to develop a production of furniture for domestic consumption, avoiding imports and using local resources that combined durable natural materials with Portuguese technology and traditional craftsmanship. He was able to avoid the unemployment of nearly 100 workers by reusing local technology for new furniture projects by combining durable natural materials with the steel structures that this steel industry normally produced, taking economic advantage and social gains from the human capabilities and local resources that they could have been wasted. Despite being a serial industrial production, he incorporated the Portuguese identity through the use of local long-lived materials, local human resources and technology in a search of what it considered to be the true concept of sustainable social and regional development.

His intervention at Metalúrgica da Longra was decisive to achieve these goals, resulting in the famous line of Cortez furniture and other innovative pieces such as a series of upholstered chairs metal, widely used in audiences of theater and cinema.

At a time when the supply of Portuguese industry was limited and undefined, there was so much to be done. These particular circumstances produced the need for opportunity to design a global project of great coherence: an integral relationship between the nature of production (the deadlines, the means and the processes associated with it) and the cultural, economic and social context. Daciano believed that Design should be set up as the construction of a relationship with users, with those who commissioned it, and even with those who produced it. (Martins and Spencer, 2009)

The commitment to industry was evidenced in the creation of office furniture systems, with the choice of durable materials and the rationalization of industrial production, allowing the reuse of old machines and methods. Daciano's options led to the production of furniture still in use today, due to its simple and timeless forms and the quality of the materials in which they were manufactured.



Figure 1. Daciano da Costa (1970) office chairs produced by Longra.

In the early seventies, Victor Papanek in his book "Design for the Real World, Human Ecology and Social Change", challenged designers to work on social responsibility and that they should propose simple solutions to be used by the whole community. (Papanek, 1972)

Designers need to recognize and play new roles based on the world rapid changes and in the artifacts that are massively produced. Daciano showed an early interest in the rationality and functionality values, which he intended to incorporate in their work, in line with what was happening with other pioneers of modern design abroad (Neves, 2009).

Daciano was involved in the process of understanding the need for a comprehensive integration of human capabilities, social needs and local resources into the design process. He has developed his creative process to reconcile the ingenuity of the designer with the needs of the producer and with the capacities of the workers, but also with the local resources and with durable materials and forms.

We can consider Daciano's working solutions for Longra Industry as 'sustainable achievement' (we must point out that in the seventies this concept was not yet established and meaningful), an innovation anticipating one of the main transversal aspect of nowadays design: sustainability.

Since the early sixties, when dealing with the Portuguese industry, he have always tried to develop a close relationship between the integration of engineering production system with human principles. (Martins e Spencer, 2009).

For several decades, Daciano was a striking figure in the development of a Design Culture, not only because of his project work, but also because of his influence as a teacher and as a promoter of the new project thinking ruled by the principles of Sustainable Design. He criticized the desperate quest for originality and repudiated the effect of immediate culture and "high-pressure success" that encourages useless production and "visual waste" (Costa, 1998). The products he has created maintain the sense of synthesis where complexity is simplified, where tradition is integrated into the contemporaneity within the process of industrial design.

He maintained the desire to adopt the processes of systematic thought and production rationalization. Since the early 1960s, when dealing with Portuguese industry, he has always tried to develop a close relationship between the integration of human principles and the production systems engineering. (Martins and Spencer, 2009)

The design developed by Daciano demonstrates a high technical and methodological control of the industrial product and a distinctive ecological and social awareness, in the sense of an accurate design thinking that operates the mediation between the designer, industry and society.

We can consider Daciano's working solutions for Longra Industry as 'sustainable achievement' (we must point out that in the seventies this concept was not yet established and meaningful), an innovation anticipating one of the main transversal aspect of nowadays design: sustainability.



Figure 2. Longra's stand in Lisbon International Fair (1971)

BUREL FACTORY: SUSTAINABILITY BY THE RE-SIGNIFICATION OF CRAFT TECHNIQUES

Design for sustainability requires generating solutions that are equally beneficial to the society in general and to the communities around us, to the natural environment, and to the global, but especially to the local, economic systems. (Vezzoli e Manzini, 2008; Vezzoli, Kohtala & Srinivasan, 2014)

The *Burel Factory*, a textile industry design project in which Cláudia Albino was involved can be part of this basic principles. Cláudia Albino is a senior designer and assistant professor at Universidade de Aveiro, committed with social Integration and sustainable regional development. She is involved in several projects about this issues, through partnership models between design and handcraft techniques. Her work is based in searching to understand the way how Design, as a meta-discipline with transdisciplinary skills, may become a useful instrument in the creation and promotion of new practices with the ability to give visibility to the distinctive values of the territory.

One of the projects takes place in Manteigas, a region located in the inner center of Portugal near Estrela Mountain. By the end of the first decade of the 21st century, many people in this region were in economic difficulties because they had stopped working on woolen manufactures once they had shut down. The *Penhas Douradas Fashion* project, created by Isabel Costa and João Tomás was undertaken under the motto "Re-creating the past, making it present forever and now". This idea allowed that the old knowledge and the how-to-do of the people of Manteigas could find new applications for their skills, integrating them into a new agglutination project. The main purposes of this project were: to value the skills of the inhabitants of Manteigas, who have lost their jobs in large numbers due to the closure of wool mills, which have always characterized this region. And also, through the collaboration of several designers, to value the raw material of burel, pure and resistant wool, traditionally used in confection of the covers used by shepherds of the mountain. (Albino, 2014)

Burel is a Portuguese handcrafted fabric, with 100% wool, high durability and resistance, which has always accompanied the life in the mountains. Each family produced their pieces for their own use, and the article that acquired greater cultural expression was the cover used by the shepherds. Today it is intended to bring this unique heritage, reinvented to the measure of the present so that it is not only remembered as a handcrafted fabric of the past. By the combination between passion, dedication and commitment of those who work this ancient handcraft skill to an innovative, relevant and surprising design, it seeks to provide new memories with new meanings, dimensions and values. (www.burelfactory.com, 2014)

In 2011, *Lanifícios do Império* was an old textile factory dealing with a process of insolvency and, in order to keep the jobs for the 30 people who worked in it, *Saberes e Fazeres da Vila* rented this factory, managing to ensure the required orders avoiding the factory closure.

That same year a new use for the burel fabric produced by *Burel Factory* was tried, as an interior finishing material in architecture. Specifically, burel was used as the lining of the interior walls of the *Microsoft Lx* headquarters building in Lisbon. This work has led to new orders in burel fabric for the new use in wall surfaces lining in several parts of the world, already representing this type of orders, a significant part of the turnover of *Burel Factory*.



Figure 3. Burel fabric on the interior walls of the Microsoft Lx headquarters building in Lisbon

Nowadays *Burel Factory* manufactures burel fabrics, with new weavers, carders and dressmakers. The majority of the workers in the factory are from this region and holders of the ancestral knowledge in the production of the burel fabric.

The artisans work in partnership with several designers integrated in the project, in an open outsourcing system, producing burel products both for home and clothing.

Guided visits to this factory are taking place, with many foreigners visiting it, so that the use of English language is fundamental. All this implied to involve in the project also other people efficient in other skills like project management and communication, not endemic in the territory.

Currently this company has its products presented in an exclusive packaging, for sale in more than 40 stores in Portugal. This brand products are also communicated through the company website, increasing more and more the number of orders that are carried out in this way. E-commerce also allows the possibility of buying products online.



Figure 4. Burel Factory products.

Burel Factory brand sales for the international market represent a high percentage of total turnover. Currently the company sells, in addition to Portugal, to Finland, Germany, Belgium, the Netherlands, France, the United States of America and Japan. Being Japan its main international market. The company is even working with a design office in Tokyo to implement burel products more associated to the needs of Japanese tastes and needs

This project, in accordance with its objectives of rescue and translation of the diversity of the knowledge and practices of this region, presents itself as an effective initiative to develop a local culture through Design. It involves local communities, contributing for the territorial and human development. It has been a project able to give new meanings to traditional techniques, creating new experiences in the region promoting the artifacts and the territory of origin both locally and globally.

Portuguese design in its relationship with handcraft techniques, thus updates its knowledge vocation through artefacts of sustainable value in harmony with diversity, providing social and environmental quality, redesigning possibilities for partnership, valuing local values while incorporating artisans, as an effective partner of processes and projects, in a collaborative way. In this context, design is the communication interface between the inherited past and a desired future. (Providência, F. in Albino et al. 2011)

From her experience in several projects in this areas, Cláudia Albino concluded that in projects where there is a high material and immaterial involvement of the actors that promote their likelihood of success is significantly higher than in cases where these commitments are not made by the agents involved and the promoters of the projects. (Albino, 2014)

CONCLUSIONS

Throughout this research we understood that design, being a meta-discipline with transdisciplinary skills, may become a useful instrument in the creation and promotion of new practices with the ability to enhance the distinctive values of the territory.

Usually we do not need special technological know-how to achieve sustainable design, we just need to look at ways that have worked in the past and adapt them to current needs and conditions. We can apply successful examples that can socially and economically transform people, adapting them to other regions or realities.

From the initial phases of this research, we can conclude that it is important to cross over the new ideas that designers can bring to the skills of workers and craftsmen and find new forms of sustainable design artifacts. The main issue is to contribute for the construction of a partnership model between Design, Handcraft Skills and Industrial Techniques that may lead to an increase in the value of local identities, achieving sustainability, social integration and regional development.

We can also conclude that in projects where there is a high material and immaterial involvement of the actors promoting them, the probability of success is significantly higher than in cases where these commitments are not verified by the agents involved and the promoters of the projects.

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REFERENCES

- Albino, C. (2014) Os Sentidos do Lugar, Valorização da identidade do território pelo design, PhD Thesis, Universidade de Aveiro.
- Costa, D. (1998), Design e Mal-Estar, CPD - Centro Português de Design, Lisboa.
- Lage, M. O. P. (2007) Metalúrgica Longra (1920-1993), in: Revista da Faculdade de Letras. História, Lisboa.
- Martins, J. P. Spencer, J. (2009) Continuity and Change, Atelier Daciano da Costa, True Team, Cascais.
- Neves, J. M. (2009), Two Generations, Atelier Daciano da Costa, True Team, Cascais.
- Papanek, V. (1972), Design for the Real World, Human Ecology and Social Change, Phanteon Books, New York.
- Vezzoli, C. and Manzini, E. (2008) Design for Environmental Sustainability, Springer, London.
- Vezzoli, C., Kohtala, C. and Srinivasan, A. (2014), Product-Service System Design for Sustainability, Greenleaf Publishing, Sheffield, UK.
- www.burelfactory.com, Accessed in November 2014.

RS13.3. Social Integration

1192 HOW PLACE BRANDING CREATES AND BENEFITS FROM SOCIAL CAPITAL

ABSTRACT

The success of place branding is judged by the economic prosperity the branding creates. When implemented successfully place branding has a positive economic effect on the community by accomplishing the goals for which it was crafted. These goals can include increasing tourism, attracting new businesses, or revitalizing a downtown. All achieved through governments and private organizations (local development groups, chambers of commerce, not for profits, resident associations, etc.) working under the same overarching message. The most successful branding campaigns have a very high level of cooperation and high levels of social capital. Social capital holds the organizations together and keeps them focused. The purpose of this paper is to show how place-branding strategies can both build social capital and benefit from existing stocks of social capital within a community. In the former case, this formation of social capital can come as an unintended consequence of the branding process. Section one provides a brief overview of social capital and defines the term for use in this paper. It describes how bridging and bonding aspects are fundamental in understanding social capital formation. Section two describes the fundamentals of place branding. It identifies three key principles present in successful place branding campaigns. Section three offers examples of how place branding campaigns created social capital within a region’s economic development community. It describes how the increase in social capital is an unintended consequence in many place branding campaigns. Section 4 describes how existing social capital that exists within an industry can be leveraged to assist in the branding process.

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1655 SOCIAL INTEGRATION OF THE UTHULIS AND CHUKANIS INTO THE CHARLAND COMMUNITIES IN BANGLADESH

ABSTRACT

The paper is wedded to explore the social integration of the uthuli and chukani riverbank erosion displacees into the charland communities on the Jamuna riverine ecosystem of Bangladesh. The livelihood of charland people of Char Chhinna in the Jamuna riverbed is desolated annually by the riverbank erosion displacement and they are impelled to leave their places of origin. This alarming situation seizes their own dwelling environment and pushes them to find shelters under their neighbor’s and/or relative’s houses and/or other places. The uthulis are not able to pay for such shelter. But the chukanis have to pay annual rent for that. In reducing their vulnerability to displacement and/or mitigating the erosion hazards, the uthuli and chukani households use their social capital and connectedness, e.g., kinship, neighborhood, samaj membership, patron-client relationship, etc. It increases their trust and ability to cooperate before and during the riverbank erosion displacement. The paper is primarily based on the data gathered through direct interviewing with the randomly chosen uthuli and chukani household heads of the study village, observation, focus group discussions (FGDs), case studies, and informal interviews with some stakeholders. Both the qualitative interpretation and quantitative measurement of social reality are considered to be reciprocally focused here. For analysing the unit of this study, the primary and empirical sources of data are exclusively utilized. In the time of riverbank erosion displacement uthuli and chukani households help each other to transfer all dismantled materials from their place of origin to safer places. Their relatives and/or neighbors also extend their hands in sheltering the displacees in the time of crisis. As it is not adequate, they have to take a local loan (haolat) from their samaj members, neighbors and/or relatives without interest. The uthuli and chukani riverbank erosion displacees are impelled to secure supports and cooperation of the non-displacee charland people, and other stakeholders in confronting with the adverse livelihood and in securing social integration into the charland communities so that they can continue their familial survival. A number of suggestive policy measures for sustainable rural development are formulated based on findings as the final job of this research.

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1786 KNOWLEDGE DISCOVERY BASED INTERACTIVE DECISION SUPPORT SYSTEM FOR IDENTIFYING ASSOCIATIONS AMONG CHILDHOOD HEALTHCARE INTERVENTIONS AND HEALTH SYSTEM BUILDING BLOCKS

ABSTRACT

Maternal and Child Healthcare (MCH) has always been regarded as one of the important issues globally. There are various priority interventions for adolescent females, pregnant mothers, infants, and children. These interventions get circulated among society through different healthcare service facilities like hospitals, primary health centres, sub centres, community health workers, etc. To improve healthcare condition of any region, all MCH interventions and healthcare service elements should perform synergistically. A knowledge discovery based interactive Decision Support System (DSS) has been developed with five different modules. Among them, one module has been developed for identifying frequently occurring healthcare service elements along with infant and childhood healthcare interventions. This module extracts healthcare service elements which have frequently occurred along with a healthcare intervention when coverage of the intervention was either poor or moderate or good. For development of this DSS, Shiny app under R software has been used. This specific module has been prepared by incorporating Association Rule Mining (ARM) technique, which is a very renowned unsupervised data mining technique, with the system. An interactive Graphical User Interface (GUI) has also been developed so that policy makers can generate different scenarios very easily by using this sophisticated data mining technique just by clicking some widgets. Data of around 14 infant and childhood healthcare interventions and 40 healthcare services from 600 Indian districts have been utilized to check efficiency of the module. All data used in the system are secondary data, collected from Districts Level Household Survey Phase three. Results are showing that presence of healthcare committees like health and sanitation committees, Rogi Kalyan Samity were comparatively higher at districts where coverage of adolescent interventions was higher and on contrary influence of ASHA workers was comparatively more at districts with low interventions coverage rate. Among SC level services, there were few services which have frequently occurred along with childhood interventions and availability of these services have increased as coverage rates of interventions got enhanced. Those services were male healthcare workers at SCs, availability of auto disposable syringes, IFA tablets, and ORS at SCs, communication facility at SCs, and SCs located at government buildings. By utilizing the system, frequently occurring healthcare services have been found out separately for all 14 interventions. By exploring differences in healthcare service elements, users would be able to gather knowledge about different behavior patterns of healthcare service elements at good performing MCH regions and poor performing regions.

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1787 A QUASI-EXPERIMENTAL CASE STUDY OF ESTIMATING THE EFFECTS OF PROGRAM DESIGN AND IMPLEMENTATION ASPECTS ON PROGRAM OUTCOMES IN NATIONAL HEALTH MISSION

ABSTRACT

Background: India’s National Health Mission (NHM) was launched in 2005 to strengthen the primary healthcare system, and to encourage pregnant women to use institutional healthcare. A notable program design feature of NHM is its ‘Janani Suraksha Yojana’ component (a cash-transfer program) that provides cash incentive to pregnant women to use institutional delivery. But, until the year 2010, this cash incentive was not linked to the uptake of ante-natal care (ANC), which might differentially impact program outcomes. Objective: This study measured the extent to which program design and implementation aspects reflect on two major program outcomes of NHM: uptake of institutional delivery and ANC. Methods: Data from District Level Household and Facility Surveys (DLHS) Rounds 1 (1995–99) and 2 (2000–04) from the pre-NRHM period, and Round 3 (2007–08) and Round 4 (2011–12) from post-NHM period were used. A quasi-experimental study design was applied. Wealth-related and education-related relative indexes of inequality, and adjusted pre-post difference-in-differences regression models were estimated. Results and Conclusion: The study found that the program design and implementation aspects differentially and adversely affected the program outcomes. No positive impact on the uptake of ANC was found in the early post-NHM period 2007–08. However, there was considerable increase in the uptake of, and decline in inequity, in ANC in the late post-NHM period 2011–12 (the period when ANC was included in the cash-transfer program). On the other hand, inequities in institutional delivery declined steeply in both the early post-NHM period 2007–08 and the late post-NHM period 2011–12, but with larger equity impacts in the late post-NHM period 2011–12. These study findings highlight the importance of effectively designing public programs and targeting the deprived populations in the early stage of the program for better program outcomes.

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RS14.1. Spatial Planning

1556 URBAN PLANNING IN BANGLADESH: ISSUES AND CHALLENGES

ABSTRACT

At present urban planning has become an important issue all over the world including Bangladesh due to the huge growth of population and their effective management in urban settings by systematic techniques and policies. Bangladesh has highest population density in the world. More than 30% of its people live in urban areas which will be around 50% by 2050. Now, the development of any country depends on the planning of its urban sector as the country is shaping its urban face day by day. Although the urbanization in third world countries is full of socioeconomic, political, cultural and may other problems, it has become inevitable process in the present era. The Vision 2021 and the Perspective Plan 2010-2021 have set development targets for Bangladesh by the end of 2021. Those targets if achieved will alter the socio-economic environment of Bangladesh from a low income economy to the first stages of a middle income one. Those development priorities include ensuring broad-based growth and reducing poverty; ensuring effective governance, sound institutions, creating a caring society; addressing globalization and regional cooperation; providing energy security for development and welfare; building a sound infrastructure and managing the urban challenge; mitigating the impacts of climate change; and promoting innovation in a knowledge-based society. An attempt has been made in this study to find out the issues and challenges of urban planning in Bangladesh. The study identified that the present trend of urbanization is the causes of pollution, joblessness, criminal activities, poverty, deplorable condition of slums, corruption, inefficiency in service delivery, weak governance etc. It has also explored that the challenges of urban planning in Bangladesh are enormous. That is, poor management, inefficiency and lack of coordination among implementing agencies, insufficient financial resources, individual control of land, arbitrary political boundary, irregularity of environmental site; difficulties in breaking down past heritage, anticipation of future change etc. The study is mainly based on secondary data which have been collected from different published materials and processed manually in order to make the study more informative, analytical and useful for the readers. It may help to the academicians, policy makers, urban development practitioners and researchers to do more and more empirical research on urban planning to explore the real issues and challenges with a view to ensuring sustainable urban planning and development. Finally a number of recommendations have been put forward to meet the issues and face the challenges of urban planning in Bangladesh.

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1223 HOW DIVERSE ARE THE NEIGHBOURHOODS? A DIVERSITY INDEX TO ASSESS LAND USE MIX THROUGH OPEN SOURCE AND ONLINE DATASETS**Deepank Verma²⁷⁷, Arnab Jana, Krithi Ramamritham**Indian Institute of Technology Bombay, Mumbai, India, Email: deepankverma1@gmail.com, arnab.jana@iitb.ac.in, krithi@iitb.ac.in**ABSTRACT**

Land use mix has been studied as a phenomenon as well as the part of policy initiatives towards the creation of vibrant neighbourhoods. It has also been viewed in different perspectives by researchers primarily in economic terms where the presence of complementary land uses supports Transit Oriented Development, Public transportation, encourages street activity and businesses. Mixed-use development promotes urban diversity and vibrancy by increasing the attractiveness of the area. However, due to lack of credible datasets, it becomes infeasible to quantify the diversity in urban areas. We demonstrate an approach using open source databases and datasets to measure aggregated land use and typology diversity mix at a detailed spatial scale. With the availability of large geographic databases, POI's have become primary option to extract the information about urban land use types and its functions. We collected Points of Interests (POI) information and performed Local Climate Zone (LCZ) classification for the city of Mumbai. We further used standard diversity indices such as Richness, Entropy and Simpson Index to measure degrees in mixed land use and built typologies. The POI an LCZ calculation helped in providing a greater understanding of the inherent structure of the city when viewed from the perspective of diversity. This process facilitated the creation of diversity maps which might be helpful in monitoring dynamics in housing, transportation, public health, urban planning and design. Although analysis of the results is still limited in the paper, it still provides the methodology to recreate such work in various cities.

Keywords: Google Places API, Wikimapia, OpenStreetMap, POI, LCZ, Mixed Land Use**1 INTRODUCTION**

Land use mix has always been counted towards the strategic urban planning and design. Mixed land use has been one of the major proponents of activism held by Jane Jacobs for American Cities. Since then, it has been viewed in different perspectives by researchers primarily in economic terms such as in Multifunctional (Batty, Besussi, Maat, & Harts, 2003; Rodenburg & Nijkamp, 2004; Vreeker, de Groot, & Verhoef, 2004) cities, and Multiple Land use theory (Louw & Bruinsma, 2006). Mixing land use has a literal meaning of mixing functional uses horizontally, among the different parcels of land or vertically, among the various floors of a building (Montgomery, 1998). According to (Louw & Bruinsma, 2006), Mixed-use development promotes urban diversity and vitality by increasing the attractiveness of the area to the people and other businesses. It further creates a dense mix of these activities which are alive during most of the hours in a day. Apart from advocating interaction between different people, businesses, and environment, it creates a vibrant neighbourhood, creates a place for various activities which in turn provides a better quality of life. The diversity of the area explains the importance of one land use for the sustenance of others by showing the dependence of people, public amenities and other businesses towards each other.

Land use mix as a policy has been widely researched and considered as a great urban planning tool for optimising usage of urban resources while keeping neighbourhoods safe, vibrant and lively. However, large-scale studies with empirical analyses are still non-existent owing to lack of credible datasets which are open to the research community. Furthermore, there is no particular methodology to ascertain the approach with which any of the studies in measuring land use mix should proceed. This particular study is focused towards the creation of a method to select and identify the most diverse areas in the city of Mumbai. Jane Jacobs (Jane, 1961) in her book "The life and death of great American cities" identifies four elements which induce diversity such as a mix primary land use, intensity, permeability of urban form, and the mix of building typology (Montgomery, 1998). This study undertakes two of the elements such as the land use and built typology to study the diverseness across all the sub-wards in the city. Points of Interests (POI) is taken as a proxy indicator of the existence of various land uses. Diverseness in Urban area can be measured via analysing different indicators such as economic prospects, demographical aspects, and infrastructure. It can vary in scale and depend upon the choice of domain. It is challenging to understand the intricate relationship between different variables and actors. Higher Diversity across one domain might be low in other (Choi & Sayyar, 2011). Mix use diversity has been found to provide lively, secure and stimulating public realm while balancing workspaces, businesses and living spaces (Jacobs, in (Louw & Bruinsma, 2006)). This study deals with the formulation of methodology to calculate the diversity indices for cities at fine administrative scale. In particular, the city of Mumbai is considered in this study as an example to portray the methods. Diversity indices for each block are calculated from the POI datasets collected from online databases and Built typology extracted from Satellite imagery available widely on open repositories.

2 RELATED WORK

(Montgomery, 1998) gives an account of the creation of healthy and active cities, which are a balance of ordered form and structured complexity. He further advocates the role of diversity in mixed-use for the creation of dynamic cities. Creation of mixed-use diversity is a two-step process, one, the creation of primary land uses which are people attractors such as offices, schools, shops, recreation places. Second, land uses including businesses and services which grow in response to primary land uses (Jane, 1961). Empirical studies have linked land use diversity to the availability of

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employment (Malizia & Motoyama, 2016), use of public transportation and reduction of travel times (Cervero, 1988; Holian, Kahn, & others, 2012), ease of setting up of businesses (Quigley, 1998), the low cost of housing (Song & Knaap, 2004). Regardless of the existence of vast literature in understanding Mixed use, there has been a crunch on methods and datasets to calculate and represent diversity. (Batty et al., 2003) Introduced techniques to represent multifunctionality by visualising diversity and density through data sources in GIS. (Choi & Sayyar, 2011) studied how land use mix affects the walking behaviour of people, where people travel less in areas with high mix land use diversity. (Hao, Geertman, Hooimeijer, & Sliuzas, 2012) explained of land use diversity through statistical models in which the results revealed the relation of land use diversity with the proximity to industries and city centres. (Song & Knaap, 2004) developed several quantitative methods to measure mixed land uses in various neighbourhoods.

Until now the research in understanding the relationships between land use diversity and behaviour was quite limited due to the unavailability of large datasets. Recently, Volunteer Geographic Information (VGI's) is increasingly being used to explore and understand places and cities. VGI datasets such as Foursquare, Facebook places, OpenStreetMap have become increasingly popular among the researchers as they provide access to well maintained and up to date databases. (Jiang, Alves, Rodrigues, Ferreira, & Pereira, 2015) used VGI information from Foursquare and Facebook places to prepare disaggregated land use of Boston. Similarly, (Jayanetti, Meedeniya, Dilini, Wickramapala, & Madushanka, 2017) created enhanced land use information generation through foursquare datasets for the city of Colombo. Google API has been used to explore the empirical laws governing the colocation of businesses and amenities within a neighbourhood using the location of amenities. (Casta, Hidalgo, & Castañer, 2015) Created an Amenity-space where connections between different businesses which are likely to co-locate are marked. The likeliness of occurrence of the businesses is then statistically calculated. Google POI has also been used for transportation research mainly in trip prediction problems (Ermagun, Fan, Wolfson, Adomavicius, & Das, 2017). The POI's information from Google API is not exhaustive at any level and mostly focused on targeting businesses. However, among all the online managed databases, it is the most reliable and managed online places database. Also, most of the other online databases have limited coverage in the cities. To create more rigorous and exhaustive data collection tool, we considered including Wikimapia and OpenStreetMap databases as well.

We performed Supervised classification task in satellite imagery to classify and extract these typologies. LCZ classification technique is followed, which is highly documented and researched in studies related to Urban Climate Zones demarcation. LCZ classification approach has predefined classes and step by step procedure to create climate zone maps for any city. Here, this technique is utilised to delineate various types of land typology present in the city. We extended the classification approach by using different methods and datasets to arrive at better classification accuracy than vanilla procedure. In this study. The diversity of POI and land typology together help explain the concentration of particular land uses over specific typologies. The usage of one diversity measure over the other has been a highly debatable topic in ecology and economics (Baumgärtner, 2005; Magurran, 1988). Diversity metrics such as Atkinson index, Simpson index, Balance index, Herfindahl index, etc. (more on (Song & Knaap, 2004)) have been used to compare and differentiate between different areas. Among such metrics, Hill numbers have been utilised in the calculation of diversity in this study. Hill (Hill, 1972) unified the measures of diversity into the quantitative framework, which provides species abundance distributions in the form of richness, Shannon entropy and Simpson measures; also called Hill numbers (Jost, 2006; Yue et al., 2016). The hill numbers notation can be given as:

$$q_D = (\sum_{i=1}^s p_i^q)^{1/(1-q)}$$

where, D: Diversity, p: Proportion of the abundance of the species; s: the total no. of species and q is the order of the diversity.

- a) q = 0: Richness: Richness of the individual sub-wards is higher where more significant number of classes are detected. Richness does not depend on the frequency of elements in the class. The richness component of the diversity provides the information on the unique types of POI and Built typology present in each of the wards.
- b) q = 1: Exponential of Shannon entropy index: Shannon entropy considers every class according to its number of the elements present. It does not provide more weight to the abundant classes. High Entropy values indicate randomness while the lower shows order. Among all of the orders of diversity, Shannon entropy is widely used in other domains.
- c) q = 2: Inverse of Simpson concentration index: Simpson Index is more sensitive towards more dominant classes in a ward. The calculation includes the sum of squares of the proportion of classes which for lower value becomes insignificant; therefore, higher value dominates. "It is a measure of dominance concentration" (Hill, 1972).

3 STUDY AREA AND DATA COLLECTION

Methods of Dividing the area into smaller parts to apply diversity metrics may result in complications in the usage of self-defined shapes and sizes giving rise to Modifiable Areal Unit Problem (MAUP) (Dark & Bram, 2007). The concept of Ecological Fallacy has been widely discussed in the research circles involving spatial aggregation tasks. However, no particular solution is available to check this problem. For this study, rather than sub-dividing the area into a grid, we utilised Election sub-ward boundaries of Mumbai city. The boundaries are obtained from the Mumbai municipal election board which constituted 228 sub-wards (Fig. 3) divided from 22 wards. The POI information present in the databases is usually

in the form of geolocation, name and types of their functional uses. We developed a programming script to fetch a wide range of information on diversity indices from these POI sources when provided with the shapefile of each of the sub-ward boundary (fig. 1 A).

The Google Places API provides access to the POI database through different search options such as radar search and radial search. Radar search is useful when ranking the POI's based on the distance to the queried location, whereas radial search provides an output on a comprehensive list of POIs within that queried radius. We developed custom search based on above two methods which recursively fetch information on POI given the shapefile (boundary) of the queried ward. The places in Google database are categorised into 96 different types including specifics of sub-types of establishments, which is massive from the analysis point of view. We aggregated 96 categories into 16 classes (Ermagun et al., 2017) relevant to our study (Table. 1). The data from Wikimapia is gathered through Wikimapia API. Unlike Google Places, Wikimapia provides access to POI's through different options such as search by area, by place id and bounding box. The results also provide the vector files of POI's polygons, where present. Wikimapia has no fixed set of categories. Moreover, quite a few places are also tagged in different languages. Similarly, OpenStreetMap provides the data in the form of points, polygons and annotations to describe the place of interest. It provides the detailed description of the different types of tags by which places are marked. The data can be queried from the custom-made script and is also available for download as a shapefile for the city from the companion website *Geofabrik*²⁷⁸. The labels of POI obtained from OpenStreetMap and Wikimapia are then grouped into 16 classes.

Table 24: Categorization of various POI labels.

S.no.	Group	POI
1.	Vehicle repair/services	car repair, carwash, gas station
2.	Night Life	bar, nightclub
3.	Personal Care	beauty salon, haircare, spa
4.	Administrative offices	courthouse, lawyer, police, fire station, city hall, embassy, local government
5.	Educational Institutions	library, school, university
6.	Food	bakery, cafe, food, meal takeaway, restaurant, meal delivery
7.	General stores and establishments	miscellaneous stores
8.	Medical Services	dentist, doctor, health, hospital, pharmacy, physiotherapist, veterinary care
9.	Services	electrician, locksmith, moving company, painter, plumber, real-estate agency, travel agency, general contractor, roofing contractor, insurance agency, laundry, storage
10.	Recreational	amusement park, aquarium, art gallery, casino, bowling alley, gym, movie rental, movie theatre, museum, park, stadium, zoo
11.	Hotels	Rv park, lodging, campground
12.	Religion	cemetery, church, funeral home, Hindu temple, mosque, place of worship, synagogue
13.	Financial	accounting, atms, finance, bank, post office
14.	Specialised Stores	bicycle store, bookstore, clothing store, convenience store, department store, electronics store, florist, furniture store, grocery, supermarket, hardware store, home goods store, jewellery store, liquor store, pet store, shoe store, shopping mall, car dealer
15.	Transportation	bus station, subway station, train station, taxi stand, parking, car rental
16.	General Establishments	Miscellaneous

We followed Local climate zones (LCZ) classification (Bechtel et al., 2015) approach to categorise different built and natural typologies in the city. LCZ classification was initially studied as an attempt to gather details about the morphological aspects of the cities for the climate studies. It provides a framework named WUDAPT²⁷⁹ for the classification of different climatic zones using readily available remote sensing techniques without the use of proprietary software and databases. The process includes usage of widely available free satellite imagery from Landsat, Google Earth Platform and SAGA GIS software. This technique classifies the urban areas into 17 classes, in which 10 represent built-up areas and remaining, the natural areas. This process is feasible for the analysis of city-wide area expanding to regions, however, does not provide satisfactory results at the building structure level. The output is an aggregation of the typological details of the surroundings.

4 ANALYSIS OF THE DATA

However easier is the availability of these datasets, the information is far from being error-free. Points gathered with the help of API's are not tagged with the correct label; most of the points in Wikimapia are tagged without any labels. There are large number of POI classes listed in Wikimapia and OpenStreetMap, but only a few are actively used by the users while tagging the information. Fortunately, names of the places in the POI provides a hint to the type of the establishment. To solve the issue of missing classes information in POI, we created a bag of words (BOW) (fig. 1B) which included common names of various establishments such as eateries, housing societies and general stores from the correctly labelled POI.

278 <http://download.geofabrik.de/>
 279 <http://www.wudapt.org>

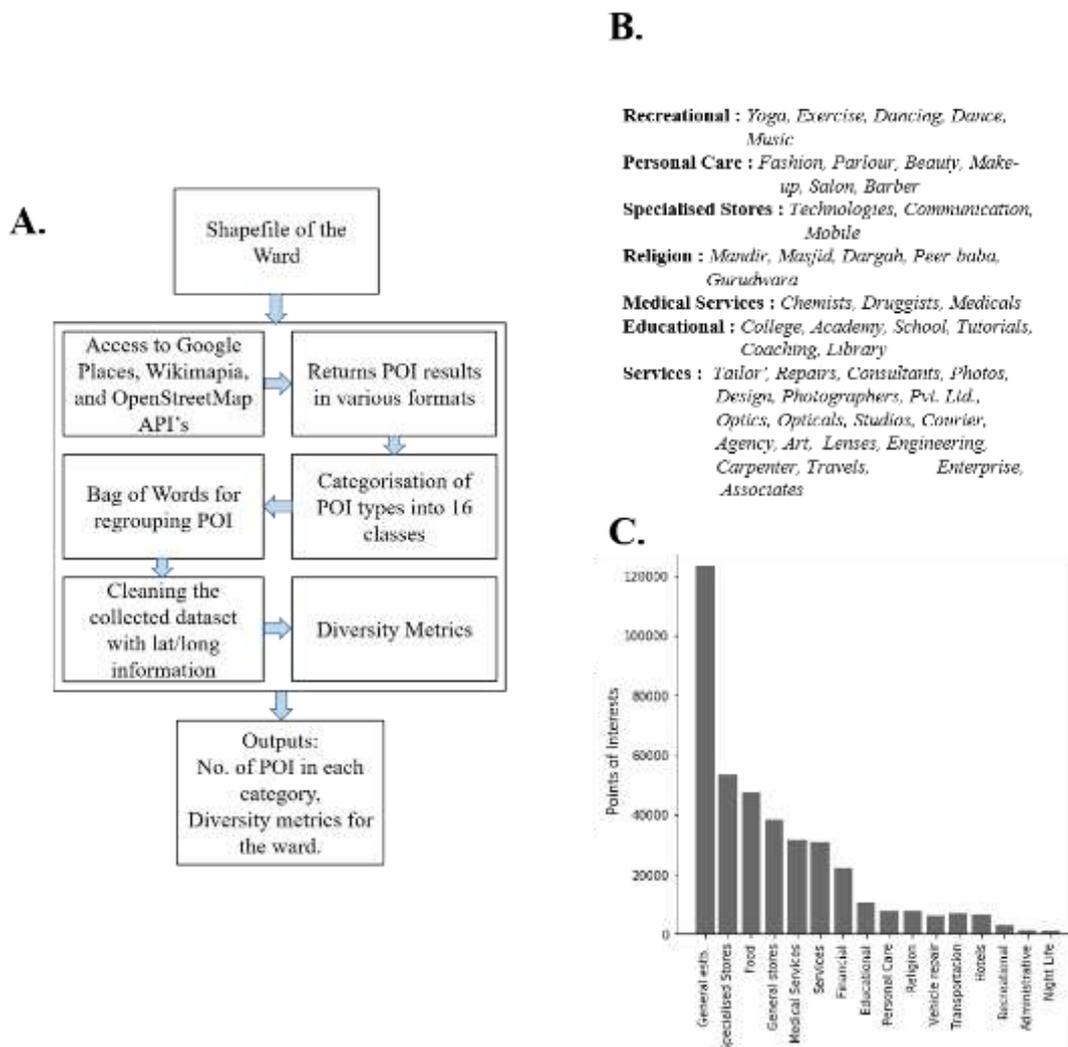


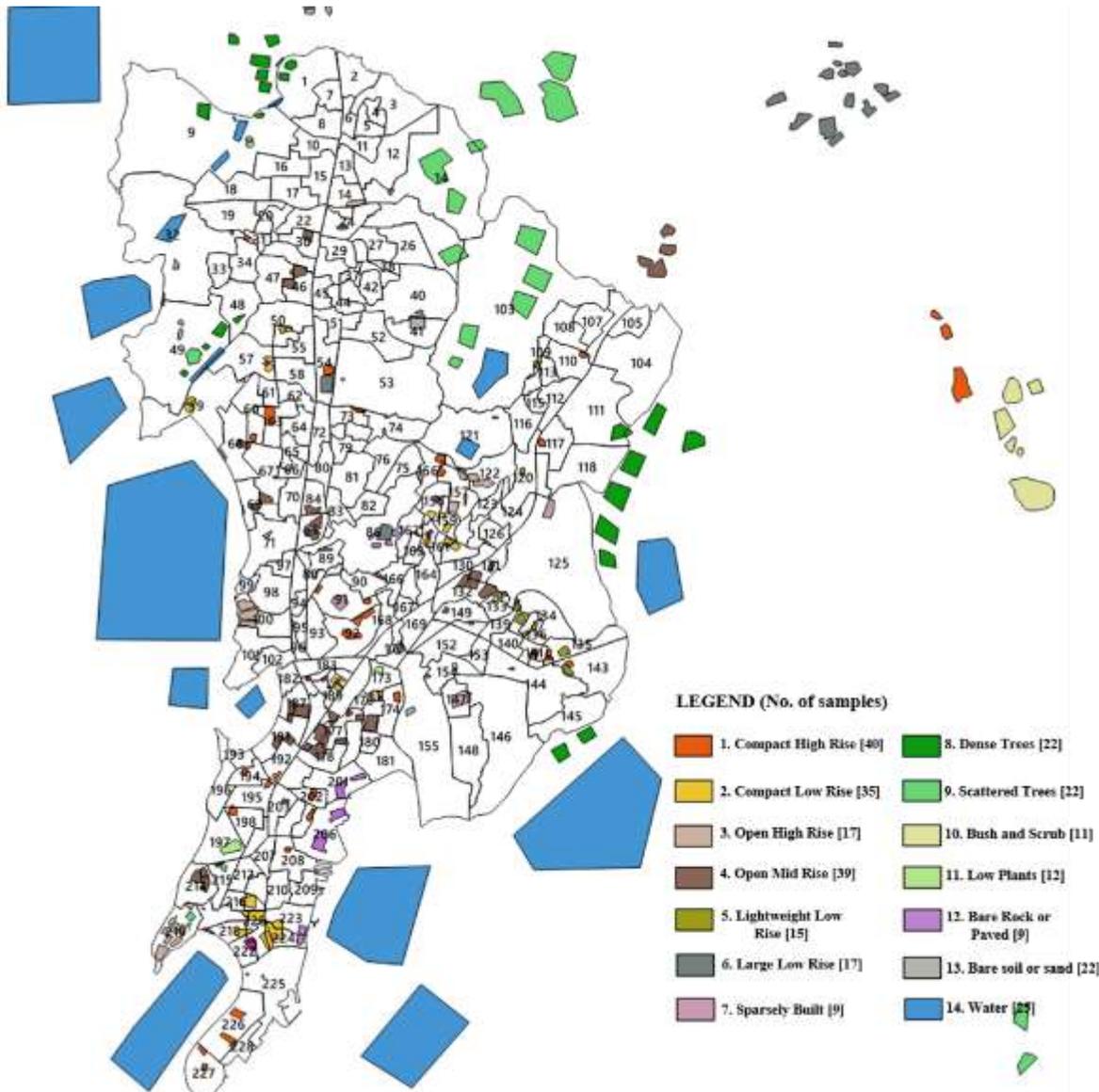
Figure 62: Workflow of POI data collection and Outputs (A). An example of Bag of Words (BOW) to classify labels (B). The total number of POIs gathered through three API's. (C)

The uncategorised POIs are then classified by matching the part or the portion of the name with the words in created BOW. However, the creation of BOW is not fit for use in different areas due to the prevalence of a different set of naming conventions being followed by people from different regions in branding their establishments. We discarded the Places which do not provide sufficient information about the names or the labels. The POIs with residences category are removed from the calculation of entropy due to the fact that all of the wards have almost an equal number of households since we used administrative, electoral wards. Collection of data from various sources have high chances of duplicity and the inadvertent inclusion of rogue POIs. The Wikimapia is a most accessible website to masses and provides an easy interface for drawing and locating POI. However, it has no control over moderation or to filter out the vandalism in updating POI information by the website users. Hence it consists of significantly more corrupt dataset amongst the three sources. However, easy access to the website helps in the inclusion of local information by the users which might not be present in other managed databases. For example, the location of weekly markets and local small shops are present in Wikimapia but absent in OpenStreetMap and Google Places databases. The duplicity in the data is removed using the combination of the latitude-longitude pair and the name of the establishment. A radius of 10m is selected around each existing points to filter out the similar named POIs inside the radius. The output of the script provides the diversity metrics which can be plotted and represented in GIS map. The developed script takes the input as a shapefile and returns the output as a diversity metrics utilising every process we discussed (fig. 1A).



Figure 63: Type of LCZ classes prominent in city of Mumbai.

The WUDAPT classification is well documented and straightforward technique to classify urban morphology of any city. We followed a similar process as described in the documentation²⁸⁰ with slight modifications where required. Landsat images of the area are downloaded for two seasons (October 2016 and May 2017) and stored after clipping the extent to the city region. The resulting images are then subsampled to 100m resolution, down from the original spatial resolution of 30m. 300 Training samples for the 14 classes are manually digitised with the help of Google Earth (fig. 3). We kept aside 75 samples for determining classification accuracy.



²⁸⁰ <http://www.wudapt.org/create-lcz-training-areas/>

Figure 64: Map showing training samples of LCZ.

The samples for all the 17 classes as described in WUDAPT are not present in the city of Mumbai. The classes such as compact mid-rise and open low-rise have negligible existence in the city, therefore are not considered in this study. However, we removed the samples of the "Heavy Industry" class although it has distinct presence due to its close resemblance to other built and natural classes. We performed Random Forests Supervised classification technique to identify different clusters. It has been found that the vanilla approach towards classification does not always provide results with sufficient accuracy. The reason for this is overlapping built typologies especially in cities of developing nations, where the compact high-rise, mid-rise, open high-rise and mid-rise are jointly present in a neighbourhood (Kotharkar & Bagade, 2017). The classifier produces a large number of false-positives due to such occurrences. Many studies (Xu, Ren, Cai, Edward, & Wu, 2017) have dealt with this situation by utilising alternative processes to classify images such as through modified supervised classification techniques. Taking a hint from such studies, we extended this approach by using data and image processing solutions such as PCA (Principal Component Analysis) and GLCM (Grey Level Co-occurrence Matrix).

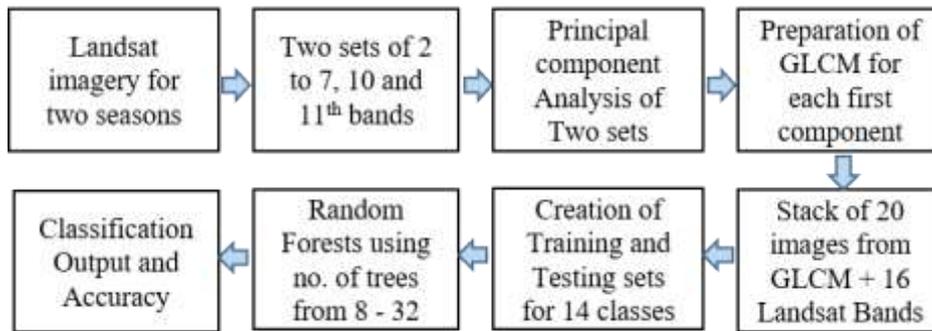


Figure 65: Flowchart describing process of LCZ classification.

With 16 individual bands of Landsat imagery for two different seasons (Bands 2 to 7, 10 and 11 of each imagery), we performed Principal Component Analysis for each set of bands. PCA is dimensionality reduction technique which lay emphasis on variation present in the dataset and generates patterns. It transforms the set of correlated values to produce set of uncorrelated variables, also known as principal components. In satellite image, the set of correlated values are the pixel values present in each band. PCA transforms the values from 8 bands to produce principal components which show their contribution to understanding the variation in brightness values of pixels. In the individual set of bands, the first, second and third components explained around 85, 11 and 3 percent of the variance among the pixels, respectively. GLCM is a measure of textures present in satellite imagery. GLCM is useful in the images where the differences between the brightness values in different classes are smaller. According to (Haralick & Shanmugam, 1973), "This matrix is a two-dimensional histogram of grey levels for a pair of pixels which are separated by a fixed spatial relationship." The matrix estimates the joint probability distribution of a pair of pixels. GLCM provides 10 different texture measures such contrast, dissimilarity, homogeneity, angular second moment, energy, max. Probability, entropy, mean, variance and correlation in the form of imagery. GLCM is calculated for the first PCA component of both the sets with the help of SNAP²⁸¹ software by ESA. The process resulted in the creation of 10 images explaining GLCM textures for each first components in both sets.

The Image classification task included 16 Landsat bands from two different seasons and 20 images computed from GLCM resulting in 36 images. The classification task was performed in SAGA GIS software using random forests. We experimented with a different number of trees from 8 to 64. The classification accuracy increases with the numbers of trees and plateaus after 24 trees. In the study, we are more interested in the diversity of the built typology. Therefore, we bundled the other natural classes into single Natural class. A total of 8 classes (7 Built + 1 Natural) are used to calculate classification accuracy (Table. 2). The classification accuracy is calculated as a fraction of total correctly predicted pixels and the total number of pixels classified which gave 85% accuracy. Fig. 4 shows the flowchart of the process of LCZ classification.

²⁸¹ <http://step.esa.int/main/toolboxes/snap/>

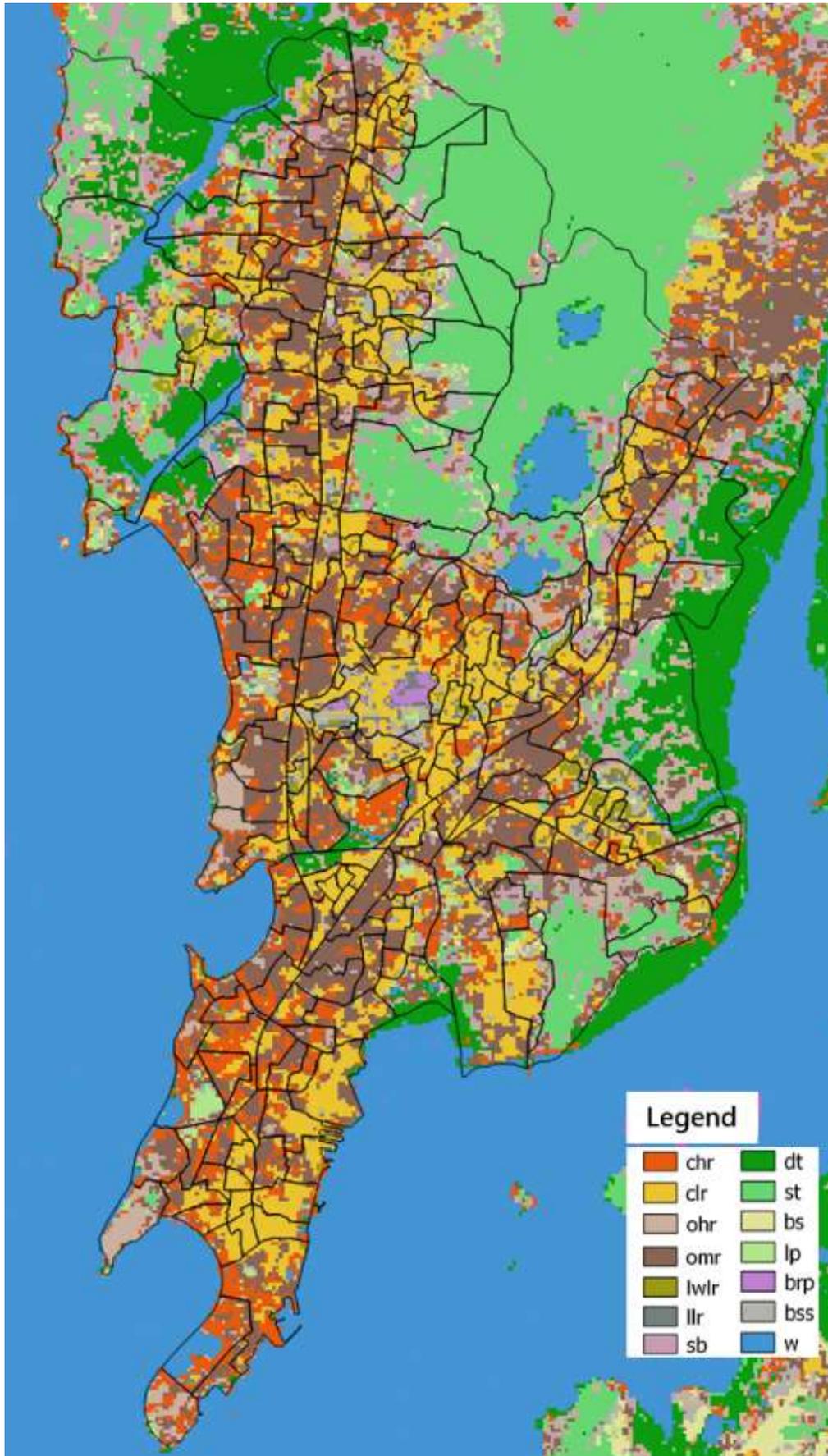


Figure 66: Image classification output.

Table 25: Confusion matrix of classified Pixels.

	CHR	CLR	OHR	OMR	LWLR	LLR	SB	NAT
CHR	533050	0	118456	78970	0	9871	9871	100654
CLR	19743	296139	49357	0	0	167812	0	68327
OHR	29614	0	217169	128327	0	0	69099	77683

OMR	78970	0	39485	651506	0	9871	148070	36783
LWLR	0	9871	0	0	49357	0	0	7871
LLR	0	9871	9871	0	0	434337	0	20914
SB	19743	0	0	0	0	0	394852	13521
NAT	0	0	0	0	9871	118456	197426	6811198

Note:

Total prediction: 11045968
 Correct prediction: 9387608
 Accuracy: 84.9

5 RESULTS

The number of points in each of the POI classes and the number of classified pixels of each LCZ class were used to calculate hill numbers as diversity metrics for each sub-ward. The results of which can be understood with the help of various data representation techniques such as choropleth maps and scatter plots. Throughout the study, we assumed the total number of POIs captured by custom-made scripts is consistent with the actual number of POIs present in each ward. It is to note that the actual Points of interests and establishments would be much higher than what is being reflected in Online databases. We assume that collected POI is the representative sample of the diverse Places present in each ward. Similarly, The LCZ technique to identify the urban typology within 8 classes is only accurate to 85 percent, which is a satisfactory figure in terms of the WUDAPT classification technique, however false-positive pixels in classification may produce different diversity values in each ward. However, this error in classification is not localised and affect the complete area. Therefore, a comparison between different areas regarding diversity metrics can still be conducted without significant consequences.

We compare the LCZ and POI Shannon entropy maps (fig. 6) to find out the consistency between the clustering pattern between the two. It is evident from the maps that POI entropy does not form any specific clusters as in LCZ. Also, there is less variation between the POI entropy values than LCZ. A trend of wards with high POI diversity can be seen along the major roads of the city. The reason can be cited to the establishment of the variety of the businesses due to the presence of major roads for quick access to other parts of the city. LCZ on the other hand show clustering pattern. Wards in South Bombay (A), North (B), and Central (C) are more diverse which is due to the inclusion of different built typologies such as High, Mid and Low rise (slums) and Water due to streams and coast; dedicated Green spaces and presence of small forests.

The wards which share the city boundary usually are larger and include coastal areas, forests and mangroves. The diversity in Land typology is, therefore, higher for such wards. Interestingly, such wards also account for relatively higher diversity in POI which might be the reason due to the onset of various businesses in the periphery of the city. South Bombay (A) is considered as a business and cultural hotspot due to the presence of heritage monuments, offices of multinational companies, restaurants and recreational places. This can be reflected in the comparison indices for both the maps. The scatter plot (fig. 7) shows the diversity values with respect to each ward. Interestingly, the wards in south Bombay (173- 228) are present in both ends of the spectrum. Quite of few have rich diversity in businesses, and others have diversity in land typology. Together, such wards provide an interesting mix of establishments and natural spaces.

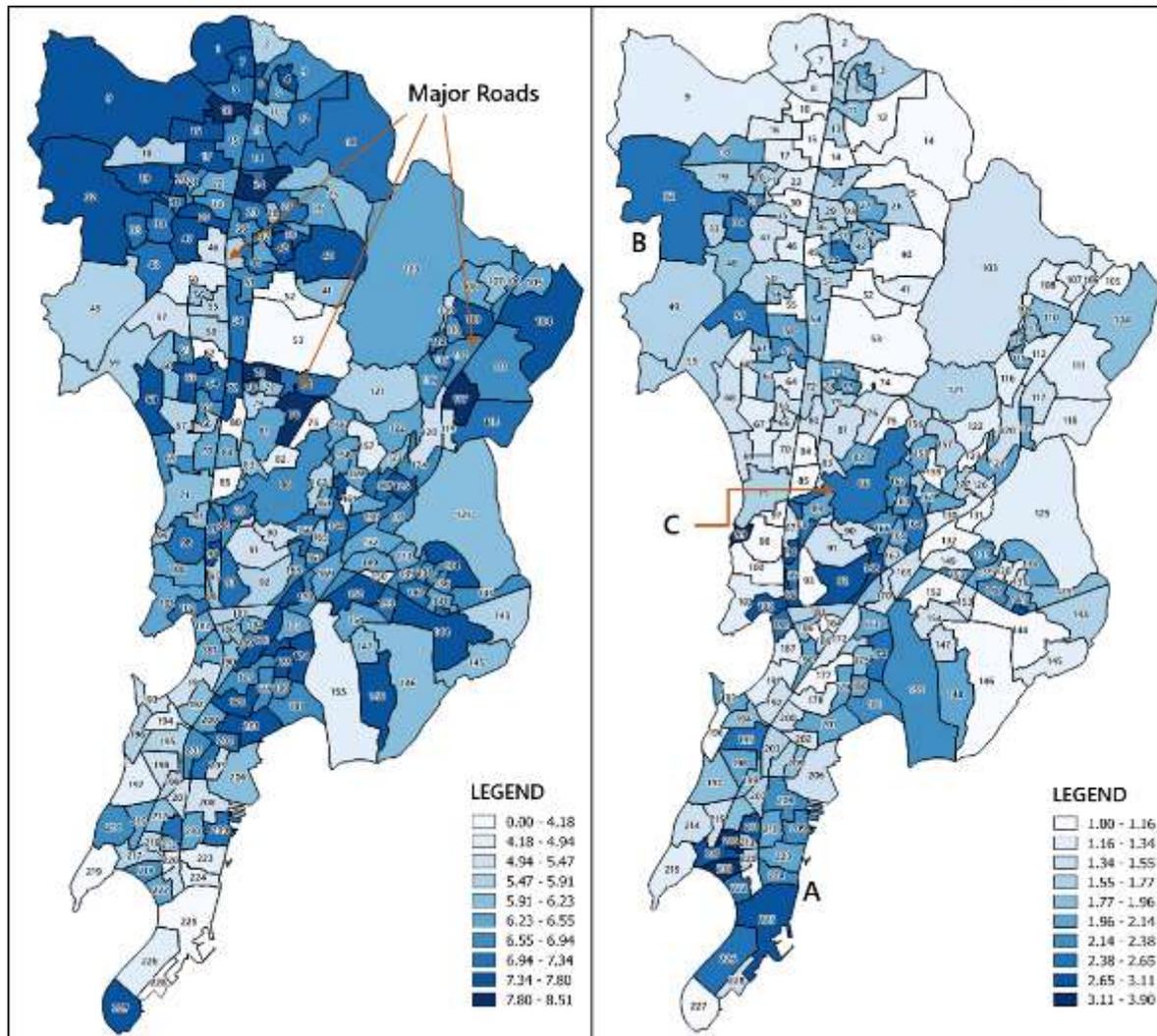


Figure 6: Comparison of Shannon Entropy results between POI (Left) and LCZ (Right) maps.

Cities have been the product of advances humankind has made over the years in technology and innovation. In recent years, due to rapid and haphazard growth, neighbourhoods have started to become vastly similar and unrecognisable. Monotony in visual appearances and built typology have started becoming apparent which is altering inherent diversities present in the cities. Research in understanding form and function at a large scale have been quite scarce owing to the absence of large datasets and the techniques to calculate the assorted variety in the cities. This study is aimed towards the creation of methodology where the diversity patterns can be studied. Although diversity of neighbourhoods depends on various factors and domains taken into consideration, we made use of the data which is widely available and can be used to determine the micro relationships between form and function in a detailed manner. Such process can be reiterated in different cities to compare and relate the localised diversity in terms of built typology, land uses and businesses. This study provides the overview of the results based on aggregated statistics of the presence of individual Points of Interest and Built typology. Such study if focused on investigating few wards in close comparison may outline significant details about the relationship between the occurrence of specific POIs at specific typologies. Future studies might use Land uses, demographic statistics to gain detailed insights into urban character and can monitor dynamic nature of cities.

The tendency of a diverse set of POI's being clustered in few wards is possible due to the existence of major or local economic hub of the city. We relate the spatial extent of each ward with the Shannon entropy values of POI to comment on the possibility of the existence of such districts and hubs. The area statistics of 228 wards varies from 31 sq. km to 0.23 sq.km. Fig.8 shows the scatter plot of ward area and the amount of POI present in the city of Mumbai. The scatter plot presents only the top and bottom 50 wards with respect to the area. The Colorbar and the radius represent the typology diversity (LCZ diversity) for each ward. It can be seen in the graphs that POI entropy in wards with lesser area tends to vary when compared to the larger ones. Only 10 of the bottom 50 wards in the 2nd figure have entropy less than 6 which is considerably lesser than 25 wards being under 6 in the first figure. Further, comparatively larger and brighter data points suggest high diversity values in typology in the 2nd figure. Smaller wards therefore are more diverse in terms of POIs and typology than the larger ones.

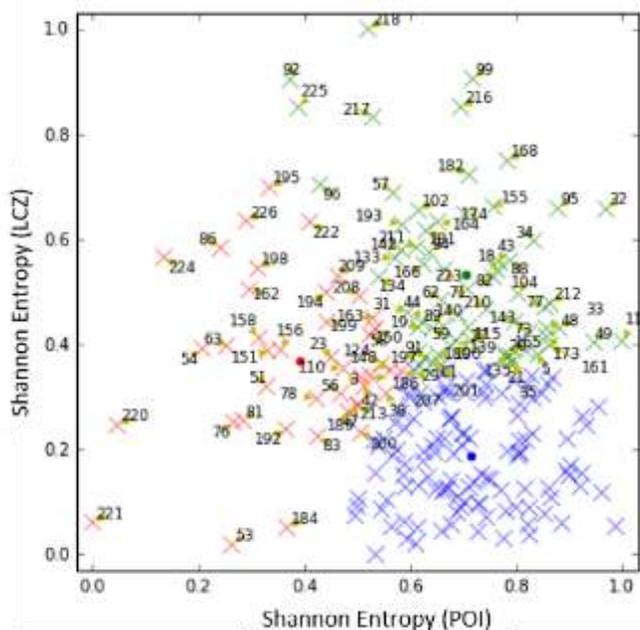


Figure 7: Scatter plot of sub-wards displaying relationship between POI and LCZ diversity values.

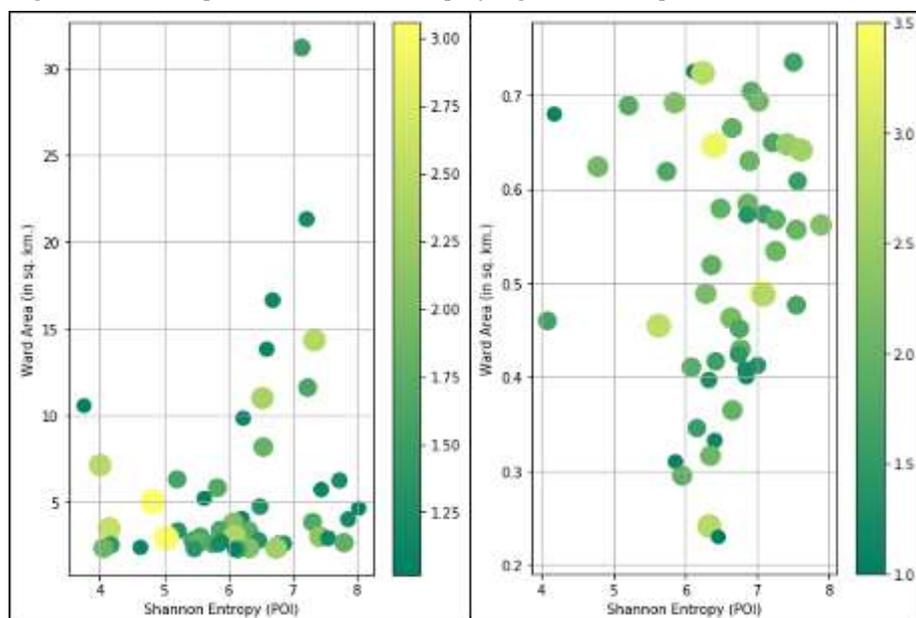


Figure 8: Comparison of Diversity between larger and Smaller wards.

6 CONCLUSION

Cities have been the product of advances humankind has made over the years in technology and innovation. In recent years, due to rapid and haphazard growth, neighbourhoods have started to become vastly similar and unrecognisable. Monotony in visual appearances and built typology have started becoming apparent which is altering inherent diversities present in the cities. Research in understanding form and function at a large scale have been quite scarce owing to the absence of large datasets and the techniques to calculate the assorted variety in the cities. This study is aimed towards the creation of methodology where the diversity patterns can be studied. Although the diversity of neighbourhoods depends on various factors and domains taken into consideration, we made use of the data which is widely available and can be used to determine the micro relationships between form and function in a detailed manner. Such process can be reiterated in different cities to compare and relate the localised diversity regarding built typology, land uses and businesses. This study provides the overview of the results based on aggregated statistics on the presence of Points of Interests and Built typology. Studies like these, if focused on investigating few wards in close comparison may outline significant details about the relationship between the occurrence of specific POIs at particular typologies. Future studies might use Land uses and demographic statistics to gain detailed insights into dynamic nature of cities.

ACKNOWLEDGEMENT

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REFERENCES

- Batty, M., Besussi, E., Maat, K., & Harts, J. (2003). Cities : Density and Diversity in Space and Time. *Built Environment*, 30(4), 324–337.
- Baumgärtner, S. (2005). Measuring the diversity of what? And for what purpose. *A Conceptual Comparison of Ecological and Economic ...*, 1–33. <https://doi.org/http://dx.doi.org/10.2139/ssrn.894782>
- Bechtel, B., Alexander, P., Böhner, J., Ching, J., Conrad, O., Feddema, J., ... Stewart, I. (2015). Mapping Local Climate Zones for a Worldwide Database of the Form and Function of Cities. *ISPRS International Journal of Geo-Information*, 4(1), 199–219. <https://doi.org/10.3390/ijgi4010199>
- Casta, E. E., A., Hidalgo, C. A., & Castañer, E. E. (2015). The Amenity Space and The Evolution of Neighborhoods. *ArXiv:1509.02868 [Physics.Soc-Ph]*, 1–17.
- Cervero, R. (1988). Land-Use Mixing and Suburban Mobility. *Transportation Quarterly*, 42(3), 429–446. <https://doi.org/10.1068/a201285>
- Choi, E., & Sayyar, S. S. (2011). Urban Diversity and Pedestrian Behavior - Refining the concept of land-use mix for walkability. *Space Syntax Symposium Proceedings*, 8, 1–15.
- Dark, S. J., & Bram, D. (2007). The modifiable areal unit problem (MAUP) in physical geography. *Progress in Physical Geography*, 31(5), 471–479. <https://doi.org/10.1177/0309133307083294>
- Ermagun, A., Fan, Y., Wolfson, J., Adomavicius, G., & Das, K. (2017). Real-time trip purpose prediction using online location-based search and discovery services. *Transportation Research Part C: Emerging Technologies*, 77, 96–112. <https://doi.org/10.1016/j.trc.2017.01.020>
- Hao, P., Geertman, S., Hooimeijer, P., & Sliuzas, R. (2012). The land-use diversity in urban villages in Shenzhen. *Environment and Planning A*, 44(11), 2742–2764. <https://doi.org/10.1068/a444696>
- Haralick, R. M., & Shanmugam, K. (1973). 1973_-_Robert_M_Haralick_-_TexturalFeaturesforImageClassification[retrieved_2018-03-07]. <https://doi.org/10.1109/TSMC.1973.4309314>
- Hill, M. . (1972). Diversity and Evenness: A Unifying Notation and its Consequences. *Ecology*, 54(2), 427–432.
- Holian, M. J., Kahn, M. E., & others. (2012). *The impact of center city economic and cultural vibrancy on greenhouse gas emissions from transportation*.
- Jane, J. (1961). *The death and life of great American cities*. New-York, NY: Vintage.
- Jayanetti, J. A. A. M., Meedeniya, D. A., Dilini, M. D. N., Wickramapala, M. H., & Madushanka, J. H. (2017). Enhanced land cover and land use information generation from satellite imagery and foursquare data. In *Proceedings of the 6th International Conference on Software and Computer Applications - ICSCA '17* (pp. 149–153). New York, New York, USA: ACM Press. <https://doi.org/10.1145/3056662.3056681>
- Jiang, S., Alves, A., Rodrigues, F., Ferreira, J., & Pereira, F. C. (2015). Mining point-of-interest data from social networks for urban land use classification and disaggregation. *Computers, Environment and Urban Systems*, 53, 36–46. <https://doi.org/10.1016/j.compenvurbsys.2014.12.001>
- Jost, L. (2006). Entropy and diversity. *Oikos*, 113, 363–375. <https://doi.org/10.1111/j.2006.0030-1299.14714.x>
- Kotharkar, R., & Bagade, A. (2017). Urban Climate Local Climate Zone classification for Indian cities : A case study of Nagpur. *Urban Climate*. <https://doi.org/10.1016/j.uclim.2017.03.003>
- Louw, E., & Bruinsma, F. (2006). From mixed to multiple land use. *Journal of Housing and the Built Environment*, 21(1), 1–13. <https://doi.org/10.1007/s10901-005-9029-y>
- Magurran, A. E. (1988). Why diversity? *Ecological Diversity and Its Measurement*, 1–5. https://doi.org/10.1007/978-94-015-7358-0_1
- Malizia, E., & Motoyama, Y. (2016). The Economic Development–Vibrant Center Connection: Tracking High-Growth Firms in the DC Region. *The Professional Geographer*, 68(3), 349–355. <https://doi.org/10.1080/00330124.2015.1089129>
- Montgomery, J. (1998). Making a city: Urbanity, vitality and urban design. *Journal of Urban Design*, 3(1), 93–116. <https://doi.org/10.1080/13574809808724418>
- Quigley, J. M. (1998). Urban Diversity and Economic Growth. *Journal of Economic Perspectives*, 12(2), 127–138.
- Rodenburg, C. H., & Nijkamp, P. (2004). Multifunctional land use in the city: a typological overview. *Built Environment*, 30(4), 274–288.
- Song, Y., & Knaap, G. J. (2004). Measuring the effects of mixed land uses on housing values. *Regional Science and Urban Economics*, 34(6), 663–680. <https://doi.org/10.1016/j.regsciurbeco.2004.02.003>
- Vreeker, R., de Groot, H. L. F., & Verhoef, E. T. (2004). Urban multifunctional land use: Theoretical and empirical insights on economies of scale, scope and diversity. *Built Environment*, 30(4), 289–306. <https://doi.org/10.2148/benv.30.4.289.57157>
- Xu, Y., Ren, C., Cai, M., Edward, N. Y. Y., & Wu, T. (2017). Classification of Local Climate Zones Using ASTER and Landsat Data for High-Density Cities. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, 10(7), 3397–3405. <https://doi.org/10.1109/JSTARS.2017.2683484>
- Yue, Y., Zhuang, Y., Yeh, A. G. O., Xie, J.-Y., Ma, C.-L., & Li, Q.-Q. (2016). Measurements of POI-based mixed use and their relationships with neighbourhood vibrancy. *International Journal of Geographical Information Science*, 00(00), 1–18. <https://doi.org/10.1080/13658816.2016.1220561>

1506 SPATIAL & TEMPORAL ASSESSMENT OF HEALTHCARE FACILITIES IN MUMBAI: K-WEST WARD

ABSTRACT

There is a necessity of healthcare facilities (HFs) to perpetuate human life from various kind of diseases. The demand is growing briskly day by day with the growing population in urban areas, which generates some questions like, are the HFs well distributed over the area based on their speciality, affordability and service timing, if so then, how much area can be served by the existing HFs, if so then, are they able to provide 24 hour service, if not then, which areas are underserved or health facilities shortage areas and in which time window, and which are the probable areas to place a new HFs. This paper analysed the current situation of HFs both spatially and temporarily in k-westward of Mumbai as a study area. The spatial analysis demonstrates the spatial inequality in terms availability and accessibility of HF's. From the results, it was found out that most of the unserved areas are low-income neighbourhoods and they are lack of affordable HFs (i.e. public). The spatial inequality of various healthcare services was computed using the network analysis with different catchment areas. The temporal analysis considers different time frames of service timing of HFs like morning, afternoon, evening and midnight. The result shows that only a few out of 179 HFs provide 24hrs services, of which only two are public HFs that means lack of public HFs, especially in night hours. This spatial and temporal analysis will give an idea to health managers, policy makers and planners where to open new HFs, or what will be its operating time window. This methodology can be applied to other geographic areas.

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RS14.2. Spatial Planning

1109 LAND USE/COVER CHANGE AND URBAN GROWTH IN AGARTALA CITY, TRIPURA, INDIA

ABSTRACT

Agartala is one of the fastest growing City among North-Eastern states of India with a population over four lakhs. Being a capital city of India, Tripura it is experiencing multi-dimensional problems such as over population, traffic congestion, water logging, inadequate solid waste disposal system and tiltation of buildings. The present study illustrates an integrated approach of Remote Sensing and GIS (Geographical Information System), i.e., Geospatial techniques for assessment of urbanisation, urban growth and land use/land cover dynamics of Agartala city. Landsat Satellite imageries of two different time period, i.e., Landsat Thematic Mapper (TM) of 1991 and Enhance Thematic Mapper (ETM) 2015 were acquired from USGS Earth Explorer/GLCF and quantified the land use/land cover changes in Agartala City during 1991 to 2015. The images of the study area were categorised into five different classes, viz. built-up area, water bodies, open space, vegetation and agricultural land. The remotely detect land use/cover change during 1991 to 2015 shows that Agartala is gradually changing as vegetative cover and open space have been renovate into built up areas. Low-lying marshy land and water bodies have been also transformed into built up areas. The study reveals that the city is expanding maximum towards the north-south direction due to presence of an airport in north and National Highway-8 along the periphery of the city in the south. The paper also highlights the importance of digital change detection technique for nature and location of change of Agartala city area. And it will contribute to both the development of sustainable urban land use planning decisions and also for forecasting possible future changes in growth patterns of the city. : Land use/cover, Urbanisation, Urban growth, Geo spatial technique.

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1565 REJUVENATING AN ABANDONED TOWN: THE CASE OF DHANUSKODI ISLAND, INDIA

ABSTRACT

Cities or towns that were previously functional but have been abandoned at some stage, represent an instance of unprecedented urban decaying. The revival of such towns get interlinked with the concept of urban renewal and redevelopment. This study revolves around Dhanuskodi, the end point located in the eastern part of Pambam Island, that was abandoned after the devastating impact of the cyclone and coastal disaster that took place in December 1964. Since colonial period Dhanushkodi was famous for trade and commerce. During mid of 20th century it was established as a modern market due to availability of good and transport facility. Due to the geographical location and its economic richness it was known as “Singapore of the South”. The most severe cyclonic storm which struck the town on 22-23 December 1964 and it lost its importance and abundance with the storms immediate effect. The cyclone devastated the entire town, washing away the railway track along with the last stream engine Pamban-Dhanushkodi passenger train that once connect Rameshwaram with Dhanushkodi and the entire villages swept away. This tip of southern part of Dhanushkodi island was destroyed and it is the same location that underwent subsidence under the Neo-tectonic activity in the mid of century and a subsequent emergence during the 2004 tectonic activity and tsunami. Presently Dhanushkodi island consists a small fishermen community that has been struggling in isolation since 1964. The local and state govt has proposed such kind of plans for rejuvenating the township. For the development of coastal tourism in TamilNadu the Ministry of Tourism, Tamil Nadu has launched “Swadesh Darshan Scheme” in 2016. Local, State and Central government has been proposing initiation of several scheme to redevelop towns infrastructural, communicational and other purpose has been needed. This study is an attempt to review the situation, attempt to draw up a framework for its revival with proper conservational measures coupled with renovation and restructuring so as to preserve its previous historic and mythological significance. This study analyses the evolution of the island, and assesses the present situation of existing dwellers of that island and subsequently proceeds to draw up the development issues, in the context of the proposed railway link with the mainland. The objective is to envisage the future possibilities of Dhanushkodi to be established again as an integrated region Southern India. The study will be based on qualitative survey aimed at an attempt to undertake a SWOT Analysis.

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1648 IMPACT OF URBAN CENTRES ON REGIONAL DEVELOPMENT: A CASE STUDY OF UTTAR PRADESH

ABSTRACT

Regional development is the outcome of territorial, economic and social integration. Urban centres act as an engine of growth of a region due to its multifunctional role in its internal and external relations with the human settlements and its environs. In 21st century, 'changing mode of production' and rapidly growing population leads to urbanization in developing countries. Urban population and urban centres are increasing rapidly in India as well as in Uttar Pradesh. According to census of India 2011, Uttar Pradesh has 22.28 percent urban population with 915 urban centres. But inter-regional variation of urbanization is very high in the state, census of 2011 shows that the Western Uttar Pradesh has most urbanization and Eastern Uttar Pradesh has least, 32.45 percent and 13.40 percent respectively. This paper is based on secondary data collected from Census of India, National Sample Survey Organisation (NSSO) and etc. Correlation, Nearest Neighbour Method for statistical analysis and cartographic representation are used to show the distribution of urban centres and regional development in different parts of Uttar Pradesh. This paper focuses on the regional distribution of class-wise urban centres and share of statutory towns and census towns in total urban population of Uttar Pradesh. It also tries to shed light on the connectivity among different urban centres and district headquarters and how they could help in planning and regional development of the region. The study found that number of urban centres has direct impact on the level of regional development, the western part of the state is more developed than the eastern part of the state. Most of the part of Bundelkhand and Tarai region has least number of urban centres and both come in the most backward regions of Uttar Pradesh. The results depict that small urban centres play a major role to provide services and markets to rural economy and it has positive impacts on regional development. Key words- urbanization, urban centres, regional development, planning, region

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1728 PLANNING SCHOOL NETWORKS IN DECLINING TERRITORIES: AN ANALYSIS AT THE LOCAL SCALE²⁸²**J. Wolf*, J.L. Marques, E. Castro**

Department of Department of Social, Political and Territorial Sciences (DCSPT), University of Aveiro, 3810-193, Aveiro, Portugal.

*Corresponding author: E-mail: jwolf@ua.pt**ABSTRACT**

Demographic change, and in particular phenomena such as ageing, shrinkage and depopulation, have a prominent place on the agenda of many European countries. But, even if they can be understood as general European problems, different regions and countries have different trends. Portugal, which has currently one of the lowest fertility rates in the world, has witnessed a particularly intense demographic decline, aggravated by the fact that the negative natural growth rates have not been compensated by a significant influx of migrants (as has occurred in other EU countries). The highly asymmetrical spatial layout of the country also means that this demographic challenge affects regions very differently, with some regions still growing, while others are already declining for decades. Notwithstanding the broad scientific discussion of this topic, local planning policies have struggled to address the challenges that arise from a contracting population on a broad scale. In fact, planning instruments are often based on the assumption of economic and demographic growth, to which they respond with urbanization and the provision of services and infrastructures, and not set to assume shrinkage as a permanent, or at least long-term, reality. Further, service provision to a shrinking population rises a particular set of problems that are inherently difficult to address such as; shrinking revenue; underused and overstretched infrastructures; the need to justify increased spending for adapting these infrastructures in declining territories; or guaranteeing service provision and quality to small and decreasing population pockets. This article will discuss the planning of public services in a context of shrinkage, by focusing the planning of primary schools in Portuguese municipalities. Six municipalities, which have witnessed significant restructuring of their schooling network in the last decade, and a varying degree of population decline, will be analysed. This analysis will focus on: i) the criteria underlying the used planning instruments; ii) the spatial layouts that are the outcome of applying these criteria; iii) the way in which (or whether) the planning of the schooling networks took into account the significant changes in the quantity and age structure of the population.

Keywords: Shrinkage; demographic change; public services; spatial planning**INTRODUCTION**

Territorial decline has been a frequent subject of urban and rural development literature in the last decade. Regarding rural areas, their decline has already been analyzed by many authors in the context of the urbanization processes and the concentration of industrial and tertiary activities of the late nineteenth and early twentieth century (see, for example, Carver, 1927 or Longstaff, 1893). But the decline of rural areas continues to be a relevant subject in many European territories, including issues such as: rural ageing (Burholt & Dobbs, 2012); the abandonment of remote agricultural or low density areas (MacDonald, Crabtree, & Wiesinger, 2000; Strijker, 2005); or the process of decline and its relation to cultural marginalization (Bryant, Paniagua, & Kizos, 2011).

Urban decline is also, by no means, a recent scientific subject. Decline has, for example, been considered by the cyclical models that, since the 1970, have tried to apprehend urban transformation through several phases: growth, suburbanization, decline and (eventually) reurbanization (Champion, 2001; Hall, 1971; van den Berg, Drewett, Klaasen, Rossi, & Vijverberg, 1982). In these models decline can be understood as response to saturation of some urban areas, which leads to people and firms favouring less densely populated areas which have lower agglomeration costs and provide more access to urban amenities (in particular space). Decline is therefore assumed to affect major urban areas as well as city centres, as a consequence of suburbanization or relocation of employment. Other early authors focusing on decline, noting the difficulty in apprehending it through a single conceptual framework, note the coexistence of different trends in different regions and at different scales (Morrill & Symons, 1977; Bourne, 1980).

Notwithstanding these analyses, the last decades saw an increased interest in this phenomenon, as can be seen by the proliferation of literature centred on the concept of *urban shrinkage* (Großmann, Bontje, Haase, & Mykhnenko, 2013; D. Haase, Haase, & Rink, 2014; Lang, 2012; Reis, Silva, & Pinho, 2015; Wiechmann & Pallagst, 2012). This conceptual shift – from decline to shrinkage – can be linked to changes in decline patterns, namely the low fertility rates of many European countries and the broad political and socioeconomic restructuring processes in Eastern Europe, as well as broad changes in urban systems, where broad polarization trends have led to the marginalization of many urban areas. But, coexisting with urban decline and shrinkage, other areas continue to grow and expand (Turok & Mykhnenko, 2007), highlighting the complexity of urban transformation processes, which comes from: i) the uncertain number of factors that influence urban development, ii) their unpredictable behaviour, iii) interactions at different scales, and its variability over time (Cheng & Masser, 2003). Therefore, urban change has been highly differentiated and dependent on concrete spatial context, with their specific spatial, economic and demographic layouts.

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This complexity of urban transformation processes makes it difficult to devise planning approaches that deal with the multiple dimensions of shrinkage, while also addressing the specific challenges that are associated with it. It has, in this regard, often been noted that current planning instruments are essentially growth oriented and therefore ill-suited to shrinkage (G.-J. Hospers, 2014; Johnson, Hollander, & Hallulli, 2014; Sousa & Pinho, 2015). But the analysis of concrete spatial planning instruments and the way in which (or whether) they address shrinkage/decline is still scarce. This article will contribute to this discussion by analyzing the planning of school facilities in six municipalities in Portugal, which have gone through varying degrees of decline, as well as restructuring of their school networks. It is divided into three sections: the first one analysis of shrinking, with a focus on Portugal; the second one briefly reviews the planning challenges coming from shrinkage; the third one analysis the case studies.

DEMOGRAPHIC CHANGE: SHRINKING REGIONS IN PORTUGAL

As noted in the introduction, decline and abandonment are an essential part of any urban transformation process. The main causes associated with it – economic, politic, demographic or spatial – have also already been discusses since the 1980 (see for example Bourne, 1980)²⁸³. What is new about current shrinkage is the importance of each of these dimensions and their specific role. Three aspects in particular should be highlighted: urban sprawl; economic change; demographic decline (A. Haase, Bernt, Grossmann, Mykhnenko, & Rink, 2013).

In this sense decline, or shrinkage, are multidimensional concepts, whose precise definition is subject to a broad scientific debate. While not intending to contribute to this debate, this conceptual ambiguity makes it useful to shortly clarify what is understood by each one: shrinkage is essentially a process of sustained population loss that leads to a decrease of the urban (or artificial) land uses; decline mostly entails population loss. Both terms – decline and shrinkage – will here be used interchangeably. In fact, possibly the most important dimension of shrinkage is demographic decline. This is not only because population decline tends to be the starting point of any analysis of shrinkage (Hospers, 2014, p. 1508), but because demographic changes are often the underlying cause of this phenomenon. Currently, ageing, population decline and the depopulation of some of the more remote areas are occurring at a large scale in many European countries, as well as other developed countries in the world. These trends can be linked what some authors considered to be a second demographic transition (Kaa, 2002; R Lesthaeghe & Neels, 2002), where fertility rates became structurally lower than replacement levels, linked to a maslovian change in preferences (Ron Lesthaeghe, 2010).

But urban shrinkage also reflects a growing polarization and fragmentation of urban development. In the last decades, a global network of urban places emerged, accompanied by a disconnection from their regional or national contexts – in a trend towards “deregionalizing” urban development (Stratmann, 2011). This global network, shaped by a global system of communications and led by global capitalist socio-economic forces, has been witnessing two main processes: i) specialization – which promotes the differentiation of urban landscapes according to their role in the global hierarchy; and ii) homogenization – mainly related to sharing, across the globe, tastes, living patterns or fashion – which results in what Koolhaas calls the emergence of the generic city (REM Koolhaas, 1995). Both mechanisms lead to a polarization of the urban system where the more dynamic and central urban areas develop into large socio-economic agglomerations and important nodes on the global urban network, in a metropolisation process analysed by many authors (Borja & Castells, 1997; Frey & Zimmer, 2001; Peter Hall and Kathy Pain, 2006; Stratmann, 2011). These urban areas also concentrate a growing share of economic activities, namely the ones related to innovation and knowledge, industrial and tertiary alike (Krätke, 2007).

At the European level, this metropolisation process has led to the growth of the large urban areas and conurbations that are located in the pentagon formed by London, Paris, Milan, Munich and Hamburg, which are complemented by a second layer of cities, such as Barcelona, Rome or Berlin, or cities with a national or regional relevance (Peter Hall and Kathy Pain, 2006). In parallel to the growth of large metropolises, many of the more peripheral areas are stagnating or declining. This decline affects many of the old industrial cities but also cities in shrinking regions, namely in eastern Europe (Turok & Mykhnenko, 2007): the majority of the eastern European cities has witnessed population loss in recent years, even if capital cities and more centrally located cities are excluded from this trend (Scott & Kühn, 2012).

The polarization of the urban system is also very visible in the Portugal, which has a very hierarchical urban systems and lacks medium-sized cities. In fact, the two largest functional urban areas (the metropolitan Areas of Lisbon and Porto) concentrate around 40% of the population (according to the urban audit) and have been growing above the national average since the 1950 (Marques, 2003).

²⁸³ According to this author, decline can be understood as a consequence of: 1) structural economic changes; 2) the movement of people according to job opportunities, amenities, social attributes or cultural preferences; 3) the unplanned outcome of public policies; 4) the systemic exploitation which is inherent to capitalist systems; 5) the complexity of social systems, with their significant randomness.

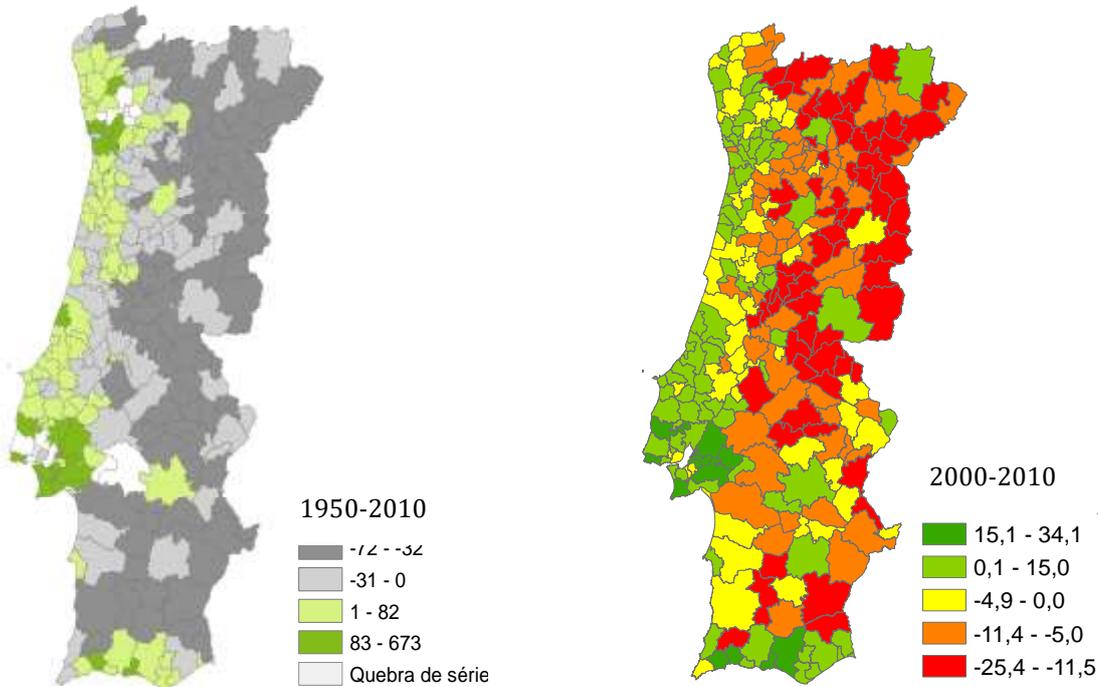
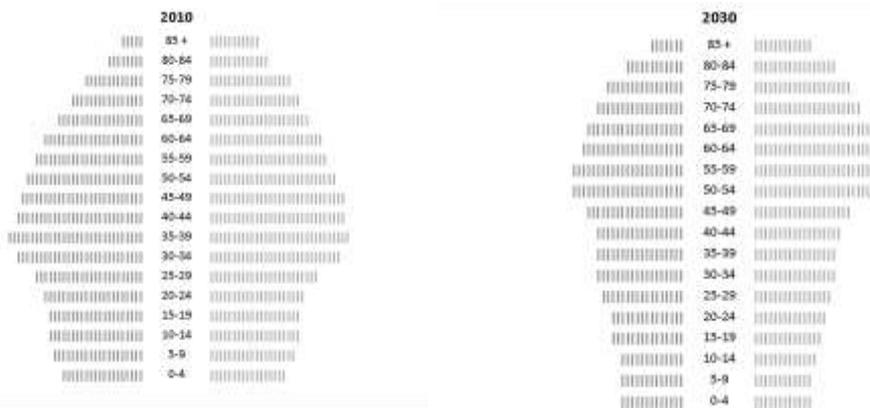


Figure 67: Growth rates in Portuguese Municipalities (%)

Much of the territory outside of the influence of the two largest urban areas has been witnessing very low growth rates, or decline, in particular the inland areas. This divide between coastal and inland areas is central to the territorial layout of the country, and can be observed since the nineteenth century, when the inland districts began to witness growth rates below the national average (Mourão, 2006). This trend has been accelerated throughout the twentieth century and, in the last decade, only a small share of non-coastal municipalities has been growing (see figure 1). But when looking at the medium-term trends the decline has even been more accentuated, with a smaller share of municipalities concentrating the population growth.



Source: Demospin Project (the projection is made considering a closed population)

Figure 68: Current and projected age structure of the Portuguese population

This trend is expected to continue, or even accentuate. In fact, given the age-structure, and its expected evolution if considering current fertility trends, population decline can be assumed for the next decades. And, considering current polarization trends and the fact that the general level of urbanization of Portugal is still below EU averages (the ESPON 1.3.4. project, for example, shows that in 2006 73,5% of the Portuguese population lives in functional urban areas, comparing to 83,7% in Spain or 77% in France), there is still room for further concentration of the population and for a sharper decline in much of the territory.

PLANNING SERVICES IN SHRINKING REGIONS

As was discussed in the previous section, the causes for shrinkage are manifold and include structural issues – such as demographic trends, global economic linkages, technological development or cultural preferences – with more localized ones – which are concerned with the spatial characteristics of a given territory or its position in the broader urban context. As noted by Martinez-Fernandez *et al.* (2016), this makes shrinkage an essentially glocal issue, meaning that it depends on local responses to broader societal trends. Shrinkage is, thus, a complex and highly differentiated phenomenon, which is difficult to address through local planning policies, not only given its multidimensionality and the complex causal relations which lead to it, but also because many of the explaining factors are out of reach to local policy makers.

From a service provision perspective, population decline poses specific challenges such as: shrinking revenue; underused and overstretched infrastructures; the need to justify increased spending for adapting these infrastructures in declining territories; or guaranteeing service provision and quality to small and decreasing population pockets. However, service provision should not only be understood as a reaction to population decline: it is, in itself, a factor that contributes to shape shrinkage. The planning of public service regarding decline can, thus, be made from two perspectives: i) as part of policies to counter it; ii) as a way to mitigate its negative consequences.

Regarding the first (i), the most frequently considered strategies for countering decline are not directly related to service provision. In fact, given that local development prospects dependent more on attracting and retaining population (and not on stimulating natural growth), many local policy-makers have focused on developing strategies aimed at stimulating the local economies or place-making. These policies range from providing favorable fiscal regimes (this was used, for example in Sosnowiec – Bernt *et al.*, 2012), to promoting urban regeneration or tourism through place marketing. The main goal of these approaches is to create a favourable image and put the place on the map, through marketing strategies (Hospers 2011, p. 370). But the practical impact of these measures is often questionable. Not only because territories are multi-dimensional and complex and are therefore difficult to ‘sell’ (Kavaratzis & Ashworth, 2005), but also because the broad use of these strategies can lead to a highly competitive environment and zero-sum games (G.-J. Hospers, 2014).

Another frequently adopted strategy for countering decline is the provision of amenities (which include services). The literature has shown they concur with labor-market opportunities in explaining attractiveness of a given place, in particular in the USA (Chen & Rosenthal, 2008; Clark & Hunter, 1992; Ferguson, Ali, Olfert, & Partridge, 2007; Gustafson, Hammer, Radeloff, & Potts, 2005) but also, to a lesser degree, in Europe (Biagi, Faggian, & McCann, 2011; Cheshire & Magrini, 2006; Rodríguez-Pose & Ketterer, 2012; Sarra & Del Signore, 2010). In Portugal this relation was analysed, in an exploratory fashion, by Barreira, S. Ramalho, Panagopoulos, & Guimarães (2017). But, even if the importance of the provision of amenities for the attractiveness of a territory is broadly recognized, there is scarce empirical prove of the success of measures that are based on this approach in dealing with decline. In Germany, for example, many municipalities have developed child-care services or the provision of affordable housing, without a clear contribution for mitigating or countering decline (Küpper, 2011). In Portugal, many of the less developed territories have also tried this type of approach and tend to have a better coverage of social services for children or the elderly, without a clear impact on their demographic prospects.

Strategies for mitigating decline and adapting to it (ii), on their turn, tend to focus on resizing and repurposing. One of the most debated case is, in this context, the urban strategy applied to eastern German cities – the *Stadtumbau Ost* (Deutscher Bundestag, 2012) – which namely included the demolition of a very significant amount of housing (see, for example, Bontje, 2004; Wiechmann & Pallagst, 2012; Wiechmann, 2009; Pallagst, 2008). Another strategy is to deal with shrinkage through a smart decline approach, such as using vacant urban land to provide green areas (D. Haase et al., 2014), involving citizens in its management or on sharing the provision of functions between different local authorities (Popper & Popper, 2002). Nonetheless, the adoption of this kind of approach is challenging, since it implies assuming decline as a long-term reality which, as was noted, is not something planning systems are well adjusted to. Further, given the impact physical decline and population loss have on the image and identity of a region, assuming shrinkage can even contribute to accelerate it (G.-J. Hospers, 2014) or become a self-fulfilling prophecy. This means that most strategies for addressing decline are based on revitalization or stabilization (Johnson, Hollander, & Hallulli, 2014, p. 151).

PLANNING SCHOOL FACILITIES IN PORTUGAL

Although often considered bureaucratic and centralized, education in Portugal has been subject to several policies, programmes and measures that embody a gradual shift towards decentralization and territorial contextualization (Alves, 1996: 1169; Formosinho, 2000; Machado, 2014). Decentralization essentially means shifting competences from the central state to local or regional bodies, in particular municipalities. In Portugal, decentralization in education has been advancing since the 1980 and, while initially comprising mainly complementary tasks – e.g. transport or social services (Neto-Mendes, 2007), gradually moved to include more essential issues, such as non-teaching staff management or the definition of extra-curricular activities. The territorialisation, while overlapping with decentralization in some aspects, can be understood as a step further in rethinking the regulation in educational matters. It implies a greater autonomy for the schools in defining local educational projects (assumed by the Decreto-Lei nº 553/80, de 21 de novembro), as well as the involvement of a broader set of agents and the acceptance of the diversity of processes, solutions and decision centres, without losing national coherence and equity (Barroso, 2013: 22).

In many ways the decentralization and territorialisation of educational policies reverberate with the broader debate on the role the state and different local and regional agents have in policy formulation and implementation, expressed in the governance literature of authors such as Kooiman, (2003, 2008) or Rhodes (1996, 2007). For this paper, two aspects become crucial. The first one is the way in which state control is being eroded and substituted by the rise of networked coordination, where the boundaries between “state, market, and community” are blurred or even dissolved (Rhodes, 1996). In the planning field, this new understanding of the role of different agent in the policy process can be associated with collaborative planning approaches, which emphasize deliberation, communication (Healey, 1990, 2003) and consensus seeking (Innes, 1996), and tend to assume the establishment of a varying set of partnerships or collaborations between different stakeholders as a key way of functioning (Healey, 1998: 1533). The second one is a change in scale in the predominant institutional arrangements between stakeholders. This change implies a downward shift, towards more localized and place-based approaches (Oliveira & Breda-Vazquez, 2010). But, in the European context, it also implies and

upwards shift, where competences and decision-making are assumed by the different EU wide bodies (Papadopoulos, 2010). This means that policy decisions, even at the local scale, increasingly depend on the institutional arrangements that are established along different layers of agents and on their position and bargaining power in these shifting policy arenas – leading some authors to classify this new context as a multilevel governance system (Kokx & van Kempen, 2010).

But, while these trends can be associated with more participated policy processes, an increased autonomy of local stakeholders or even the (co)production of public services by local communities (Gofen, 2013; Ostrom, 2010), they have also been subject to criticism. The governance discourse, and the horizontal, collaborative, policy practices which are associated with it, are often considered a way to promote a neoliberal appropriation of state functions (Swyngedouw, 2005), or at least to provide legitimacy to a neoliberal supporting state (Gunder, 2010; Purcell, 2009). In fact, the substitution of the rational, bureaucratic, administration of public services by more flexible post-modern forms of coordination often favours the capture of processes by more powerful and organized interest groups as well as the application of performance and output-oriented approaches. Further, it has also been pointed out that central states continue to play a crucial role in defining public policies (Kokx & van Kempen, 2010; Marinetto, 2003), given their capacity to define funding mechanisms, to establish bureaucratic procedures or simply because, even if they would start as an equal partner in a collaborative governance approach, they have greater access to each of the sources of power identified by Purdy (2012) as being fundamental in this kind of process – authority, resources, legitimacy.

The inherent complexity of most modern public policy issues also means that they are not easily addressed through a loosely formulated set of procedures that is defined by a varying network of public and private agents. Therefore, more than witnessing a shift towards networks of horizontally linked public and private agents, modern states combine bureaucratic organizations, networks and markets, which form contending and cooperating institutions (Olsen, 2006).

Given this context, planning processes in education should be understood as the outcome of central state regulation, as well as the way in which local agents articulate themselves in institutional and governance arrangements. These two levels correspond, broadly, to what Barroso (2006: 51) called the “institutional regulation” and “local microregulation” of educational matters. The institutional regulation refers to the way in which the State and its administration coordinate, control and influence the context in which local decisions are made. The local micro-regulation highlights the horizontal coordination of institutional and non-institutional agents that share a space of interdependencies and interests. Both dimensions are fundamental for analysing the way in which local planning instruments face decline. In fact, the criteria and strategies for dealing with population decline in planning school facilities are very depend on the interplay that different agents and institutional frameworks in these different governance layers, as well as the assumptions regarding the role these facilities have in declining territories.

The responsibility for constructing, equipping and maintaining of primary school facilities was passed from the central State to the municipalities in 2003 (Decreto-Lei n.º 7/2003, de 15 de janeiro, revised by the Decreto-Lei n.º 72/2015, de 11 de maio). This law also assumed that planning this type of facilities would be done by the municipalities, by establishing a local planning instrument – ‘school charts’. These instruments are assumed to make a “prospective planning” of education facilities for the medium/long term, according to the offer that best serves the demographic and socioeconomic context of the municipality and the principles of rationality and complementarity. The municipalities are responsible for developing the charts, following technical criteria established by the Central State (for sizes, for the integration of different study cycles in one facility, etc.) and premises regarding the goals of these charts – such as reducing the isolation of students, promoting equal opportunities, meeting demand and articulating itself with the urban policy of the municipality. These charts are thus marked by a decentralized approach, where territorial contexts are taken into consideration and local bodies are given responsibilities but are also supposed to follow general goals and technical guidelines. In addressing decline, this integrated approach means that, besides adapting to the broader demographic, economic and social development trends, local education projects must also be understood as a central part of a territorial vision, given their role in any conceivable strategy to counter or mitigate shrinkage.

REORGANIZING THE PRIMARY SCHOOL NETWORK: FROM DISCOURSE TO PRACTICE

In this paper, the planning of primary school facilities in six different of the Centre Region of Portugal is analyzed in an exploratory way. The municipalities were selected given the role the authors had in devising local planning instruments related to education, including the revision of school charts or the development of strategic plans, which allowed to gather information as well as insights into the planning praxis that dominated these matters. The focus on primary education is justified by the changes these facilities have witnessed and, also, because they must guarantee spatial coverages which are not expected for other cycles. The depth of the analysis changes, according to the amount of information that is available for each case.

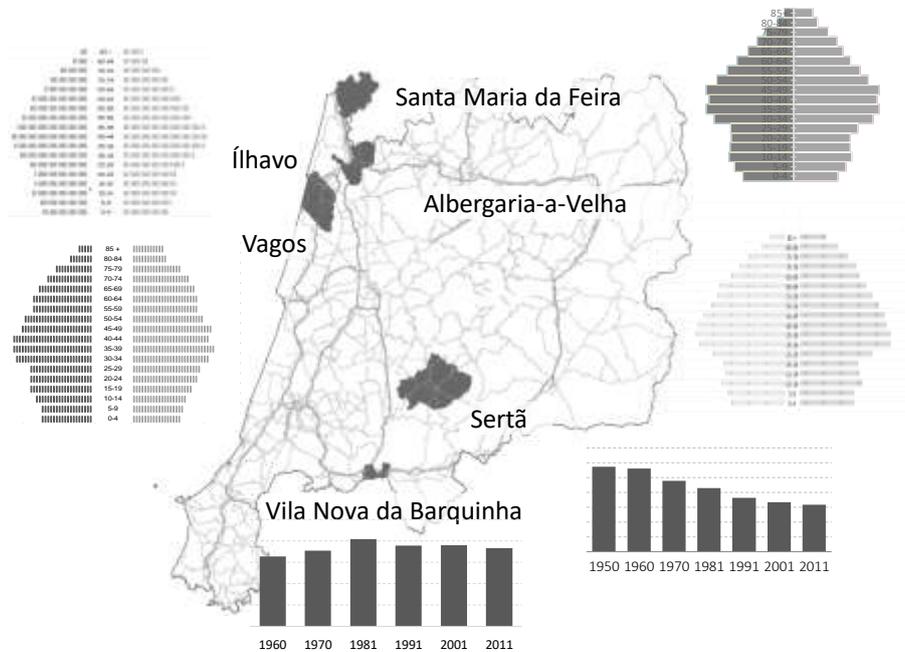


Figure 69: Municipalities considered in the analysis

As can be seen by Figure 69, the considered municipalities face very different demographic challenges. The two municipalities which are further from the coast have already witnessed a declining population in the last decades, while the other four have witnessed small increases, although their current age-structures are barrel shaped. Given these age-structures, population decline is almost inevitable in all the considered municipalities, in the medium or long-run. This decline can, essentially be understood as a consequence of persistently low fertility rates, which have led to a small amount of women in fertile age-groups, generating a negative momentum of demographic growth, which is affecting most of the European countries (Davoudi, Wishardt, & Strange, 2010). As noted by Castro, Martins, & Silva (2015), in most Portuguese regions this ageing process has reached a point where even an abrupt rise of fertility rates would not have a very significant contribution to countering decline, which would imply a very significant and constant influx of migrants in the next decades. Given that the migration rates in the analyzed municipalities are generally negative for young cohorts (and positive of old ones), further ageing and population decline can safely be assumed for all of them. This shift in the size and age-structure of the population, as well as the spatial asymmetries they tend to assume (with the more remote and less populated areas of these municipalities facing a much stronger decline), poses a considerable challenge to planning school facilities, which has led to very different policy responses in the six municipalities.

THE “RATIONALITY” OF THE SCHOOL NETWORKS

The reorganization of the school network has been one of the major planning challenges in Portugal and a paradigmatic one in dealing with decline. In fact, given the shrinking student population, there has been a continuous closing of school facilities and, since 2000 more than half of the national primary schools closed. Simultaneously, there was also a significant modernization of the school network, with the construction of many new buildings and the requalification of old ones: as noted by Martins (2014), the last decade witnessed a major renewal in school facilities, many of which were still from the first major expansion of the network in 1950-1970.

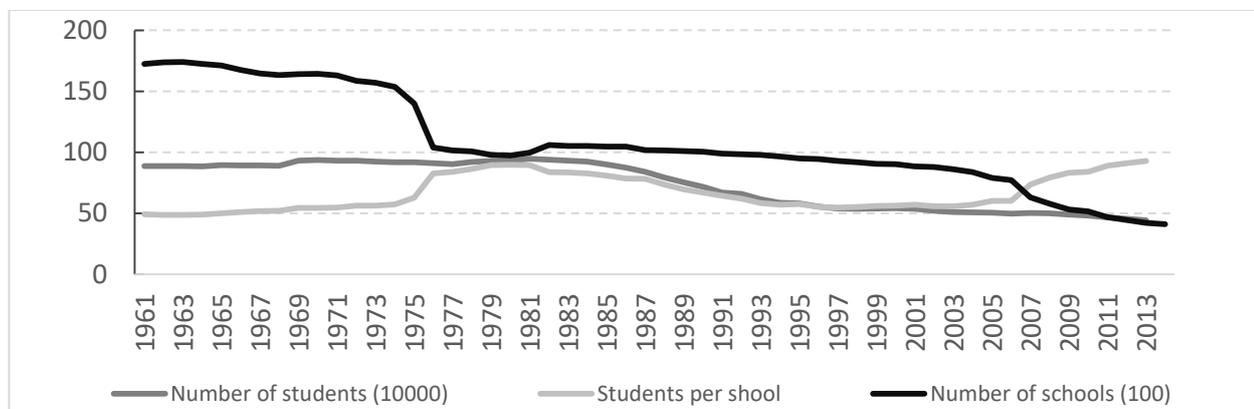


Figure 70: Number of primary schools and students (1961-2012)

This way in which these changes in the school network were done, while being a consequence of a decreasing student population, also expresses broad pedagogic assumptions. As becomes clear from Figure 70, primary school closures do not only reflect changes in the number of students, since the average size of schools has been changing significantly; they also reflect the type of school that is considered desirable. In the last decade there has, for example, been a push towards

larger school facilities that can provide the necessary amenities as well as a scale which is supposed to be more adequate for the socialization of student and the establishing of a teaching to advance their training.

In this regard, in 2010 the Government established as the criteria for primary schools to function a minimum of 21 students as well as amenities such as libraries or sport facilities (Resolução do Conselho de Ministros n.º 44/2010), following the goal for “rationalizing” the school network, established in 2005 by the second revision of the basic law for education. According to the dominant paradigm of school facility planning, this “rationality” essentially entails the closure of facilities that served small and shrinking population, mostly in rural areas, and their progressive concentration in new, much larger facilities. The rationalizing discourse has also, by a large degree, been adopted by the local planning instruments. In fact, the need to introduce “rationality” into the local school networks is stressed by five of the six school charts, which assume the need to counter the “isolation” of some of the student population.

THE PROSPECTIVE APPROACH OF THE SCHOOL CHARTS

Given this overall reduction in the quantity of primary schools it is interesting to analyse the way in which local planning instruments struggle to define a strategy for dealing with decline. In fact, the schooling charts of two of the municipalities did not include any projection for the student population but only the general population. And the projections that were made, had a very short time-span: taking into consideration that a school facility should be planned for a time-span of about 50 years, one school chart made projections for only 4 years and the longest time span was 13. But, most importantly, the estimations were overly optimistic. The two cases were only the evolution of the general population was projected, for example, assumed a growth rate which was much higher than the one that actually occurred. The projected number of students in the other school charts where also well above the real growth in the student population in all municipalities, except one. It should, nonetheless, be taken into consideration that the extension of the compulsory education until 18 years old or the finishing secondary education in 2007/2008 unexpectedly rose the number of students, which made the projections more accurate. For primary education, where the level of enrolment is much more stable, the projected number of students was, for example, much further from the actual evolution.

Municipality	Year of the school chart	Total student population					Primary schools	
		Last year of the projection	Projected student population	Projected growth rate	Actual student population	Actual growth rate	Projected student population	Actual student population
Sertã	2005	2011	2.372	-6.9	2 721	6.1	669	568
Vagos	2006	2016	3692	-2.5	3572	-4.9	1009	796
Ílhavo	2007	2011	6293	5.3	5705	-4.6	1880	1547
St M ^a da Feira	2005	2011	-	-	-	-	-	-
Vila N. da Barquinha	2005	2015	1074	17.0	896	-2.9	252	246
Albergaria-a-Velha	2007	2020	-	-	-	-	-	-

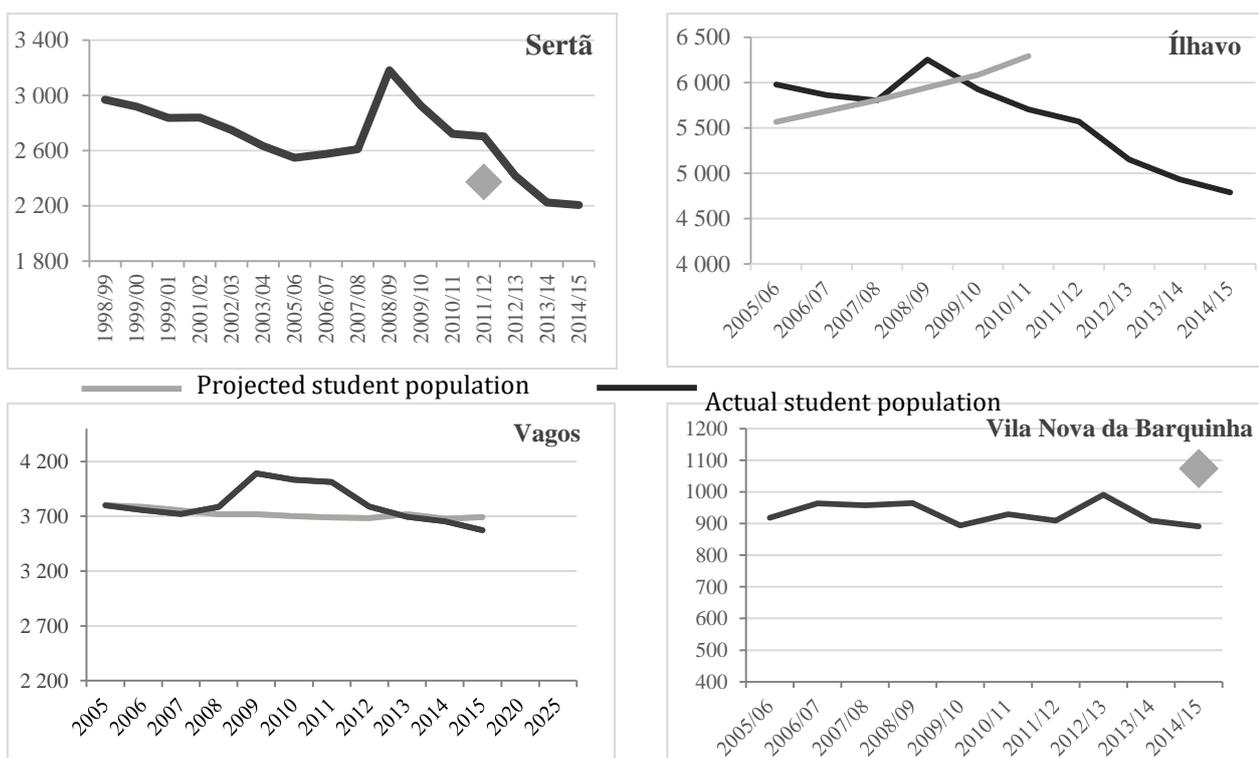


Figure 71: Projected vs actual change in student population

This difficulty in assuming decline can be explained by the applied methodologies, which often assumed the continuity of past trends, and the factors mentioned in the literature review – a growth-oriented planning system and the negative image that is generally associated with decline. But, as became clear by interacting with local policy-makers, it also expresses a very mundane issue: the difficulty in justifying the application for funding interventions in local facilities for a shrinking population. It can this be associated, to a certain degree, with the constraints of a multilevel governance structure where the definition of local planning strategies depends on the (perceived) rationales of external funding mechanisms.

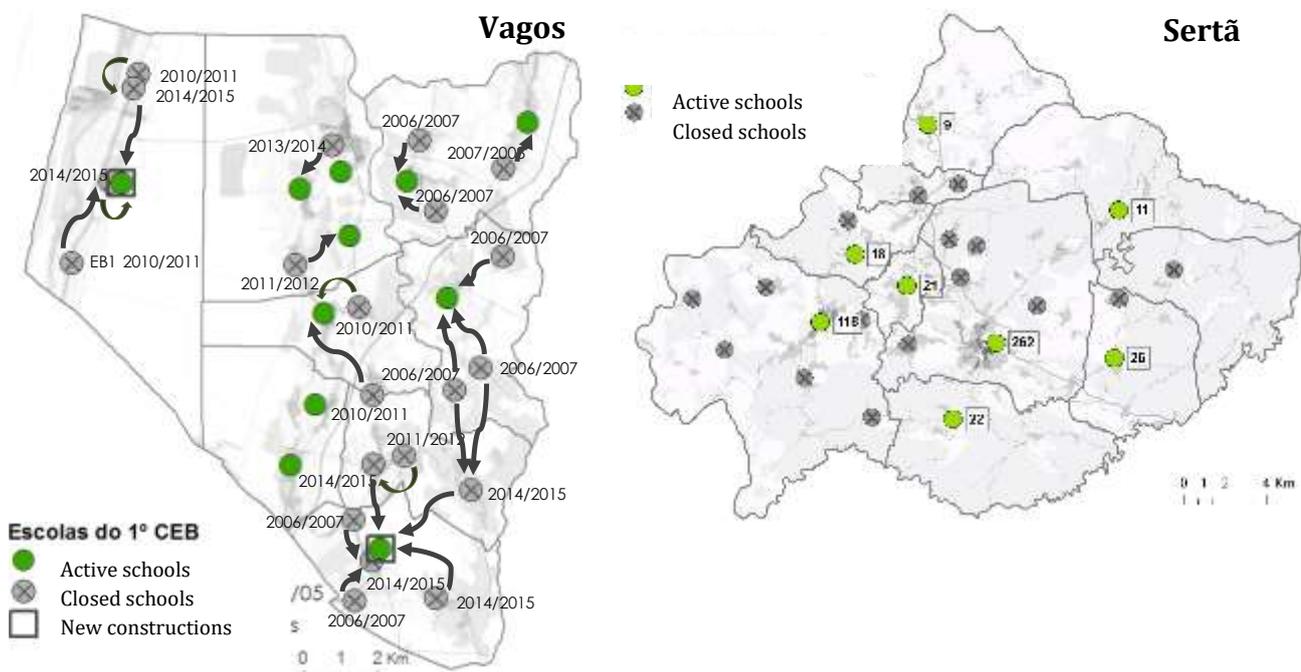
PLANNING THE DECLINE?

These multilevel governance structures are also fundamental in defining the way in the institutional regulation of the education system is translated into concrete spatial layouts. Cordeiro & Martins (2012), analysing the reorganization of school networks in 12 municipalities in Portugal, identify three different strategies at the local scale: (i) “reconfiguration by decree”, where national criteria for the functioning of schools are completely applied at the local scales; (ii) “reconfiguration by conciliation”, where criteria established by the central state are harmonized with the ones established by the municipalities; and (iii) “communitarian reconfiguration”, where the criteria established by the central state are largely ignored and closure of schools and the construction of new ones is subject to significant bargaining between local stakeholders and between those and central state actors.

When analysing the practical outcomes of implementing the school charts in four of the six considered municipalities, these different strategies become apparent. As can be seen in table 1, all the municipalities closed some school facilities, but the share differs significantly: from reducing the amount of schools by more than two thirds to reducing the amount by only one. Since the overall capacity in the school building rose in this last municipality, this meant that average occupancy rates fell, leading to an underused infrastructure.

Table 26: Reorganization of the primary school network in 4 municipalities

	Before the school chart					After the school chart				
	Year	Students	Schools	Average Size	Occupancy rates	Year	Students	Schools	Average Size	Occupancy rates
Ílhavo	2005	1706	20	85	77%	2012	1594	19	84	70%
Vagos	2004	1057	28	38	70%	2011	863	11	78	86%
Sertã	2004	651	29	22	45%	2011	487	8	61	68%
A-a-Velha	2005	1287	30	43	51%	2015	998	14	71	89%



The strategy regarding the new construction was also very different in the municipalities. In one municipality (Sertã), for example, no new facilities were constructed and the progressive closure of schools simply led to the already existing facilities absorbing the remaining students. In another one (Vagos), the strategy was mixed, with two new large buildings absorbing the student population from some of the small ones that closed, while in the rest of the territory there was a strategy of progressively closing facilities and transferring students to the remaining ones.

DISCUSSION

This analysis of the way in which local school planning instruments dealt with decline, while exploratory, allowed to get some interesting insights. The first one regards the difficulty in assuming decline. This can be seen by the tendency for overestimating the number of students, as well as by the absence of a declared strategy in addressing decline, even when it is expected. Essentially, decline is addressed through denial or passive adaptation, with a complete absence of more

proactive strategies, that could either aim at countering decline or managing it. The former strategies are further hindered by the sectoral and narrow planning approaches that predominates educational planning instruments, revealed by the complete absence of broader urban planning considerations in the reconfiguration envisaged in the analyzed schooling charts.

The second one concerns the way in which the reconfiguration of local school networks allow to understand many defining aspects of a multilevel governance system. As noted by Baixinho (2011), much of the decentralization push in educational matters has been led by rationalization discourse, where the planning and strategic allocation of resources remains centralized, while the operational decisions are decentralized. The definition of guidelines for the functioning of schools by the central state, and also the way in which local planning instruments adopt these guidelines (or even the discourse of these national policy directives), is a good example of this approach. It also highlights, in a more general way, the coexistence of central steering (or institutional regulation) in a context where local micro-regulation is supposed to be the privileged approach.

But the different approach to reconfiguration of the schooling system is also an example of the way in which central state guidelines are adapted to fit different local policy approaches. This is most evident in the varying degree to which the municipalities adopted the “rationalization” of the schooling system by simply maintaining many small facilities. But it can also be seen by small steps that are, ultimately, used to increase the reach of local decision-making. The denial (or limited assumption) of decline can even, in itself, be understood as a part of this strategy, by not providing the justification for a more radical reconfiguration of the school network and also by making it easier to apply to external funding mechanisms for rehabilitating existing school facilities.

REFERENCES

- Alves, N. et al. (1996). *A Escola e o Espaço Local. Políticas e Actores*. Lisboa: Instituto de Inovação Educacional.
- Baixinho, A. (2011). “Educação e autarquias: Lógicas de acção do poder autárquico face ao poder central e aos micropoderes locais.” *Revista Lusófona de Educação*.
- Barreira, A. P., S. Ramalho, J. J., Panagopoulos, T., & Guimarães, M. H. (2017). “Factors Driving the Population Growth and Decline of Portuguese Cities.” *Growth and Change*, 0(0).
- Barroso, J. (2005). “O Estado, a educação e a regulação das políticas públicas.” *Educação e Sociedade*, 26(92), pp.725–751.
- Barroso, J. (2006). *A Regulação das Políticas Públicas de Educação: espaço, dinâmicas e actores*. Lisboa: Educa/Unidade de I&D de Ciências da Educação.
- Barroso, J. (2013). “A emergência do local e os novos modos de regulação das políticas educativas.” *Educação. Temas e Problemas*, (12 e 13), pp.13–25.
- Bernt, M., Cocks, M., Couch, C., Grossmann, K., Haase, A., & Dieter Rink. (2012). *Policy Response, Governance and Future Directions* (No. 2). Helmholtz Centre for Environmental Research.
- Biagi, B., Faggian, A., & McCann, P. (2011). “Long and Short Distance Migration in Italy: The Role of Economic, Social and Environmental Characteristics.” *Spatial Economic Analysis*, 6(1), pp.111–131.
- Bontje, M. (2004). “Facing the challenge in East Germany: The case of Leipzig.” *GeoJournal*, 61, pp.13–21.
- Borja, J., & Castells, M. (1997). *Local & Global: management of cities in the information age. Uma ética para quantos?* London and New York: Earthscan.
- Bourne, L. S. (1980). “Alternative perspectives on urban decline and population deconcentration.” *Urban Geography*, 1(1), pp.39–52.
- Bryant, R. L., Paniagua, A., & Kizos, T. (2011). “Conceptualising ‘shadow landscape’ in political ecology and rural studies.” *Land Use Policy*, 28(3), pp.460–471.
- Burholt, V., & Dobbs, C. (2012). “Research on rural ageing: Where have we got to and where are we going in Europe?” *Journal of Rural Studies*, 28(4), pp.432–446.
- Carver, T. N. (1927). “Rural depopulation,” *IX*(1), pp.1–10.
- Champion, T. (2001). “Urbanization, suburbanization, counterurbanization and reurbanization.” In R. Paddison (Ed.), *Handbook of urban studies* (pp. 143–161). London: Sage Publications.
- Chen, Y., & Rosenthal, S. S. (2008). “Local amenities and life-cycle migration: Do people move for jobs or fun?” *Journal of Urban Economics*, 64(3), pp.519–537.
- Cheng, J., & Masser, I. (2003). “Modelling urban growth patterns: A multiscale perspective.” *Environment and Planning A*, 35(4), pp.679–704.
- Cheshire, P. C., & Magrini, S. (2006). “Population growth in European cities: Weather matters – but only nationally.” *Regional Studies*, 40(1), pp.23–37.
- Clark, D., & Hunter, W. (1992). “The Impact of Economic Opportunity, Amenities and Fiscal Factors on Age-Specific Migration Rate.” *Journal of Regional Science*, 32(3), pp.349–365.
- Cordeiro, A. M. R., & Martins, H. A. (2012). “A Carta Educativa Municipal como instrumento estratégico de reorganização da rede educativa: tendências de mudança.” *Cadernos de Geografia*, (30/31), pp.339–356.
- Davoudi, S., Wishardt, M., & Strange, I. (2010). “The ageing of Europe: Demographic scenarios of Europe’s futures.” *Futures*, 42(8), pp.794–803.
- de Castro, E. A., Martins, J. M., & Silva, C. J. (2015). *A demografia eo país: previsões cristalinas sem bola de cristal*. Gradiva.
- Deutscher Bundestag. (2012). *Bund-Länder-Bericht zum Programm Stadtumbau Ost. Gesundheitswesen*.
- Ferguson, M., Ali, K., Olfert, M. R., & Partridge, M. (2007). “Voting with their feet: Jobs versus amenities.” *Growth and Change*, 38(1), pp.77–110.
- Formosinho, J. (2000). *Políticas Educativas e Autonomia das Escolas*.
- Frey, W. H., & Zimmer, Z. (2001). “Defining the City.” In R. Paddison (Ed.), *Handbook of Urban Studies* (pp. 14–35).
- Gofen, A. (2013). “Citizens’ Entrepreneurial Role in Public Service Provision.” *Public Management Review*, (October), pp.1–21.
- Großmann, K., Bontje, M., Haase, A., & Mykhnenko, V. (2013). “Shrinking cities: Notes for the further research agenda.” *Cities*, 35, pp.221–225.
- Gunder, M. (2010). “Planning as the ideology of (neoliberal) space.” *Planning Theory*, 9(4), pp.298–314.

- Gustafson, E. J., Hammer, R. B., Radeloff, V. C., & Potts, R. S. (2005). "The relationship between environmental amenities and changing human settlement patterns between 1980 and 2000 in the Midwestern USA." *Landscape Ecology*, 20(7), pp.773-789.
- Haase, A., Bernt, M., Grossmann, K., Mykhnenko, V., & Rink, D. (2013). "Varieties of shrinkage in European cities." *European Urban and Regional Studies*, (Figure 1), pp.1-17.
- Haase, D., Haase, A., & Rink, D. (2014). "Conceptualizing the nexus between urban shrinkage and ecosystem services." *Landscape and Urban Planning*, 132, pp.159-169.
- Hall, P. (1971). "Spatial structure of metropolitan England and Wales." In M. Chisholm & G. Manners (Eds.), *Spatial policy problems of the british economy* (Vol. 1, pp. 96-125). Cambridge: Cambridge University Press.
- Healey, P. (1990). "Planning Trough Debate." *Planning Theory: Prospects for The 1990's*. Oxford, Reino Unido.
- Healey, P. (1998). "Building institutional capacity through collaborative approaches to urban planning." *Environment and Planning A*, 30(9), pp.1531-1546.
- Healey, P. (2003). "Collaborative Planning in Perspective." *Planning Theory*, 2(2), pp.101-123.
- Hospers, G. (2011). "Place marketing in shrinking Europe: some geographical notes." *Tijdschrift voor economische en sociale geografie*, 102(3), pp.369-375.
- Hospers, G.-J. (2014). "Policy Responses to Urban Shrinkage: From Growth Thinking to Civic Engagement." *European Planning Studies*, 22(7), pp.1507-1523.
- Innes, J. (1996). "Planning through consensus building." *Journal of the American Planning Association*, 62(4), pp.460.
- Johnson, M. P., Hollander, J., & Hallulli, A. (2014). "Maintain, demolish, re-purpose: Policy design for vacant land management using decision models." *Cities*, 40, pp.151-162.
- Kaa, D. J. van de. (2002). "The Idea of a Second Demographic Transition in Industrialized Countries." In *Paper presented at the Sixth Welfare Policy Seminar of the National Institute of Population and Social Security, Tokyo, Japan, 29 January 2002* (pp. 1-34).
- Kavaratzis, M., & Ashworth, G. (2005). "City branding: an effective assertion of identity or a transitory marketing trick?" *Tijdschrift voor economische en sociale geografie*, 96(5), pp.506-514.
- Kolkx, A., & van Kempen, R. (2010). "Dutch urban governance: Multi-level or multi-scalar?" *European Urban and Regional Studies*, 17(4), pp.355-369.
- Kooiman, J. (2003). *Governing as Governance*. London: Sage Publications.
- Kooiman, J. (2008). "Exploring the concept of governability." *Journal of Comparative Policy Analysis: Research and Practice*, 10(2), pp.171-190.
- Koolhaas, R. (1995). "Generic Cities." In R. Koolhaas & B. Mau (Eds.), *S, M, L, XL* (pp. 1239-1264).
- Krätke, S. (2007). "The metropolization of the European urban system in the era of globalization." In P. J. Taylor, B. Derudder, P. Saey, & F. Witlox (Eds.), *Cities in Globalization: practices, policies and theories* (pp. 150-178). London and New York: Routledge.
- Küpper, P. (2011). *Regionale Reaktionen auf den Demographischen Wandel in dünn besiedelten, peripheren Räumen*. ioer.de. Berlin: Leibniz Institut für Raumentwicklung.
- Lang, T. (2012). "Shrinkage, Metropolization and Peripheralization in East Germany." *European Planning Studies*, 20(10), pp.1747-1754.
- Lesthaeghe, R. (2010). "The unfolding story of the second demographic transition." *Population and Development Review*, 36(2), pp.211-51.
- Lesthaeghe, R., & Neels, K. (2002). "From the first to the second demographic transition: An interpretation of the spatial continuity of demographic innovation in France, Belgium and Switzerland." *European Journal of Population*, 18, pp.325-360.
- Longstaff, G. B. (1893). "Rural Depopulation." *Journal of the Royal Statistical Society*, 56(3), pp.380-442.
- Louro, P. (1999). "Educação e autarquias: da legislação às práticas."
- MacDonald, D., Crabtree, J., & Wiesinger, G. (2000). "Agricultural abandonment in mountain areas of Europe: environmental consequences and policy response." *Journal of Environmental Management*, 59, pp.47-69.
- Machado, J. (2014). "Descentralização e Administração Local: Os municípios e a educação." *Município, Território e Educação - A Administração Local da Educação e da Formação*.
- Marinetti, M. (2003). "Governing beyond the Centre: A Critique of the Anglo-Governance School." *Political Studies*.
- Marques, T. S. (2003). "Dinâmicas territoriais e as relações urbano-rurais." *Revista da Faculdade de Letras - Geografia*, 1ª série(19), pp.507-521.
- Martinez-Fernandez, C., Weyman, T., Fol, S., Audirac, I., Cunningham-Sabot, E., Wiechmann, T., & Yahagi, H. (2016). *Shrinking cities in Australia, Japan, Europe and the USA: From a global process to local policy responses*. *Progress in Planning* (Vol. 105).
- Martins, H. A. (2014). "As cartas educativas municipais e o reordenamento da rede escolar no Centro de Portugal: das condições demográficas às decisões políticas," pp.581-607.
- Morrill, R., & Symons, J. (1977). "Efficiency and Equity Aspects of Optimum Location." *Geographical Analysis*, 9(July), pp.215-226.
- Mourão, P. (2006). "Tendências de concentração regional no interior português-o caso de Trás-os-Montes e Alto Douro." *Regional and Sectoral Economic Studies*.
- Neto-Mendes, A. (2007). "A participação dos municípios portugueses na educação e a reforma do Estado-elementos para uma reflexão." In B. Sander (Ed.), *XXIII Simpósio Brasileiro de Política e Administração da Educação*. Porto Alegre.
- Oliveira, C., & Breda-Vazquez, I. (2010). "Contradictory rescaling: Confronting state restructuring and the building of new spatial policies." *European Urban and Regional Studies*, 17(4), pp.401-415.
- Olsen, J. P. (2006). "Maybe it is time to rediscover bureaucracy." *Journal of Public Administration Research and Theory*, 16, pp.1-24.
- Ostrom, B. E. (2010). "Beyond Markets and States: Polycentric Governance of Complex Economic Systems." *American Economic Review*, 100(June), pp.1-33.
- Pallagst, K. (2008). "Shrinking Cities: Planning Challenges from an International Perspective." *Cities growing smaller, 2007*, pp.7-16.
- Papadopoulos, Y. (2010). "Accountability and multi-level governance: More accountability, less democracy?" *West European Politics*, 33(5), pp.1030-1049.
- Peter Hall and Kathy Pain. (2006). *The Polycentric Metropolis: Learning from Mega-City Regions in Europe* London: Earthscan. London.
- Popper, D. E., & Popper, F. J. (2002). "Small Can Be Beautiful: Coming to terms with decline." *Planning*, 68(7), pp.20-23.
- Purcell, M. (2009). "Resisting Neoliberalization: Communicative Planning or Counter-Hegemonic Movements?" *Planning Theory*, 8(2), pp.140-165.
- Purdy, J. M. (2012). "A Framework for Assessing Power in Collaborative Governance Processes." *Public Administration Review*, 72(3), pp.409-417.

- Reis, J. P., Silva, E. A., & Pinho, P. (2015). "Spatial metrics to study urban patterns in growing and shrinking cities." *Urban Geography*, 3638(October), pp.1-26.
- Rhodes, R. a. W. (1996). "The New Governance: Governing without Government." *Political Studies*, 44(4), pp.652-667.
- Rhodes, R. a. W. (2007). "Understanding Governance: Ten Years On." *Organization Studies*, 28(8), pp.1243-1264.
- Rodríguez-Pose, A., & Ketterer, T. D. (2012). "Do local amenities affect the appeal of regions in Europe for migrants?" *Journal of Regional Science*, 52(4), pp.535-561.
- Sarra, A. L., & Del Signore, M. (2010). "A Dynamic Origin-constrained Spatial Interaction Model Applied to Poland's Inter-provincial Migration." *Spatial Economic Analysis*, 5(1), pp.29-41.
- Scott, J. W., & Kühn, M. (2012). "Urban Change and Urban Development Strategies in Central East Europe: A Selective Assessment of Events Since 1989." *European Planning Studies*, 20(February 2015), pp.1093-1109.
- Sousa, S., & Pinho, P. (2015). "Planning for Shrinkage: Paradox or Paradigm." *European Planning Studies*, 23(1), pp.12-32.
- Stratmann, B. (2011). "Megacities: Globalization, Metropolization, and Sustainability." *Journal of Developing Societies*, 27(3-4), pp.229-259.
- Strijker, D. (2005). "Marginal lands in Europe—causes of decline." *Basic and Applied Ecology*, 6(2), pp.99-106.
- Swyngedouw, E. (2005). "Governance innovation and the citizen: The Janus face of governance-beyond-the-state." *Urban Studies*, 42(11), pp.1991-2006.
- Turok, I., & Mykhnenko, V. (2007). "The trajectories of European cities, 1960-2005." *Cities*, 24(3), pp.165-182.
- van den Berg, L., Drewett, R., Klaasen, L. H., Rossi, A., & Vijverberg, C. H. T. (1982). *Urban Europe: A Study of Growth and Decline*.
- Wiechmann, T. (2009). "What are the problems of shrinking cities? Lessons learned from an international comparison." In K. Pallagst (Ed.), *The Future of Shrinking Cities - Problems, Patterns and Strategies of Urban Transformation in a Global Context* (pp. 5-17).
- Wiechmann, T., & Pallagst, K. M. (2012). "Urban shrinkage in Germany and the USA: A Comparison of Transformation Patterns and Local Strategies." *International Journal of Urban and Regional Research*, 36(2), pp.261-280.

RS16.1. Tourism

1417 ON THE SPATIAL ASPECTS OF DOMESTIC TOURISM IN INDIA: ROLE OF LANGUAGE, CULTURAL AND REGIONAL DEPENDENCE

ABSTRACT

India is seventh largest country by area and second largest country by population with diversity in terms of geographical terrains (from cold deserts of Ladakh to dry deserts of Thar, to Himalayas, tropical forests of Kerala and Nilgiris). This diversity is not limited to geography but of languages, cultural, societal and historical heritage as well. This diversity makes India one of the most popular destinations for tourists from all over the world and has been explored in the context of travel and tourism literature. One aspect that not received due attention in the context of India and other developing countries is the role and scope of domestic tourism. In this paper, we intend to explore the extent of domestic tourism using a novel dataset. We use data from National Sample Survey Organization’s sample survey on domestic tourism in India conducted from July 2014 to June 2015. This survey captured information on domestic tourism, household, visitors, and trips undertaken. The scale of the survey covered a representative sample from the whole of India, covering 8,001 villages and 6,061 urban blocks, with total number of households at 79,497 and 60,191 in rural and urban India respectively. For a job-starved country like India, tourism is a great hope sector. It is expected to grow at 11.2% CAGR in next few years, supported by penetration of digital technologies (Chowdhury, 2017). The relevance of the tourism sector for Indian economy and the growth numbers aside, the tourism sector in India is not well-explored in academic research. As a consequence, the sector grows organically without much policy understanding or interventions. We aim to plug this gap by exploring the behavioral pattern of domestic tourists in India. Specifically, we explore the tourist profile for socio-economic strata, purpose, duration, pattern of expenses, and place of choice to understand the facilitators and inhibitors of such choices. One of the key research question, we intend to answer relates to the spatial aspects of the domestic tourism. Drawing insights from the literature on international trade and gravity models of trade, we explore whether regional proximity is important for regional/spatial pattern of domestic tourism in terms of origin and destination. The regional proximity can be in terms of multiple aspects: a) physical proximity, b) lingual proximity, c) cultural and historical proximity. We intend to analyse the separate effect in determining the flow of domestic tourism and its implications for local employment and growth opportunity and spatial dependence in mobility for tourism. We use social network analysis and empirical gravity model from trade to analyse the regional patterns of domestic tourism and factors affecting these flows. Using the social network analysis, we intend to identify the clusters of local tourism which can be identified based on homophily in the network based on regional proximity defined above. A gravity model analyzes the role of size of a region, its economic prosperity, population size to explain and predict the flow of domestic tourism.

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1440 TOURISM BELIEFS, CONSERVATION PREFERENCES, AND SUPPORT FOR TOURISM DEVELOPMENT IN AN EMERGENT RURAL DESTINATION

ABSTRACT

In the last 25 years a vast literature on attitudes of host communities regarding tourism development has been produced, usually modelling support for further tourism development after residents’ beliefs about economic, social, and environmental benefits and costs of tourism. This paper aims contributing to the literature over two different grounds: on one hand, it includes expectations about affective outcomes of tourism, along with cognitive beliefs, to better explain overall attitude towards tourism; on the other hand, it assesses how conservation-related values do influence support for tourism. Based on literature gaps, a model was designed integrating two central features: (i) an overall evaluative attitude mediating the relationship between affective and cognitive belief composites and support for tourism; (ii) a measure of preferences regarding municipal conservation policies moderating the relationship between attitude and support. It was assessed from data collected in a quota sample of 349 residents in a municipality of North Portugal largely covered by a natural park with some natural and rural attractions. Quotas were defined proportionally according to the population distribution in typology of place (town versus villages) and in three demographic characteristics: sex, age, and education. Measures’ reliability and validity and paths between variables are estimated by SmartPLS software. Results show that both positive and negative affective changes are expected, but only the positive expectations contribute to explain overall attitude. As to cognitive beliefs, most residents see no significant impacts or they are moderately optimistic regarding economic and environmental effects of tourism. A noteworthy result is that the global evaluative attitude towards tourism is much more dependent on the positive affective outcomes from tourism than on the instrumental outcomes. The overall attitude has a positive effect on support, fully mediating the contribution of beliefs to explain support. On the other hand, leaning for conservation policies negatively affects support for tourism development. There is an additional positive interaction effect between attitude towards tourism and preference for conservation, meaning that people who strongly want the municipal government body to have conservation policies tend to be less supportive for tourism development, but more responsive to the effect of attitudes. On the opposite, people who want the municipal government to be less focussed on conservation, tend to be firm supporters of tourism, so their support is less dependent on the attitude. Both business and academic discourse tend to emphasise that rural destinations’ development benefits from the preservation of central features from rural physiography and culture in order to keep their attractiveness and competitiveness. However, this paper’s results suggest that, at least in this particular emergent rural destination, a conflict is apparent between residents’ conservation concerns and their support for tourism. We then interpret the overall favourable attitude and warm support as a manifestation of low concern with rural conservation and with potential negative impacts from tourism.

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1590 SUSTAINABLE TOURISM AN APPROACH THROUGH RURAL-URBAN DICHOTOMY

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ABSTRACT

The areas of low population density that characterize many of the rural areas have tourism as an opportunity for economic growth but also as a critical factor for the preservation of heritage. Sustainable tourism, whether environmental, social or cultural, can be an important element in the valorisation of these territories, keeping them part of the national productive sector. The demographic decline in rural areas endangers the tangible and intangible heritage produced by the rural society, that created them in past centuries. The study is carried out in one of the municipalities with the greatest aging and abandonment population in Portugal, and where since the 1950s the process of social desertification has had the greatest impact. With the disappearance of the rural society that created it, this architectural heritage is threatened by an urban society that presents other aesthetic values and use. The identity of the remaining populations is threatened by the devaluation they feel of the dominant social groups in relation to their heritage. The current appropriation of buildings, especially public ones, with the change of their initial functions and the de-characterization of the villages as a socio-economic centre, leads their experience to an evident post-ruralism. This paper analyzes, at the level of the parishes, the functional transformation, which occurred during the second half of the XXth century, in the municipality of Idanha-a-Nova in Portugal and the public policies developed by the local administration to promote tourism.

1 INTRODUCTION

The demographic and economic decline in rural areas, that are by definition areas with low density, puts in danger to maintain the tangible and intangible heritage produced by the rural society that created them, in past centuries.

With the disappearance of rural society, the material heritage is threatened by an urban society that presents other aesthetic values and usage; the architectural characteristics is often neglected by the need of reuse of buildings as public as private ones.

The identity of the rural populations, that still remain in these territories, is threatened by the devaluation that they feel, on the part of the dominant social groups, with respect to their heritage.

Tourism can be the factor that counteract or not, a tendency that has been reflected in the destruction of the landscape of the small settlements of the territory.

The sustainable tourism can be an option to increase economically these areas by its defence of natural conditions and built heritage.

In Europe, in general, what is called natural landscape had always a human hand, since the density of occupation of the territory, the dispersion of the population, and the millennia that was occupied, do not leave much opportunity for a pristine nature, so the natural heritage is also a cultural one.

2 GOALS AND FRAMEWORK

This paper intends to analyse the actual situation of rural territories of the interior of Portugal and the importance of the heritage to make them reborn economically.

It is studied the functional and organizational changes and, or appropriation of the territory in the context of demographic desertification and disappearance of the traditional economic structure between 1960 and today.

The focus is put on the importance of the development of new and old local festivities to increase the local economy of the villages profiting from their heritage and the opportunity to participate in this new dynamic that the residents can have.

These transformations are evaluated in the trends of evolution in a context of economic transformation of the territory "desruralised" which means a territory that has lost many of its rural characteristics and has urban functions or at least complementary to these ones as a landscape for the use of the urban population.

To connect the preservation of the popular architecture with the tangible and intangible heritage of the region with tourism activity in special the sustainable ones.

Analyze the municipal policies with the objective of to promote a sustainable tourism in the region, valorising the natural landscape namely the geological characteristics and the cultural heritage.

3 LOW DENSITY AREAS IN PORTUGAL

In the 1950s, a process of abandonment of rural areas began in Portugal, reflected in the demographic data of 1960, and has not yet ended using new local festivities to increase the visibility of the local communities.

The rural settlements had a sediment and varied functional and spatial organization, suitable for rural life.

Rapid urbanization and the process of economic globalization have affected the organization of rural areas. With demographic desertification and the technological changes of the second half of the 20th century, the economic and social structure began to disintegrate.

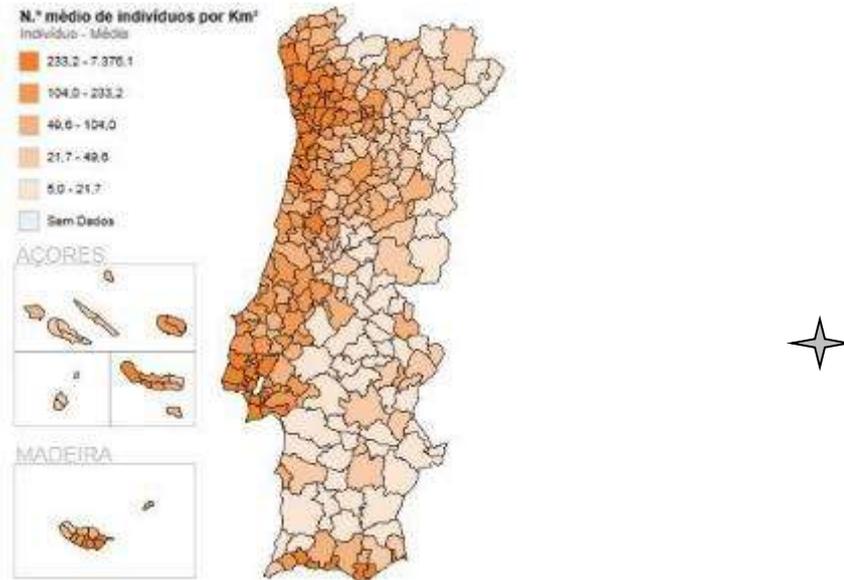
The public and private tertiary sector no longer provide part of the services; which culminated in an administrative reorganization of the parishes around the country, in 2012, which merged several local administrations and the change of place the local civil servants.

Traditional agriculture and livestock farming are in decline, the traditional landscape is in danger and some botanical species became rare by the abandonment of the fields.

Socio-economic changes from last decades endanger the tangible and intangible heritage of the villages.

This is a recurrent situation in the largest part of the country, with the exception of some towns and cities.

The territory chosen to be studied is representative of a low density area with a majority of old population, a traditional rural economy in decline and an peripheral accessibility in the east border (fig 1).

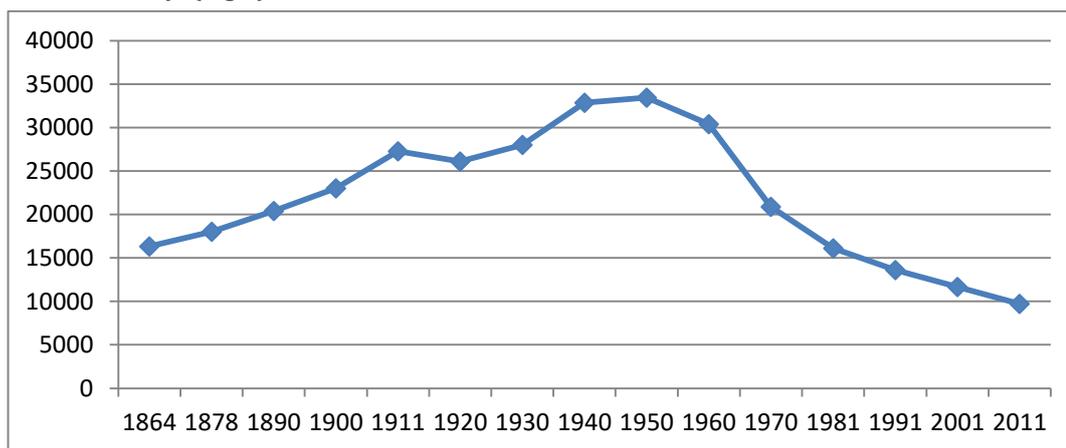


Source: INE, PORDATA

Figure 1 - Map of population density in Portugal 2011

3.1 The case of Idanha -a - Nova

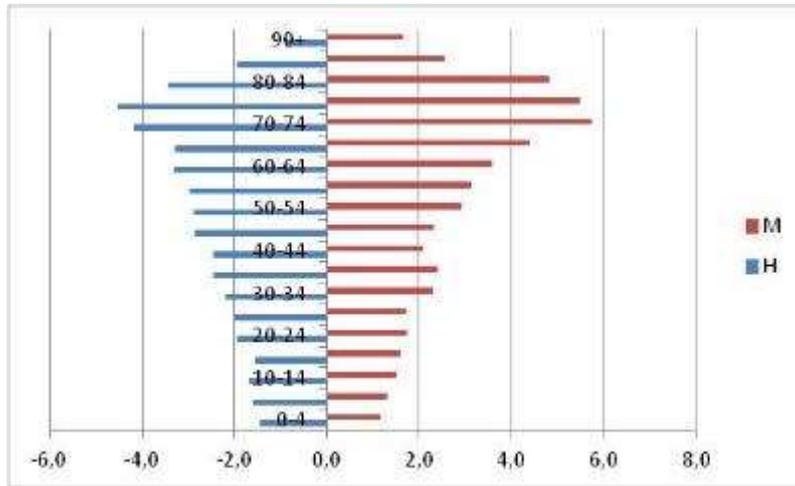
The municipality of Idanha-a-Nova as 1416 km², is the 4th largest in the country; it is also one of the municipalities with the highest aging population in 2011 (40.8% in 1960 and 49.2.8% in 2011). In 2011 has less population then in the middle of 19th century. (Fig 2)



Source: INE

Figure 2 - Evolution of the population in Idanha-a-Nova (1864/2011)

Analysing some other demographic index the elderly dependency rate was 16% in 1960 and is 88.7% in 2011, the 4th highest in Continental Portugal. The demographic pyramid (Fig.3) shows the imbalance of the municipality's age structure, with a dangerously irreversible aging.



Source: INE

Figure 3 - Demographic Pyramid of Idanha-a-Nova in 2011

With low population density: 21.5 inhab / km² in 1960 and 6.9 inhab / km² in 2011, the 3rd less dense municipality of mainland Portugal.

Table 1 - Situation of open public services in 2017

Parishes/villages (2011)	public schools	parish services
Alcafozes		
Aldeia de Santa Margarida		✓
Idanha-a-Nova	✓	✓
Idanha-a-Velha		
Ladoeiro	✓	✓
Medlim		✓
Monfortinho	✓	✓
Monsanto	✓	✓
Oledo		✓
Penha Garcia		✓
Proença-a-Velha	✓	✓
Rosmaninhal	✓	✓
Salvaterra do Extremo		
São Miguel de Acha		✓
Segura		
Toulões		✓
Zebreira	✓	✓

It was administratively organized, till 2012, in 17 parishes that all had public schools and parish administrative services, but in 2017 many of them lost the public primary school and some were merged in, so now only 7 has primary school and 4 lose the administrative services (see table 1).

The closure of these services and equipment raises the problem of the re-use of buildings and their potential abandonment. Some built heritage is in danger of ruin.

4 HERITAGE IN IDANHA-A-NOVA

The municipality has a very rich heritage related with his long history, since the built heritage such as the Visigoth Basilica of Idanha-a-Velha (Sec. VI) or the built characteristics of the village of Monsanto located in a granitic inselberg that is, in itself, an important geological heritage (natural heritage).



Figure 4 - Built heritage: Visigoth Basilica of Idanha a Velha and village of Monsanto

The Intangible heritage has been less valued but it is necessary to mention the use of “*adufe*” as a percussion instrument of Arabic origin used in local music. The religious manifestations such as the feast of “*Senhora do Almortão*”, which also has a movable heritage component for existing pieces.



Figure 5 - Intangible heritage: Bodo de Salvaterra do Extremo and to play the Adufe

The Gastronomic manifestations like the “*Bodo de Salvaterra do Extremo*” a community meal offered for free to everyone who comes.

5 MUNICIPAL POLICIES FOR THE TOURISM DEVELOPMENT

The municipality developed since 2008 with a study about the development of the territory (IPI, 2008) a new approach to the importance of tourism as a economic value.

The importance of "natural and historical-cultural heritage with with great tourism potential"(IPI, 2009) is a main impacts of municipal government action linked with the strategy for sustainability.

In this decade, the cultural and natural heritage has gained importance and visibility by the way the Municipality has increased and promoted some periodic activities around the territory in partnership with parish authorities.

The development of new periodic festivities and activities to promote local specificities at natural and heritage level in all villages that, till 2013, were parishes is very important to call people to visit them.

The events can be organised in cultural, related with social or religious cultural heritage, and natural ones, these related with the geological or botanical heritage.

Table 2 - Typology of events in the villages (parishes 2011) in 2017

Parishes/villages (2011)	Cultural Events	Nature events
Alcafozes	religious	natural products
Aldeia de Santa Margarida		nature
Idanha-a-Nova		
Idanha-a-Velha	gastronomy	
Ladoeiro	gastronomy	agricultural production
Medelim	built heritage	
Monfortinho		nature/hunting
Monsanto	historic performance	
Oledo	traditional music	
Penha Garcia	historic performance	
Proença-a-Velha	gastronomy	
Rosmanhal		nature
Salvaterra do Extremo	gastronomy/music	
São Miguel de Acha		
Segura		nature
Toulões		nature
Zebreira		nature

A important marketing of all the events in the villages, namely in outdoors around the municipality but also in newspapers and social networks gave a much bigger visibility and increases new visitors from the neighbourhood namely from Spain..





Figure 6 - Some advertisement of the events promoted by the municipality

Another interesting project that was, in first hand, related with the social support to the elder people of the municipality is the creation of a Senior University. This kind of organizations reflects the urbanization of the population who lives now in this territory. The rural population even when is at retirement age continues with the everyday life but the urban one when returns to the villages needs a different kind of leisure activities.

One of the most interesting cases is the development of the Senior University of Idanha-a-Nova (USIN), created in 2015 and headquartered at the town and with four poles in the villages: Medelim, Penha Garcia, Toulões and São Miguel de Acha; is the emergence of choral groups of traditional music, who perform in some events.

6 CONCLUSION

The situation studied is common to a large part of the rural territory of Portugal.

The municipality has developed a policy of activities, complementary each other, to increase sustainable tourism in all villages.

Both cultural heritage and traditional landscape are promoted with some success in the events with broad participation of the population.

The Senior University can be an asset for the preservation of the intangible cultural heritage and for the active aging of the population.

The popular domestic architecture is being appropriated by the urban population originating from these parishes, for seasonal use.

REFERENCES

- INE (2012) *Censos 2011 Resultados Definitivos - Região Centro*, Instituto Nacional de Estatística http://censos.ine.pt/xportal/xmain?xpgid=censos2011_apresentacao&xpid=CENSOS acedido a 10/9/2017.
- IPI, I. P. e. I., Lda. (2008). *Agenda 21 Local, Município de Idanha-a-Nova; Relatório*. Retrieved from Idanha-a-Nova:
- IPI, I. P. e. I., Lda. (2009). *Relatório de Sustentabilidade*. Retrieved from Idanha-a-Nova:

1796 ISSUES & APPROACH FOR PREPARATION OF TOURISM MASTER PLAN FOR VARKALA AND ITS SURROUNDING 7 PANCHAYAT AREA IN THIRUVANANTHAPURAM, KERALA

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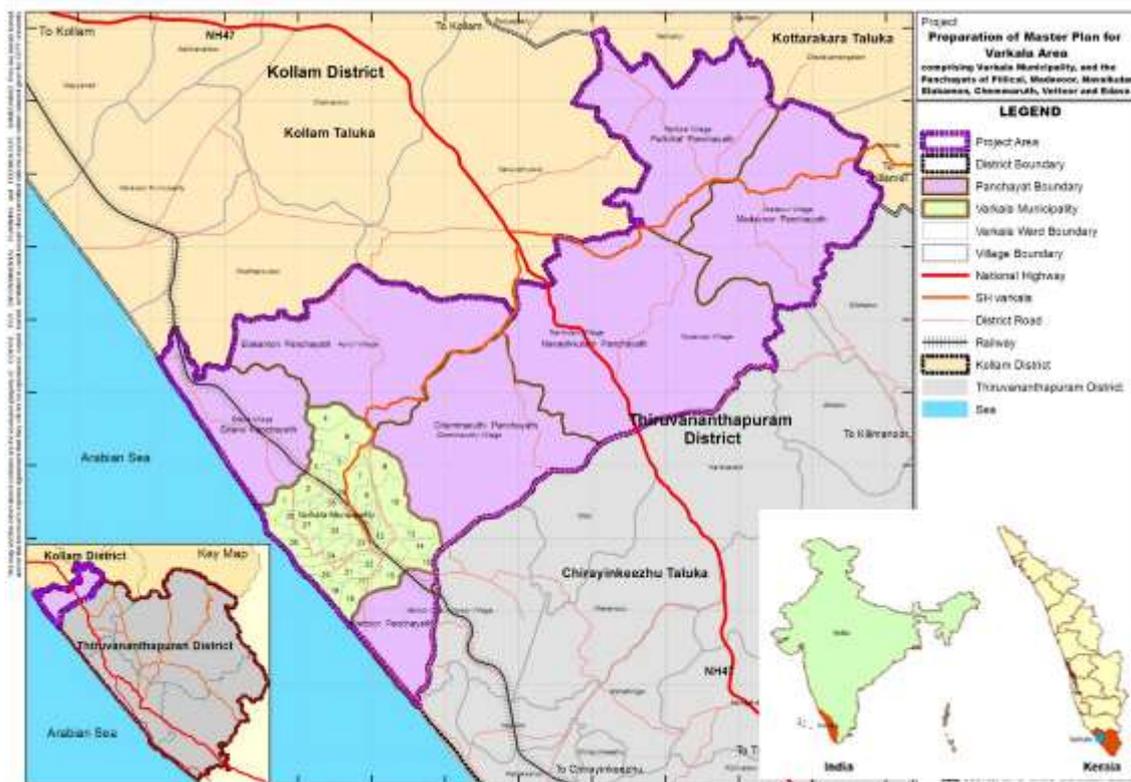
A. INTRODUCTION

Varkala Town and its surrounding 7 panchayat area is one of the preferred and eco-friendly tourist destinations in Kerala the local area plan focus on integrating it with needs of community, local tourism economy, improving quality of life and providing employment opportunities with least interference in the natural environment. Minimum Intervention in local environment & maximum output through participatory process of planning is the desired goal of the proje

Varkala, located north of Thiruvananthapuram, is one of the important religious tourist destinations in Kerala. It is visited by hundreds of thousands pilgrims regularly as well as during the special occasions throughout the year, tourist both from India and abroad. In view of Varkala's enormous tourism potential, Government of Kerala has initiated the process of preparing Master Plan-2041 for integrated development of this area through a number of infrastructure development projects to make Varkala a tourists' paradise, both for the domestic and foreign tourists.

1. Study Area

Varkala Municipality and seven Panchayats namely; Pallickal, Madavoor, Navaikulam, Elakamon, Chemmaruthy, Vettoor and Edava constitute the study area. It is part of the Chirayinkeezhu taluka of Thiruvananthapuram district and has a population of nearly 2.22 lakhs (Census 2011). it has an area of about 142.58 sq.km. This is the first planning effort of developing the project area comprising Municipal and Panchayat areas through a regional planning framework.



Source: Census of India 2011

Figure 1: Administrative Boundaries

2. Demographic Structure

The total population of the project area in 2011 was around 2.22 lakh persons which was around 1.77 lakh in 1981 and 1.99 lakhs in year 1991 and 2.17 in 2001. The decadal growth rate of population has shown a decline trends during the decades 1991-2001 and 2001-2011. The average population density is around 17.1 person per hectare, which is quite low as compared to the district density (49 person per hectare) and the State average of 65.4 person per hectare (Census 2011). The average household size is 3.8 persons in the project area (Census 2011). The workforce participation rate in the project area is around 34% (Census 2011), of which nearly 25% are Main Workers and the remaining 9% are the Marginal Workers.

3. Existing Land Use of Study Area

The project area is well connected by roads, railways and the airways. The National Highway NH-66 connecting Kollam to Kanyakumari passes through it. Rail connectivity is provided by Southern Railways in this region. The international airport of Thiruvananthapuram is only 55 km which is linked by NH-66.

The existing land use study shows that nearly 7.06 sq.km (5.4%) of the total project area is under Residential (Built) category, while about 0.43 sq.km (0.3%) and 0.11 sq.km (0.1%) is under Commercial (Built) category and Industrial (Built) category, respectively. The combined area covered under land use categories namely Vacant Open Area and Vacant Vegetal Area measures about 63.85 sq.km (49%), while under Plantation and Agriculture it is about 38.41 sq. km. (29.4%)

Main Features & Land use details

i. **Residential (Built):**

The major concentrations of activities under this category are around Varkala Municipality (22.3%) followed by Chemmaruthy (15.9%) and Navaikulam (14.4%) and the least is in Pallickal (6.9%).

ii. **Commercial (Built):**

The major concentrations of activities under this category are around Varkala Municipality (45.8%) followed by Navaikulam (15.1%) and the least is in Chemmaruthy (3.9%).

iii. **Industrial (Built):**

The area under this category is primarily concentrated in Navaikulam (30.9%) followed by Chemmaruthy (18.0%) while the least concentration is in Edava (2.8%) and Vettoor (3.2%).

iv. **Institutional Area:**

The major concentrations of activities under this category are in Varkala Municipality (33.5%) followed by Elakamon (26.4%) and the least is in Madavoor (2.7%) and Pallickal (2.7%).

Utility Area:

The major concentrations of activities under this category are in Varkala Municipality (55.8%) followed by Chemmaruthy (26.2%) and the least is in Madavoor, Pallickal and Navaikulam with almost nil area in each.

v. **Recreational Area:**

The major concentrations of activities under this category are in Varkala Municipality (75.1%) followed by Elakamon (10.2%) while the least is in Madavoor and Pallickal with almost nil area in each.

vi. **Vacant Open Area:**

The area under this category is primarily concentrated in Navaikulam (27.2%) followed by Varkala Municipality (23.5%) and the least is in Pallickal with almost nil (0.8%) area.

vii. **Paddy Area:**

The major concentrations of activities under this category are in Madavoor (24.2%), Navaikulam (20.6%), Chemmaruthy (20.2%), and Pallickal (18.1%) while the least is in Vettoor (0.3%).

viii. **Plantation and Agriculture Area:**

The area under this category is primarily concentrated in Madavoor (33.6%) followed by Pallickal (33.1%) and Navaikulam (26.1%) while the least is in Vettoor and Edava with very less area.

ix. **Vacant Vegetated Area:**

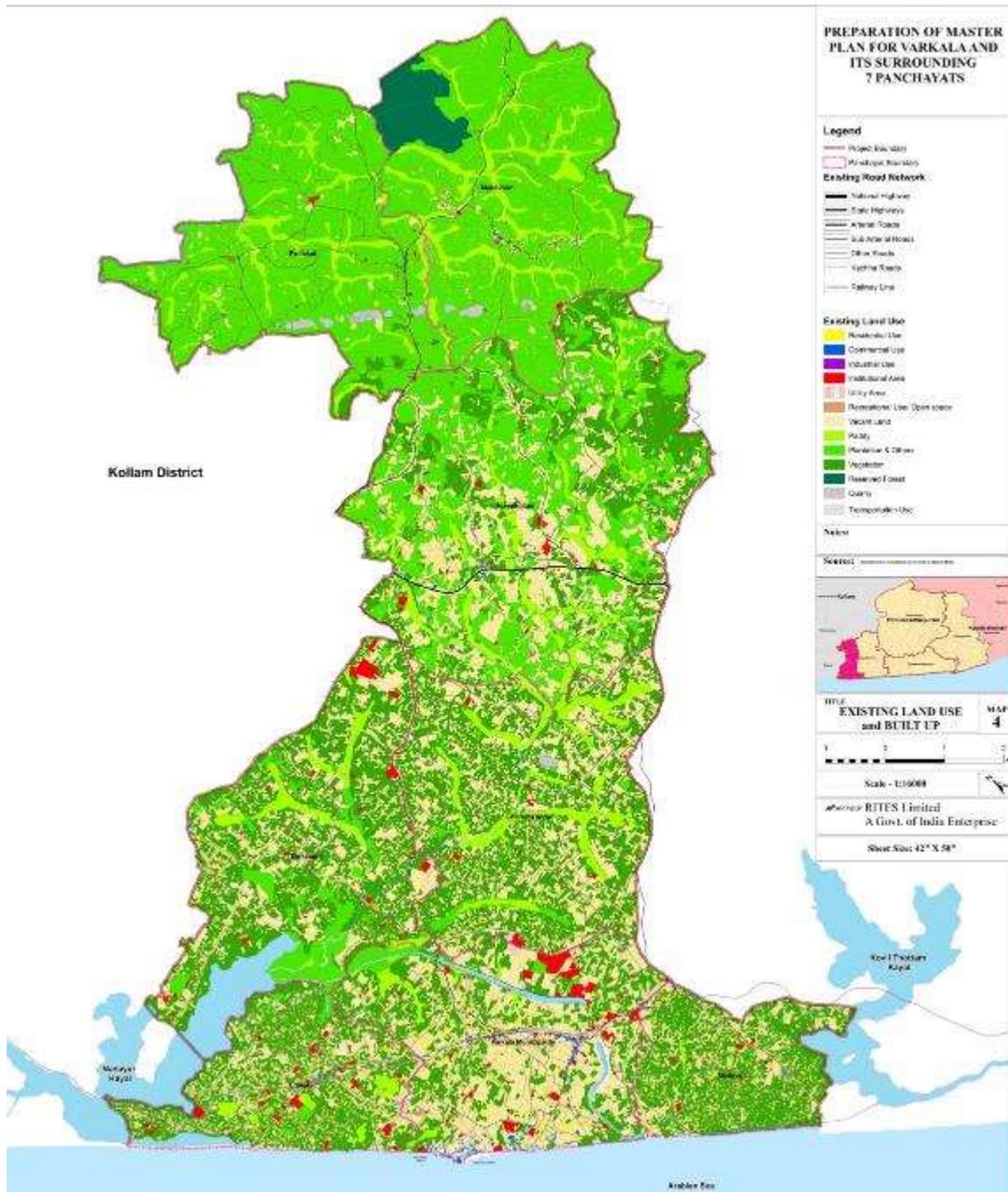
The major concentration of activities under this category is in Elakamon (22.6%), Chemmaruthy (21.3%) and Navaikulam (18.3%) while the least is in Madavoor (0.7%) and Pallickal (0.8%)

x. **Forest:**

The area under this category is only in Madavoor (100%).

xi. **Water Body:**

The water bodies cover in (61.5%) area of Elakamon, 13.8% of Varkala Municipality and 10.8% of Edava while the water bodies comparatively have less area in Madavoor, Vettoor, and Chemmaruthy ranging between 1 to 1.2%.



Source: Land Use Survey carried out for tourism master plan
Figure 2: Existing Land Use Pattern

4. Major Concerns

The major concerns are of local employment and local participation for the long term sustainability and the broad measures that emerged -

a. Ownership Pattern-

- Most of the owners of establishment whether resorts/hotels or home stays were local people from Varkala (63%) and Kerala (33%) while only 4% of the owners were from outside of the State.
- Most of the accommodation establishments were either fully or partly owned comprising nearly 74% of the total establishments surveyed. About 20% of the establishments were fully or partly leased while about 6% were run on contract basis either fully or partly.

b. Employment Pattern-

- In the surveyed accommodation units, almost half (50%) of the staff (other than restaurant staff) working in facilities during peak season was from Kerala while that from Varkala was 34% and from outside Kerala was only 16%. On the other side, during the off season, the share of staff (other than restaurant staff) working was 44% from Kerala, which was marginally higher than that from Varkala at

40%. The percentage of worker staff (other than restaurant staff) from outside Kerala remained constant at 16% during off season.

- In the surveyed accommodation units, restaurant staff during peak season was highest from Kerala at 41% while that from Varkala was least at 23% and from outside Kerala was 36%. On the other side, during the off season, the share of restaurant staff working was 45% from Kerala, which was quite higher than that from Varkala at 30%. The percentage of restaurant staff from outside Kerala declined to 25% during off season.

c. Tourist accommodation and Social Facilities-

- Most of the accommodation facilities (82%) were operational for the whole year while about 4% of the facilities were operational only up to 3 months in a year. Nearly 11% of the facilities were operational for nearly 6 months while about 4% of the facilities were operational up to 9 months within a year.
- As regards the foods and beverage facilities available in the establishment nearly 34% had restaurants and 24% had cafeteria. The other foods and beverage facilities included bakery and bar which was observed in 5% & 4% respectively of the total sample surveyed.
- With reference to business related facilities nearly 15% had conference facility and about 13% said to have information / travel desk. With reference to fitness and yoga centre, nearly 23% of the establishments had ayurvedic centre, 7% had yoga centre while only 1% had saloon facility.
- Less than half of the accommodation facilities (55%) surveyed did not have any restaurant facility in the premises.
- Nearly 38% of the restaurants served vegetarian food while 37% of the restaurants served non vegetarian food. Sea food was served in the highest number of restaurants (40%) while Continental food was served in the least number of restaurants (23%).

d. Inadequate Infrastructure Services-

- Nearly 33% of the accommodation facilities had source of only tap water and other sources, about 87% of the accommodation facilities had source of only ground water and other sources, and nearly 11% of the accommodation facilities had source of tanker water supply.
- Of the total surveyed accommodation units more than 92% of the units had the water storage capacity of more than 1,000 litres while the remaining 8% had capacity of less than 1,000 litres. Only about 3% of the accommodation units surveyed had more than 5,000 litres water storage capacity.
- Only 1% of the total accommodation units surveyed had piped sewerage network facility while majority of the units (79%) had either septic tank or soak pit facility.
- It was observed that on an average the distance of procurement of raw material ingredients like vegetables, fish, food grain, etc was 3-4 km for the hotels/accommodation units in Varkala.
- When inquired about the environmental awareness practiced in the establishments, nearly 52% of the establishments introduced solar energy as a part of the green energy initiative in their premises. Nearly 24% practiced rain water harvesting and 7% practiced water recycling in their premises. About 13% segregated the solid waste and nearly 16% of the establishments generated energy from waste.

B. MAJOR ISSUES OF THE STUDY AREA

In order to make tourism development sustainable in Varkala, an integrated development strategy is essential formulation of the Master Plan. The major concerns identified in the study related to environment, economy and socio-cultural aspects mentioned as follows.

• **Environmental Issues -**

- Violation of Coastal Regulation Zone
- Pollution of water bodies and beaches
- Cliff erosion
- Destruction of the natural environment (fauna and flora)
- Reduction in tree cover due to uncontrolled development

• **Economic Issues -**

- Lower level of local participation in tourism and related activities in terms of employment, entrepreneurship and informal activities
- Marginal jobs/low wages from tourism sector for local people
- Lower economic benefits to local people in spite of increasing tourist inflow to the region

• **Socio-Cultural Issues -**

- Exclusion of local community from beaches/tourism spots

- Commoditization of culture and art forms
- New building styles/westernization of styles among people
- Low level of interest/involvement in tourism
- **Traffic and Transportation Issues –**
 - Signage's plays a very important role to reach the tourist destination, which is lacking in town.
 - Safety and security is very important in tourist areas. On the cliff at places railings are missing, streets lights are not adequate. So it very unsafe to walk on the cliff in the night time. There should security staff members on the cliff and near the beach.
 - Road network capacity is not adequate in the Varkala as the available right of way (ROW) of roads is very limited at most of the network and thus roads cannot be widened adequately.
 - Considering limited road capacity there is need to optimize the use of available infrastructure by adopting traffic management measures wherever possible.
 - Planned roads need to be provided with adequately wide right of way to meet the requirement of future traffic.
 - In Varkala out of seven railways crossing only one has been grade separated and remaining area road level. About 72 trains are passing on these crossing every day. This problem needs to be addressed on priority.
 - Absence of footpaths on the entire road network.
 - Out of total person trips the share of walk trips is about 35%. Walk trips as feeder to buses and other modes are additional. There is high pedestrian traffic on Varkala Beach and in Varkala Town area and some other areas in Varkala. Footpath facilities are almost absent; therefore provision of footpath facilities is very important. Share of cycle traffic is as low as 2%. This mode of transport needs to be promoted by providing cycle tracks along the roads.
 - Parking of vehicles is assuming critical dimension in Varkala. Limited off-street parking lots encourage on street parking in the core areas and Varkala Beach resulting in reduced capacity of the road system. Parking facilities need to be augmented substantially.
 - Poor geometrics at the junctions. Geometrics of the junctions need to be improved. Grade separation required wherever necessary.
 - Varkala Tunnel was a popular tourist highlight. With the advent of advanced transportation methods through road, rail and sky, the transportation through Varkala tunnel has stopped. The canal and the tunnel have gone into disuse and heavy silt accumulation and vegetative growth has taken place. It is recommended to revive the canal and tunnel for tourist activates
 - Outer cordon surveys indicate significant through traffic to the city. This point to the need of road bypasses to the city.
 - At present, modal split in favor of public transport is about 65% of total motorised person trips. As the income levels increase, car ownerships would also increase. This would lead to increased use of cars and share of public transport would fall. In order to arrest this shift, it is very important that fast, reliable, frequent and comfortable mass transit system is planned for the city.
- **Overexploitation of coastal natural resources and unchecked construction activities–**
 - Concentration of tourism activities near the helipad and the north cliff, without any development in other area have resulted in over exploitation of resources at one place thus posing major threat to the sustainability of the tourism activity,
 - Over exploitation of coastal natural resources for tourism development is a major concern. Unchecked construction activity is constantly spoiling the pristine beauty of these areas.

C. DESIGN APPROACH & PLANNING PRINCIPLES

For the purpose of formulating the Varkala Master Plan-2041, the approach adopted to mitigate local & Tourism issues.

- Assessing existing demographic and infrastructural scenario in the project area,
- Assessing the existing tourism scenario of Varkala and the surrounding area,
- Impact of tourism on environment and the culture of the project area,
- Identification of major issues confronted in Varkala with reference to tourism,
- SWOT Analyses
- Vision, Objectives and Strategies for increasing tourism potential of the region and overall development,
- Planning Proposals, Land Use Zoning and framing the Development Control Regulations considering the existing situation and envisaged future developments,

- Estimates on requirement of physical and social infrastructure to cater to the growing needs of the Study Area by 2041,
- Strategies for protection of environmentally and culturally sensitive areas,
- Master Plan implementation strategy

The **broad principles** has been formulated are as follows:

- **Multiple Nuclei Concept**

Multiple-Nuclei development approach shall be adopted for creating more places of investment opportunities. This nuclei approach will be ideal since each component of project area will have development opportunities as per their potentials. The concept will also help in creating equitable development across the Study area guided by the dominant existing land use. The model will also help in effective utilization of natural resources by spreading activities at different nodes thus avoiding overutilization of natural resources and also minimizing congestions at a one place.

- **Decentralized Development**

Decentralization of tourism activities will help in developing the planning area for reducing pressure on particular area and also safeguarding the cliff from construction activities. Decentralization can be supported by incentives (special packages, etc) and promoting thematic tourism activities (monsoon tourism, winter tourism, water sports etc.) to promote tourism at multiple locations - distributive tourism.

- **Low-Rise and Low-Density Built Form**

Considering the existing development pattern within the State and especially in Varkala, wherein the conditions for low-rise and low-density development is favorable, it is suggested to continue the same principle for future development in the Study area unless a project has specific height requirements. For an area like Varkala, where overall population density is quite low and population growth is also low the development has to be in sync with the surroundings. As a broad thumb rule, no building should be taller than the height of the local trees within the area, to ensure that buildings do not dominate the natural landscape.

- **Promotion of Public-Private Partnerships**

In Varkala, public-private partnership is needed for infrastructure development including development of accommodation, transportation, site development, other amenities, waste management, etc.

- **Local People's Participation**

Local people's participation is important for the development of the area since it provides them an opportunity of feeling pride and belongingness. Local people's participation will retain the ownership. The participation can be ensured through measures/strategies suggested as under:

- Capacity building through workshops/seminars in various fields like hospitality services, foods and beverage segment, etc.,
- Promoting Employment of local human resource in all developmental activities through policies/incentives,
- Promoting local handicrafts by providing a platform for display and marketing the products through creation of artisans' village, artisans' market, weekly market, etc.
- Promoting eating joints of local food and beverage products and cuisines,
- Integration of ongoing tourism schemes of the Government like "My Village, a Tourism Friendly Village" can be effectively implemented in areas of Edava and Vettoor Panchayats to being with.

- **Promotion of Home Stay**

Home stay tourism is an evolving branch in tourism industry. By drafting proper guidelines, the concept of the home stays by involving local people can be promoted in Varkala. The vernacular architecture of the home stay, offers tourists the experience of lifestyle of the local people and the authentic local food at a competitive pricing. It will also generate employment and finally arrest the outmigration.

- **Promotion of Tourist Circuit**

The following works may be taken up under the scheme:

Improvement of the surrounding of the destination this would include activities like landscaping, development of parks, fencing, compound wall etc.

- Enhance connectivity of tourist destination
- Providing for improvement in solid waste management and sewerage management
- Construction of budget accommodation, wayside amenities
- Procurement of equipment directly related to tourism, like water sports, adventure sports, eco-friendly modes of transport for moving within the tourism zone
- Refurbishment of the monuments

- Interpretive Signage's, directional signage, information boards, track heads etc
- Tourist arrival center/reception centers/interpretation centers/tourist information center
- To enhance the major road loop connecting all destinations can be proposed along with the major transition nodes

D. CONCEPTUAL TOURISM MASTER PLAN

1. Vision

“Developing Varkala as the one of the most preferred and eco-friendly tourist destinations and integrating it with needs of local community, improving quality of life and providing more employment opportunities with least interference in the natural environment”.

The mission set forth for realizing the vision requires a definitive approach. For this purpose, the entire project area has been divided into two zones described as under;

- i. Urbanization Area-1 (UA-1), is the area that will have comparatively high intensity of development i.e. higher FSI and developmental permission charges and the development permissions linked with the hierarchy of roads as specified in the Development Control Regulations,
- ii. Urbanization Area-2 (UA-2), is the area that will have lower intensity of development i.e. lower FSI and developmental charges than the UA-1.

It is the typical character of the project area that demands this type of approach. Since this is the first planning effort of developing the project area comprising Municipal and Panchayat areas, the development agency requires flexibility of attracting the investments at places with a few restrictions specified in the Development Control Regulations. It is the foremost requirement of the private investor, because the first choice of investor is to develop the area where land is accessible, cheaper and has the marketing potentials. Such flexibilities are not available in the strict land use zones.

Since the Zonation is based on the existing potentials to attract the investment, equally important is attaining the balanced growth and development of the project area. For this purpose, the project area within the two zones, has been designated for polycentric development as nodes of investments listed as under:

- i. Commercial hubs in Varkala, Chemmaruthy, Edava and Navaikulam,
- ii. Cultural Hub between Varkala, Chemmaruthy and Edava,
- iii. Health and Education hub in Navaikulam,
- iv. Technology Parks (IT and Other Technologies) in Madavoor, Pallickal and Navaikulam,
- v. Sports and Leisure/recreational Hub in Varkala, Edava and Elakamon,
- vi. Agro based Industry in Vettoor,
- vii. Transportation Hub in Navaikulam

2. Population, Tourist & Employment Projections

2.1 Population projection

The population of the project area comprising Varkala and other constituent Panchayats reached 222,154 in 2011 from 177,443 in 1981. During the decade 1981-91 the growth rate was 12.59% which decreased to 9.01% during 1991-2001 and further decreased to 2.01% during the decade 2001-11 suggesting a steady out migration from Varkala.

To carry out the population projection for the project area three different scenarios were considered namely

- (i) Existing decadal growth rate,
- (ii) Moderate decadal growth rate, and
- (iii) Optimistic decadal growth rate. Envisioning the type and the scale of investments that are likely to come in the project area, Scenario-3 which is Optimistic DGR of 31% has been considered for future population projections. The total population under this scenario would be around 5 lakh persons by 2041.

Table 1: Projected Population and Population Density

S. No.	Project (Municipality / Panchayat)	Area (sq.km)	Population		Projected Population Density (persons / sq.km)	
			2011	2041*	2011	2041*
1	Varkala (M)	15.33	40,048	90,032	2,612	5,873
2	Edava	9.22	25,994	58,437	2,819	6,338
3	Elakamon	17.81	25,307	56,892	1,421	3,194
4	Chemmaruthy	17.59	32,444	72,937	1,844	4,147
5	Navaikulam	28.46	40,702	91,502	1,430	3,215
6	Pallickal	16.34	16,873	37,932	1,033	2,321
7	Madavoor	18.64	21,118	47,475	1,133	2,547
8	Vettoor	7.04	19,668	44,215	2,794	6,281

Total	130.43	222,154	499,422	1,703	3,829
Existing Population Source: Census of India | * Forecasted Population					

2.2 Tourist Inflow Projection and Demand Assessment

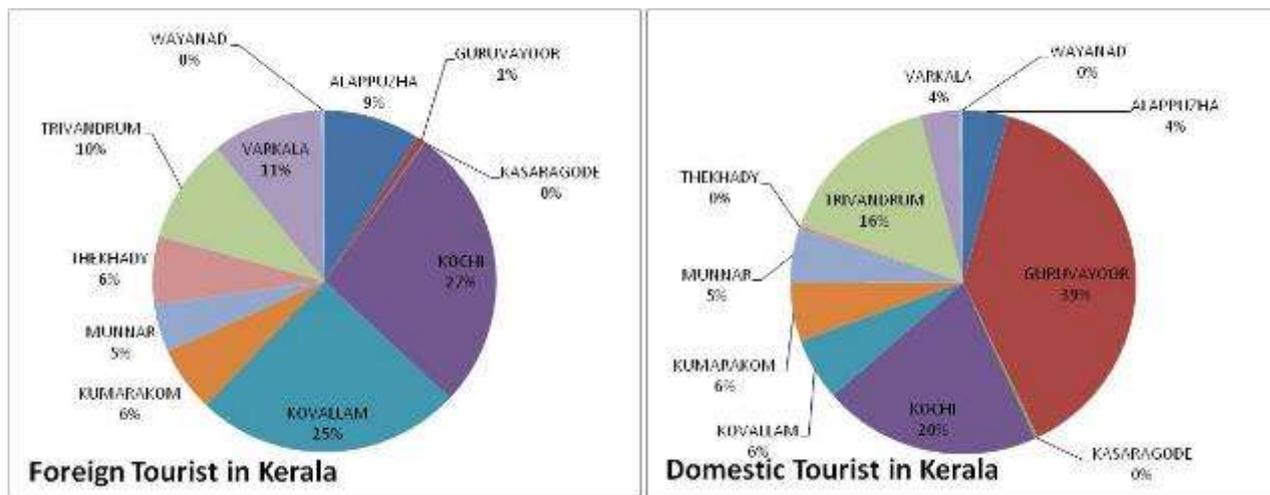
Considering the existing situation and the growing trends of tourist inflow, it was estimated that the total tourists visiting Varkala by the year 2021 would be around 4.5 lakhs (2.5%); by year 2031, would be around 8.4 lakhs (3%) and by 2041, would be around 14.8 lakhs (3.5%). During the same period the total tourists visiting Kerala would be around 164 lakhs by year 2021, around 250 lakhs by 2031 and around 380 lakhs by year 2041.

The accommodation unit requirements in Varkala by the year 2041 have been calculated considering the inflow of tourists during weekdays and weekends, both during peak and lean seasons, which comes to around 8,000 rooms by 2041. Apart from these, there will be day time tourists and pilgrims that shall be visiting the place during festivals or religious occasions.

Table 2: Projected Tourists Inflow to Varkala

S. No	Year	Tourists Inflow to Kerala			Tourists Inflow to Varkala					Decadal Growth Rate		
		Total Tourists	Foreign Tourists (FT)	Domestic Tourists (DT)	Assuming % share of Varkala in Kerala (FT)	Tourist Visiting Varkala (FT)	Assuming % share of Varkala in Kerala (DT)	Tourist Visiting Varkala (DT)	Tourist Visiting Varkala (Total Tourists)	Foreign Tourists (FT)	Domestic Tourists (DT)	Total Tourists
1	2010	9,254,340	659,265	8,595,075		45,545		160,238	205,783			
2*	2021	16,476,298	1,465,970	15,010,328	5.5%	80,628	2.5%	375,258	455,887	77%	134%	121%
3*	2031	25,007,641	2,492,149	22,515,492	6.5%	161,990	3.0%	675,465	837,454	100%	80%	83%
4*	2041	38,009,891	4,236,653	33,773,238	7.0%	296,566	3.5%	1,182,063	1,478,629	83%	75%	76%

AGR = Annual Growth Rate | DGR = Decadal Growth Rate
Existing Population Source: Census of India | * Forecasted Population Figures

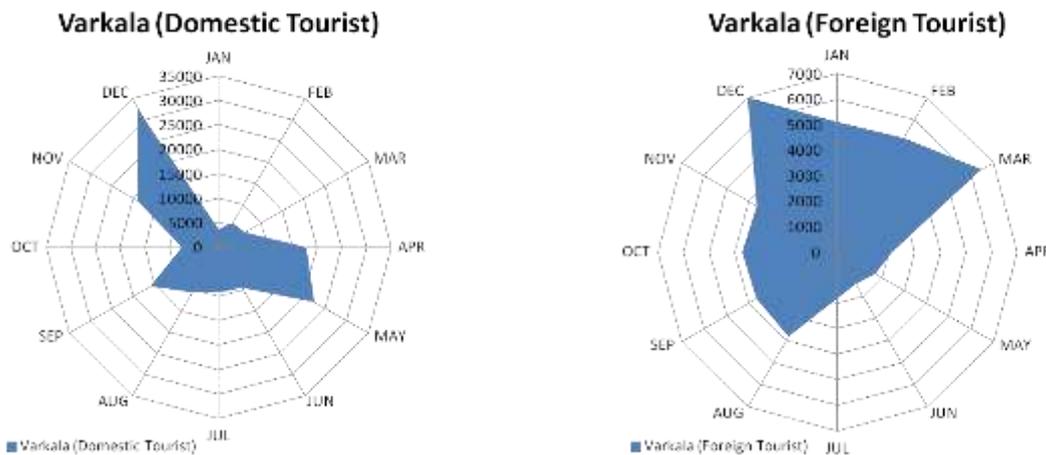


Source: Kerala tourism statistics 2010

Figure 3: Tourist Arrival in Kerala & Varkala

Varkala stands 3rd popular place in Kerala for foreign tourist visit.

Varkala stands 7th place in Kerala for Domestic tourist visits.



Source: Kerala tourism statistics 2010
Figure 4: Month Wise Tourist Arrival in Varkala

2.3 Projected Employment Structure

Assuming the average employee-to-room ratio of 1.6 for all categories of hotels and home stays in Varkala, the total employment in Varkala would be around 25,600+ jobs in the next 30 years i.e. by year 2041 in the tourism industry.

Table 3: Employment Projection (Year 2041)

S. No.	Description	Population
1	Projected Population	499,422
2	Assuming, WFPR	40%
A	Total Jobs Created	199,769
1	Total Number of Rooms required by Year 2041	8,000
2	Assuming, Employee-to-Room Ratio	1.6
B	Jobs Created in Hotels	12,800
C	Total jobs in Tourism Sector including Hotels	25,600
A-C	Jobs Creation in Other than Tourism Sector by Year 2041	174,169

3. Proposed Land use Pattern

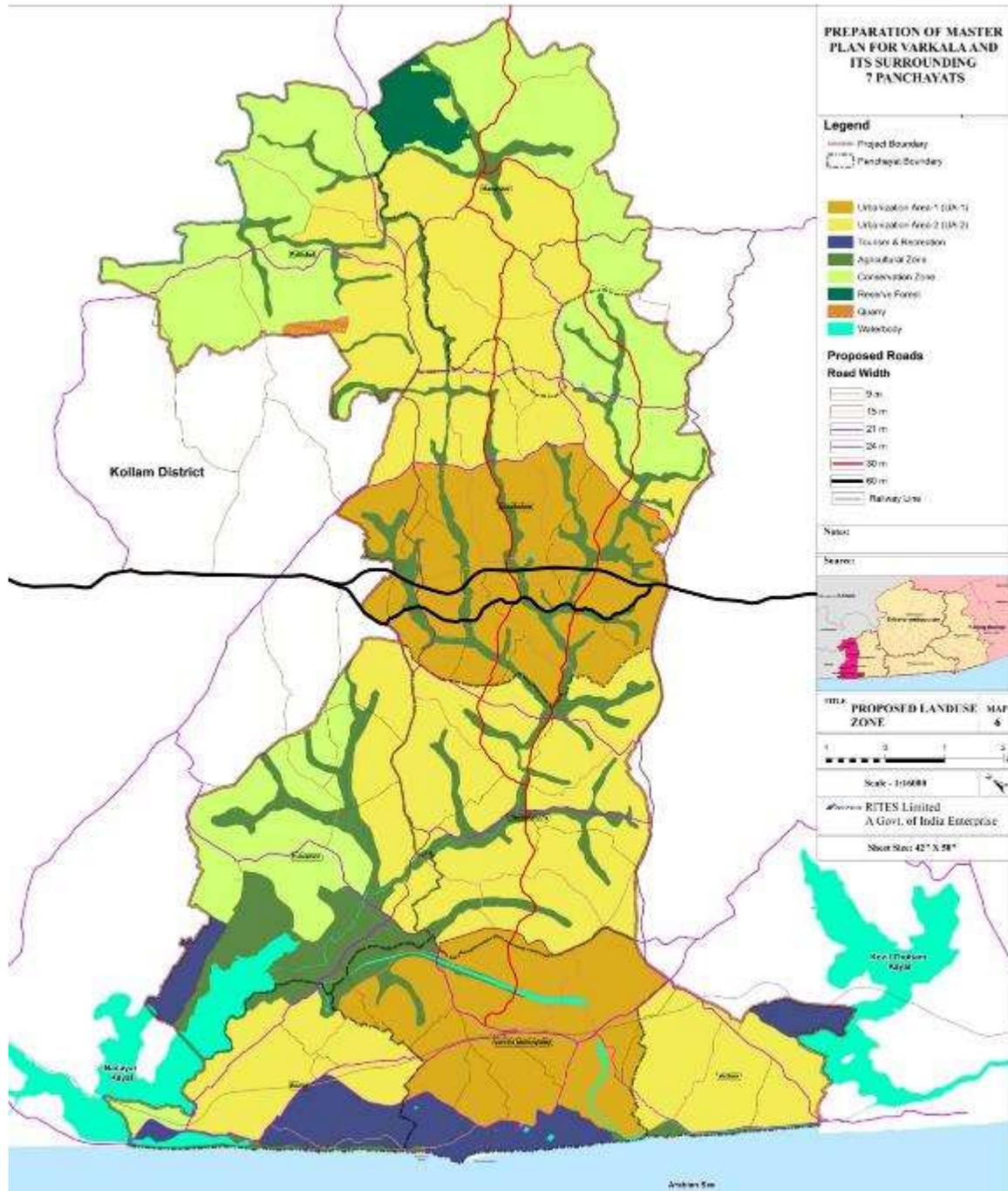
The Urbanization Area of 71.06 sq.km (54.5%) has been categorised into two zones namely Urbanization Area-1 having area of 24.51 sq.km (18.8%) and Urbanization Area-2 having area of 46.55 sq.km (35.7%). Considering the importance of the ecosystem, around 27.87 km (21.4%) area has been identified as conservation area. The tourism and recreation area has been kept around 5.71 sq. km (4.4%) and the area under agriculture is around 16.05 sq. km (12.3%) of the total project area.

Table 4: Proposed Land Use in the Project Area

S.No.	Proposed Land Use	Varkala (M)	Edava	Madavoor	Vettoor	Elakamon	Chemmaruthy	Navaikulam	Pallickal	Total
		sq.km	sq.km	sq.km	sq.km	sq.km	sq.km	sq.km	sq.km	sq.km
		% to total	% to total	% to total	% to total	% to total	% to total	% to total	% to total	% to total
1	Agriculture Zone	1.00	0.87	0.87	0.24	5.13	2.62	4.01	1.48	16.22
		6.5%	9%	4.7%	3%	28.8%	14.9%	14.1%	9.1%	12.4%
2	Conservation Zone	-	0.44	7.34	-	6.30	-	4.37	9.42	27.87
		0%	4.8%	39.4%	0%	35.4%	0.0%	15.4%	57.6%	21.4%
3	Urbanisation Area - 1	11.37	-	-	-	-	0.37	12.77	-	24.51
		74.2%	0.0%	0.0%	0.0%	0.0%	2.1%	44.9%	0.0%	18.8%
4	Urbanisation Area - 2	-	5.35	8.22	5.78	3.58	13.63	5.39	4.60	46.55
		0.0%	58.0%	44.1%	82.1%	20.1%	77.5%	18.9%	28.2%	35.7%
5	Tourism and Recreation Zone	2.07	1.87	-	0.75	0.85	-	-	-	5.54
		13.5%	20.3%	0%	10.7%	4.8%	0%	0%	0%	4.2%
6	Transportation	0.52	0.41	0.56	0.24	0.36	0.94	1.87	0.36	5.26
		3.4%	4.4%	3.0%	3.4%	2.0%	5.3%	6.6%	2.2%	4.0%
7	Water Body	0.37	0.28	-	0.03	1.59	0.03	0.05	0.22	2.57
		2.4%	3.0%	0%	0.4%	8.9%	0.2%	0.2%	1.3%	2.0%
8	Forest	-	-	1.65	-	-	-	-	-	1.65
		0.0%	0.0%	9%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%
9	Quarry	-	-	-	-	-	-	-	0.26	0.26
		0%	0%	0%	0%	0%	0%	0%	1.6%	0.2%
Total		15.33	9.22	18.64	7.04	17.81	17.59	28.46	16.34	130.43
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

The zone wise concentration of activities is as follows:

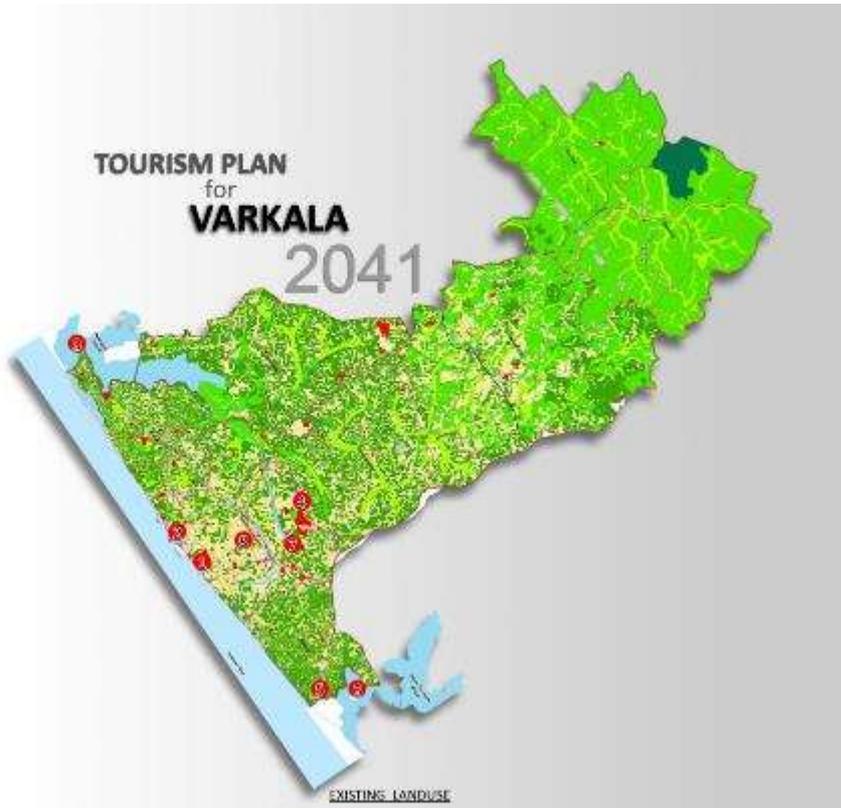
- i. **Urbanisable Area-1:** This zone comprises existing predominantly built / developed areas of Varkala Municipality and covers part of Varkala Municipality and Navaikulam. The existing developments and developing areas around the National Highway are covered under this zone. This zone shall have mixed use developments and shall accommodate the expansion of built / developed areas while at the same time focusing on the on densification of the existing developed areas. The higher order development activities shall be limited to roads of higher hierarchy i.e. more than 15 m road width. This zone comprises Varkala Municipality (46.4%) and adjoining Navaikulam (52.1%) and Chemmaruthy (1.5%).
- ii. **Urbanisable Area-2:** This zone shall act as an intermediate zone between the Urbanization Area-1 and the vernacular rural settings, ecological and natural areas. The main focus is on densification of existing developed areas and development of new areas. Mixed land use along with various service and cottage industries shall be allowed in this zone. Higher order activities shall be allowed only on the roads with road width higher than 21 m. This zone shall have various development nodes as identified in the Master Plan which shall have agro based industries, sports and recreation, IT/ITES and other technology based establishments. This zone comprises the areas of Navaikulam (11.6%), Chemmaruthy (29.3%), Madavoor (17.7%), Edava (11.5%), Vettoor (12.4%), Elakamon (7.7%) and Pallickal (9.9%).
- iii. **Tourism and Recreational Zone:** This zone covers existing areas of hotels, resorts; home stays concentrations, and such other tourism related activities. The main purpose of this zone is to promote tourism related activities within the project area while at the same time controlling and regularizing such activities within the eco-sensitive areas (cliffs). This zone shall have various activities like art centres, museums, theme parks, fair grounds, etc. That shall help in promotion of tourism in the project area. The tourism and recreation zone is concentrated in primarily four areas viz. Varkala Municipality (37.4%), Edava (33.8%), Elakamon (15.3%) and Vettoor (13.5%).
- iv. **Agricultural Zone:** This zone comprises area of existing paddy fields which are primarily low lying areas and valley areas. Various activities related to agriculture, paddy, horticulture, seed farms, dairy farms, fishing, etc have been envisaged in the zone. The major agricultural lands are in Navaikulam (24.7%), Chemmaruthy (16.2%), Elakamon (31.6%) and Pallickal (9.1%), Madavoor (5.4%), Edava (5.4%) and Varkala Municipality (6.2%).
- v. **Conservation Zone:** This zone has been provided where the development is sparse and where the large tracts of vacant land and incidental agriculture activities with the main purpose to conserve the vernacular rural settings within the project area. Residential developments with low rise and low density and passive tourism activities like home stays and lower order of commercial activities are permitted in this zone. The conservation zone is mainly in Pallickal (33.8%) Madavoor (26.3%), Elakamon (22.6%), Navaikulam (15.7%) and Edava (1.6%).
- vi. **Water Bodies:** The area under water bodies is mainly concentrated in Elakamon (61.9%), Varkala Municipality (14.4%), Edava (10.9%) and Pallickal (8.6%).



Source: Proposed Land use base on URDPFI Guidelines & Existing Land Use Survey
 Figure 5: Proposed Land Use Zone

4. Identified Projects for Tourism Promotion

Various tourist attractions like North Cliff, Papanasam Beach and Janardhan Swami Temple have high tourist activities and it lacks required tourism infrastructure facilities that needs to be upgraded and/or provided to attract tourists to this place. The major projects and the conceptual design for the development and/or up-gradation of the same have been highlighted ahead:



Source: Land Use Survey

Figure 6: Location map of Major Tourism promotion spots

4.1 Papanasam Beach

a. About the Site

Papanasam is one of the main beaches here and it is not only an important tourist spot but it also has religious significance. It is believed that a dip in the waters here can wash away all the sins (papam) and hence the beach obtained its name. Hindus find it a very auspicious place and ashes collected from the cremation grounds are immersed at the sea here. They believe that the sins of the deceased will be washed away and the soul gets *moksha* or *eternal salvation* through this ritual.

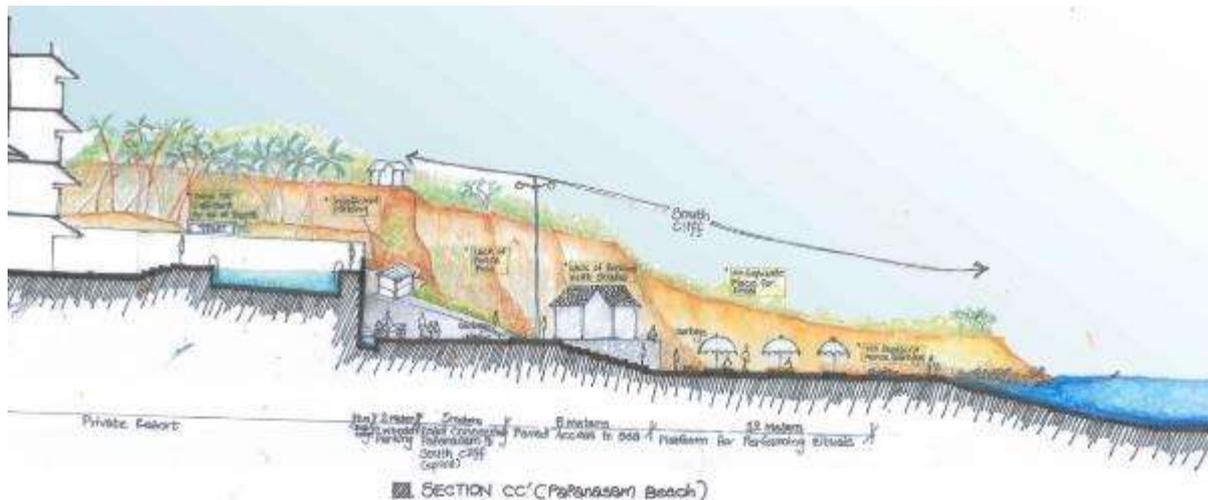


Figure 7: Section Showing Papanasam Beach

b. Approach and Access to the Site

The main junction of the Janardhan Swamy temple has the better connectivity to the Papanasam beach where bali rituals are performed. Papanasam beach is well connected by secondary streets forming a loop and which is connected to the major temple road. The access from the temple road to Papanasam through south cliff has major concentration of resorts and hotels with home stays.

c. Existing Land Use around the Site

The majority of the land use around the Papanasam beach is Hotels. The major street connecting Papanasam and Janardhan Swamy temple has more of congestion due to overlapping of religious and other commercial activity. Land use along the Papanasam and South Cliff includes majority of hotels, home stays, resorts, studios etc. Public spaces need to

be developed by providing necessary street furniture by giving better connectivity for pedestrians along the south to north cliff.

d. Major Issues

The major issues of the area:

- It lacks the proper connectivity with Informative signages along the major roads connecting the attraction and the Information center at tourist attraction
- Parking facilities are not sufficient for tourist visiting Papanasam beach, parking lots should be proposed along the major road for better connectivity and accessibility while reducing resultant congestion along road side parking
- Lots of visitor visits the Papanasam beach to perform the bali ritual and contrary it lacks the basic infrastructure to perform the rituals which results in the chaos while polluting the beach area by dumping garbage along the sea
- In spite of lots of tourist visiting the Papanasam beach it lacks the basic amenities like toilets, changing room, shading area/benches etc and basic street furniture like streetlights, benches, dustbins, railing etc. along the beach area
- Safety and security is also very important aspects near the beach area, however it lacks the security during night hours and it also becomes inaccessible due to lack of streetlights

e. Proposal

Thousands of people offered `bali` to propitiate their forefathers on the occasion of `Karkidakavavu` which seems one of the important rituals and due to these there is a heavy rush of devotees at Papanasam beach, Janardhana swamy temple at the peak seasons and also during major festivals. The proposal aims to provide the proper connection from the major temple road to the secondary streets with street furniture and easily approachable parking areas along the secondary streets and to encourage the pedestrian activity by reducing the resultant congestion due to overlapping of different activities.



Figure 8: Proposed Amenities around the Papanasam Beach

Secondary Street connecting Janardhan swamy temple and the papanasam beach should be developed by providing footpaths, streetlights and dustbins proper infrastructure to perform the bali rituals. Tourist information center should be upgraded with the better amenities and facilities, which will help tourist to gain the knowledge of the particular. It should be placed along the street at a distance of 4 meters. However, the pedestrian connection from helipad to papanasam beach area should be strengthen by providing street lights, dustbins and benches to make it more accessible during night hours.

4.2 North Cliff

a. About the Site

These cliffs, termed as Varkala Formation, that are found adjacent to the Arabian Sea are declared as geological monuments by the Geological Survey of India.



Figure 9: View of the North Cliff

b. Approach and Access to the Site

The secondary street evolving from the major temple road connects the north cliff at different points. The street connecting perpendicular to the secondary streets are the tertiary streets connecting inner cliff part. Pedestrian walkway connects the north cliff from one end to the other but due to landslides and other extreme weather the cliff has fallen at certain areas and resultant the walkway is not continuous. However at certain distance where the beach is approachable the staircase are connected to the beach.

c. Existing Land Use around the Site

The major land use around the North cliff comprises hotels, restaurants and resorts, while the cliff edge caters the major commercial activities. According to the CRZ guidelines up to 100 meter from the cliff's edge permanent construction activities are not permitted but the existing shows large number of illegal permanent constructions. During the peak season, the walkway along the cliff becomes congested due to overlapping of different activities. Public spaces are lacking and need to be developed by providing necessary street furniture by giving better connectivity for pedestrians along the south to north cliff.

d. Major Issues

The major issues of the area:

- Public Parking facilities are not available at north cliff area, parking lots should be proposed along the secondary streets and the major road for better tourist connectivity and accessibility while reducing resultant congestion along road side parking
- North cliff being one of the famous spot at Varkala many tourists choose to accommodate themselves from the stretch of helipad to black beach, which has given rise to the large number of commercial activities along the cliff's edge. Due to lack of proper waste disposal facility, the area gets flooded with garbage from restaurants as well as tourist areas.
- The cliff edge becomes a major issue for pedestrians during the nighttime since it is not demarcated properly with some kind of fencing
- Safety and security are also very important aspects near the cliff area, however it lacks the security during night hours and it also becomes inaccessible due to lack of streetlights

e. Proposal

The proposal aims to provide the proper connectivity from the major temple road and also widened the inner roads of north cliff area. Since there is lack of parking spaces on the north cliff a proper parking spaces will be marked and vehicles will be allowed to a certain point and the streets will be made pedestrianized.

Due to certain landslides on the cliff the paved walkway has been damages at certain areas with no demarcated cliff's edge, hence firstly the proper cliff's edge needs to be protected by making bio fencing and by leaving a wide paved footpath with buffer of open space before commercial activities.

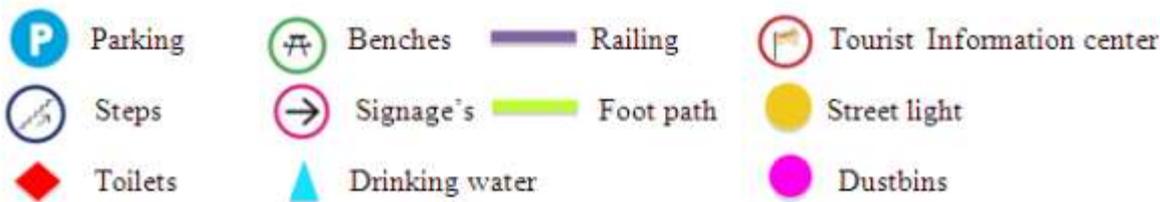


Figure 10: Proposed Amenities around the North Cliff

Tourist information center should be upgraded with the better amenities and facilities, which will help tourist to gain the knowledge of the particular attraction in and around the north cliff. Secondary Street connecting inner cliff area should be developed by providing footpaths, streetlights, benches and dustbins. It should be placed along the street at a distance of 4 meters. However the pedestrian connection from helipad to black beach should be strengthened by providing street lights, dustbins and benches to make it more accessible during night hours.

4.3 Development around Kappil Lake

a. About the Site

Kappil Lake is the north-west border town of Thiruvananthapuram district. It is located in Edava Panchayat, near Varkala. Flanked by the coconut plantations and paddy fields, Kappil backwaters attract a large number of domestic and foreign tourists.

Kappil is also famous for Kappil Bhagavathy temple and a tourist spot during the festival season. Recently DTPC has provided boating facilities in the backwaters. The boat club offers Safari boat, speed boat, pedal boats and rowing boats to the tourists at moderate rates. Communication facilities, parking and refreshment facilities are inadequate for the current level of tourist flow itself. Kappil beach is the meeting point of Kappil Lake and Arabian Sea. It is secluded, rocky stretch facing the Sea.

b. Major Issues

The major issues of the area:

- No bus or auto stands near the lake
- Lack of basic tourist oriented infrastructure
- In day time the region is deserted, there is no police booth.
- Lack of awareness among the tourist

c. Potential for Development

The place has high potential for development for the following reasons:

- Scenic beauty and backwaters
- Estuary – a place where backwater and sea meets
- Seasonally the character of the place changes i.e. in high tide the backwater and the sea meets, while in low tide the same place is accessible for beach
- Pleasant climate around the beach, sea breeze
- The area around the lake has potential area for development of tourist related activities

d. Proposal

The orange color in the map shows the potential area for tourism related development. Various viewing points have been created, which act as an independent nodes for development of various activities. The activities which are proposed in

these nodes are fishing areas, boating facilities, high end resorts, home stays etc. There is proposed pedestrian bridge connecting view point-3 and view point-2. Each of these nodes has viewing towers. Various other proposed activities have also been listed. This lake is also a major connectivity to the waterways proposed. The lake has potential for development of Dolphin Park.



Figure 11: Proposed Development around Kappil Lake

- i) There is no bus/auto stand within 2 km area of the Kappil Lake and hence it has been proposed
- ii) Tourist information centre & police booth service has been proposed for awareness of locations around the Kappil Lake and for assuring safety of tourists especially during the morning and afternoon time
- iii) Provision of water booth & public toilet near the beach area

4.4 Anjengo Fort

a. About the Site

This monument has been declared to be of national importance under the ancient monuments and archaeological sites and remains act 1958. It was one of the important forts of East India Company in Kerala. It was also served as a first signaling station for ships arriving from England and as a depot for military stores during Carnatic war. Fort is square on plan with 4 bastions with high laterite walls. Two of them face on sea side and other two on the land side. The fort campus also has two Tombstones of the Commodore of Anjengo.

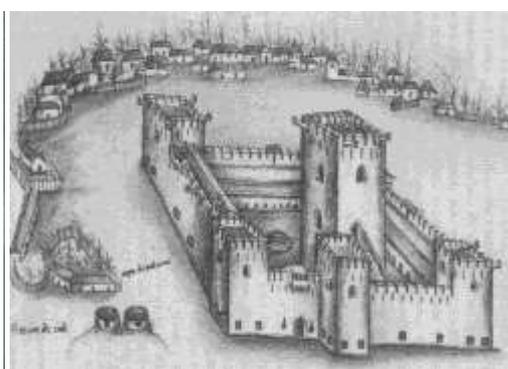


Figure 12: Aerial View of Anjengo Fort

Located about 36 km North of Thiruvananthapuram, near the famed beach of Varkala, and lying on the seacoast is Anjengo or Anjuthengu, meaning five coconut trees, 14 km away from the Helipad, Varkala.

b. Major Issues

The major issues of the area:

- Lack of maintenance at the fort
- The fort has no proper connectivity of roads

- There is Lack of awareness to the surrounding and local people
- The fort has no attraction point and has no signage to it
- There is no parking space provided and hence cars are parked on the roads at the entrance
- Big colonies of fishermen houses are built between the fort and the beach

c. Potential for Development

The fort is located right next to the beach giving it a beautiful view and location. Moreover the fort is also of great historic importance.

d. Proposal

Proper connectivity should be provided giving proper access from the beach. The condition of roads should be improved and roads should be widened. Proper signage should be provided for better direction. Proper maintenance should be done for the whole infrastructure. Sound and light show (case study: Golconda fort and Udaipur palace) should be organized for more attraction of the fort. Parking areas should be allotted and proper organized parking facilities should be provided.

ASI should organize awareness campaigns for the fort. Tourist attracting activities water sports, camels riding etc. have also been provided. The green blocks are the rehabilitee housing property comprising 60-70 (kachha pakka) houses for the betterment and development of the fort area as it positively results in the local body economy due to increase in local commercial and other activities which can greatly promote localization and economy as a whole.



Figure 13: Proposed Development at Anjengo Fort

4.5 Janardhan Swamy Temple

a. About the Site

The 2000-year old Sree Janardhan Swamy where Hindu pilgrim flocks to perform the final ritual for the deceased is the one the main attraction among the devotees. The temple precincts comprises of Temple Street, temple pond, library, Temple food court, administrative block, prayer hall etc.



Figure 14: Section Showing Janardhan Temple Precincts

b. Approach and Access to the Site

The Janardhan Swamy temple can be reached through three secondary temple streets connected by major temple road in north, east and west. It also has three access routes from which one is the main access connected by the major temple street which is in west direction and other has a direct access to the temple pond in north.

c. Existing Land Use around the Site

The majority of the land use around the Janardhan swamy temple is residential. The major node of the Janardhan Swamy temple has more of commercial activity with other religious activity throughout the day. The institutions like schools, administrative unit, library etc. is in the precincts of temple complex due to which the activities overlap and resultant congestion during peak hours. Land use along the papanasam and south cliff includes majority of hotels, home stays, resorts, studios etc. Public spaces need to be developed connecting the different building within the temple complex with a better accessibility.

d. Major Issues

The major issues of the area:

- Lack of proper connectivity and insufficient parking facilities
- Lack of basic infrastructure facilities like toilets, resting space, etc
- The water of the Temple pond needs to be treated and maintained
- Lack of basic street furniture like streetlights, benches, dustbins, railing along the temple pond etc.
- Tourist information centre in Varkala and the road side signages highlighting the important locations need to be provided

e. Proposal

The Conservation and the Revitalizing the heritage temple complex is a vital issue to be looked upon. The proposal aims to provide the proper connection from the major temple road to the secondary streets with street furniture and easily approachable parking areas to reduce the congestion during the peak hours and festival season like karkidavavubali.

However the temple pond and the Access staircase of the temple should be well connected. Public spaces in and around the temple complex needs to be renovated with proposed ramps for physically challenged devotees along with the toilet and changing room facilities

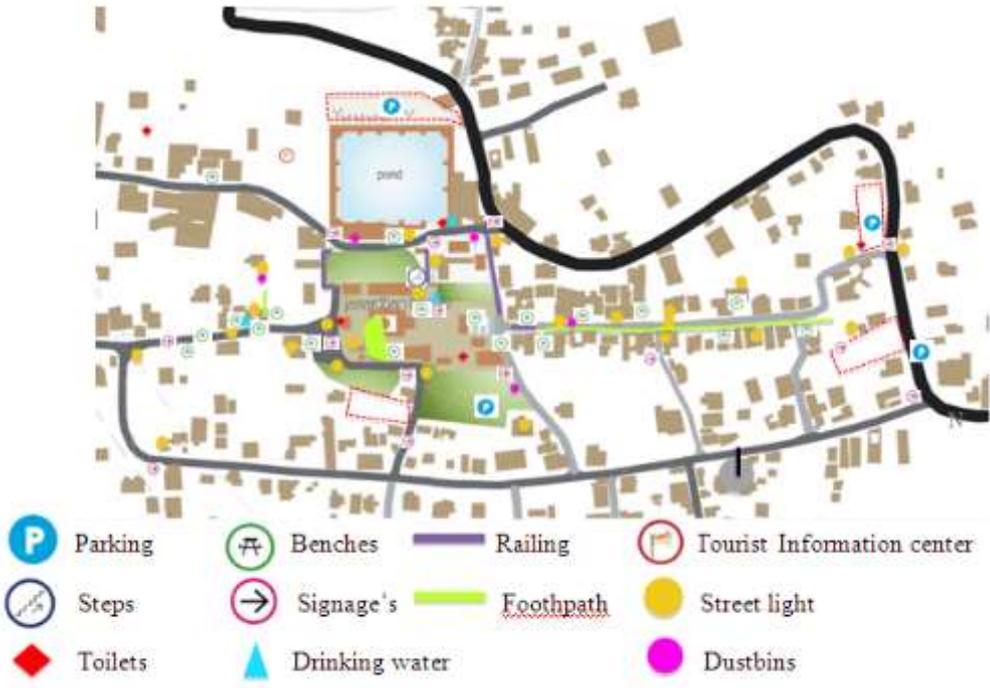


Figure 15: Proposed Amenities around the Janardhan Swamy Temple

4.6 Renovation of Varkala Tunnel

To tap the potential of backwater tourism and to meet the foreign travelers demand it is necessary to make the Varkala tunnel navigable.



Figure 72: Canal and Other Water Bodies in Varkala

Canals are waterways that are sheeted to provide a new path of travel to vessel (as opposed to improving a national water ways along its current course)

A Varkala Tunnel waterway is an aqueducts type of canal that may be used for the conveyance and delivery of portable water for human use municipal uses and agriculture irrigations.

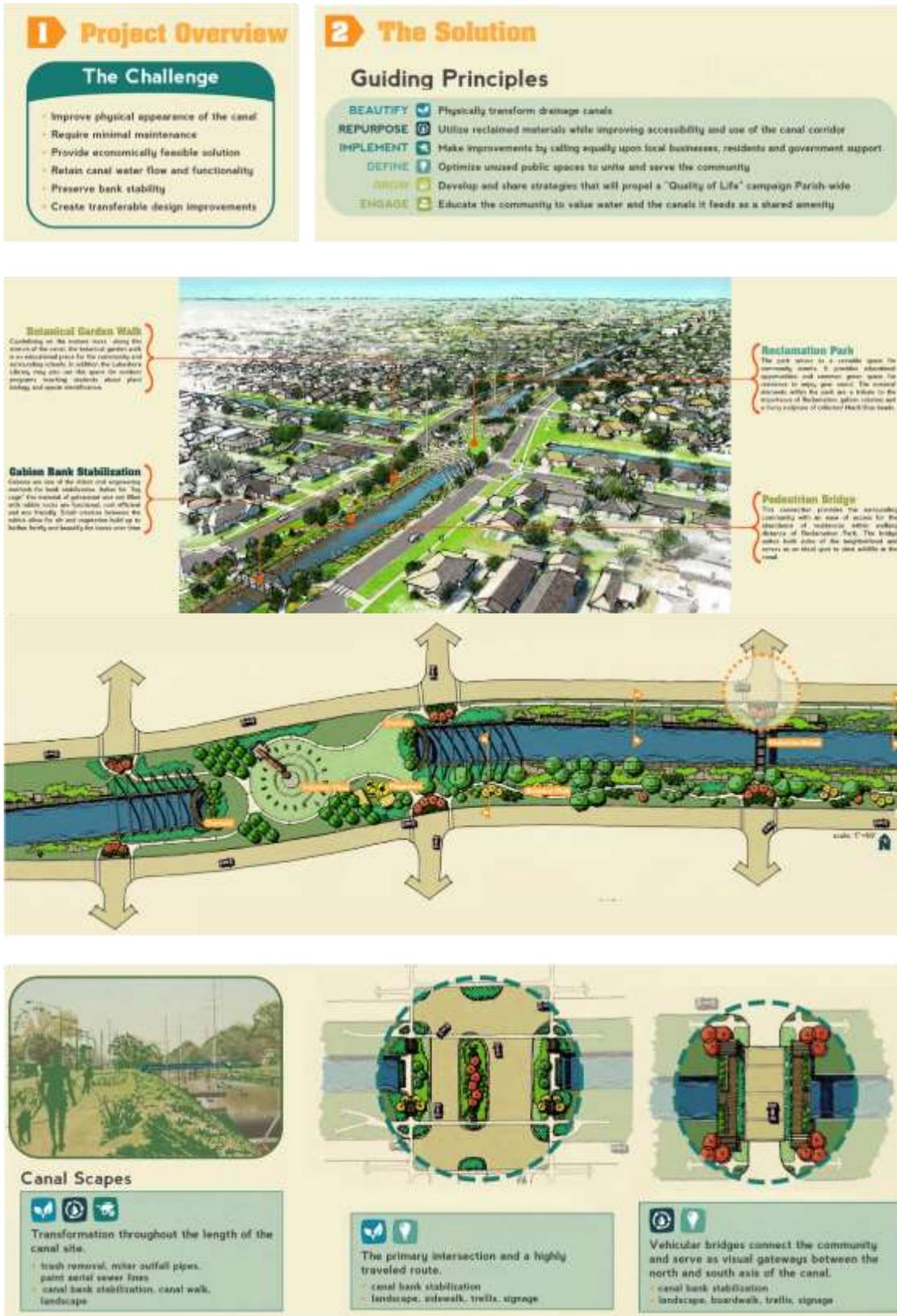


Figure 73: Conceptual Development along T.S. Canal

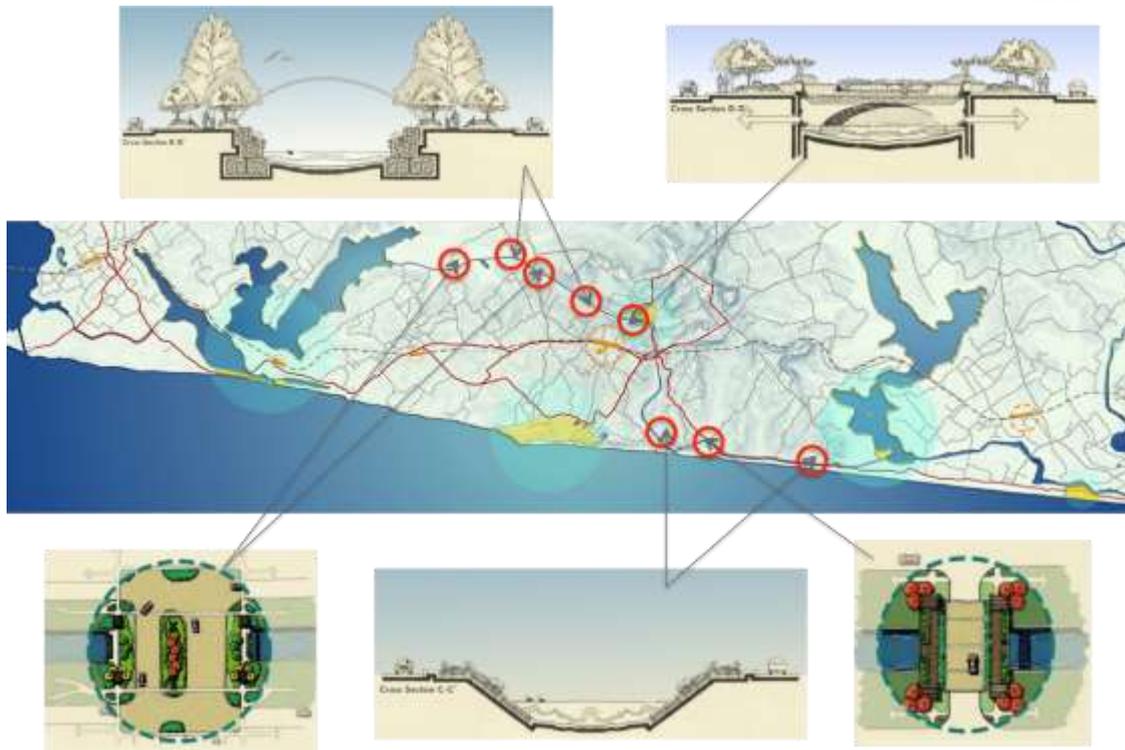


Figure 74: Development at Proposed Nodes along T.S. Canal

The Varkala Tunnel connecting Chilakkur backwater area is expected to be navigable with the assistance of Government of India and Government of Kerala at a cost of Rs. 100 crore including drudging in the area. The project is to be taken up under GOK/GOI/LSGD assistance.

4.7 Golden Island

a. About the Site

Ponnumthuruthu, also known as Golden Island is 20 km from Varkala and is known for its Shiva Parvathi temple. It is home to many birds like cormorants, egrets and herons, eagles and gulls. Various water birds too can be seen here. The mainland on the other side of Ponnumthuruthu is a coir village. There is a small coir-making unit near the ferry.

This island is known for the Shiva Parvathi temple, which is also called ‘Thuruthukshethram’ by the natives. The temple is situated amidst thick coconut groves, which has grown over the entire stretch. Valiyapurackal family owns the island and the temple. The temple is more than 100 years old and the entire island is temple property. Royal Family used to hide their cache of gold and ornaments on the island in order to keep it safe and hence it obtained the name, Ponnumthuruthu and is known for its Shiva Parvathi temple which is 100 year old and the entire island is temple property. The temple was in ruins for a long time but about a decade ago, it was rebuilt. Valiyapurackal family owns the island and the temple. The importance of the temple is during two main festivals.

1. Sivarathri is a major festival celebrated at the Siva Parvathi temple at Ponnumthuruthu. It is the festival that makes alive the otherwise less frequented island. Many devotees spend the night on the island during Sivarathri and the place lit with lights is an enchanting sight.
2. Nagapanchmi is the other important festival celebrated by the local people.

b. Major Issues

The major issues of the area:

- The backwater is not much known to tourists
- There is no proper information available about the island
- There is no proper signage’s from Varkala leading to this island
- The island is owned privately and no basic facilities are available viz. toilets, drinking water facilities

c. Potential for Development

Tourism at Golden Island can flourish more because of its historical importance with presence of flora and fauna. The access to the place could be strengthened further by promoting back waters boating. The surrounding area has immense potential to develop. Various high end resorts can come up and the place can be open up for tourist. The backwater is surrounded by has residential area. Home stays can be promoted in these areas, so they can experience tradition and culture.

d. Proposal

The orange color in the map shows the potential area for development of tourism related activity. Various viewing points are created, they acts as an independent nodes for development of various activities. The activities which are proposed in these nodes are fishing areas, boating facilities, high end resorts, home stays etc. there is proposed pedestrian bridge connecting view point-6 and view point-7. Each of these nodes has viewing towers. Various other proposed activities are further listed below. This island is also a major connectivity to the waterways proposed.

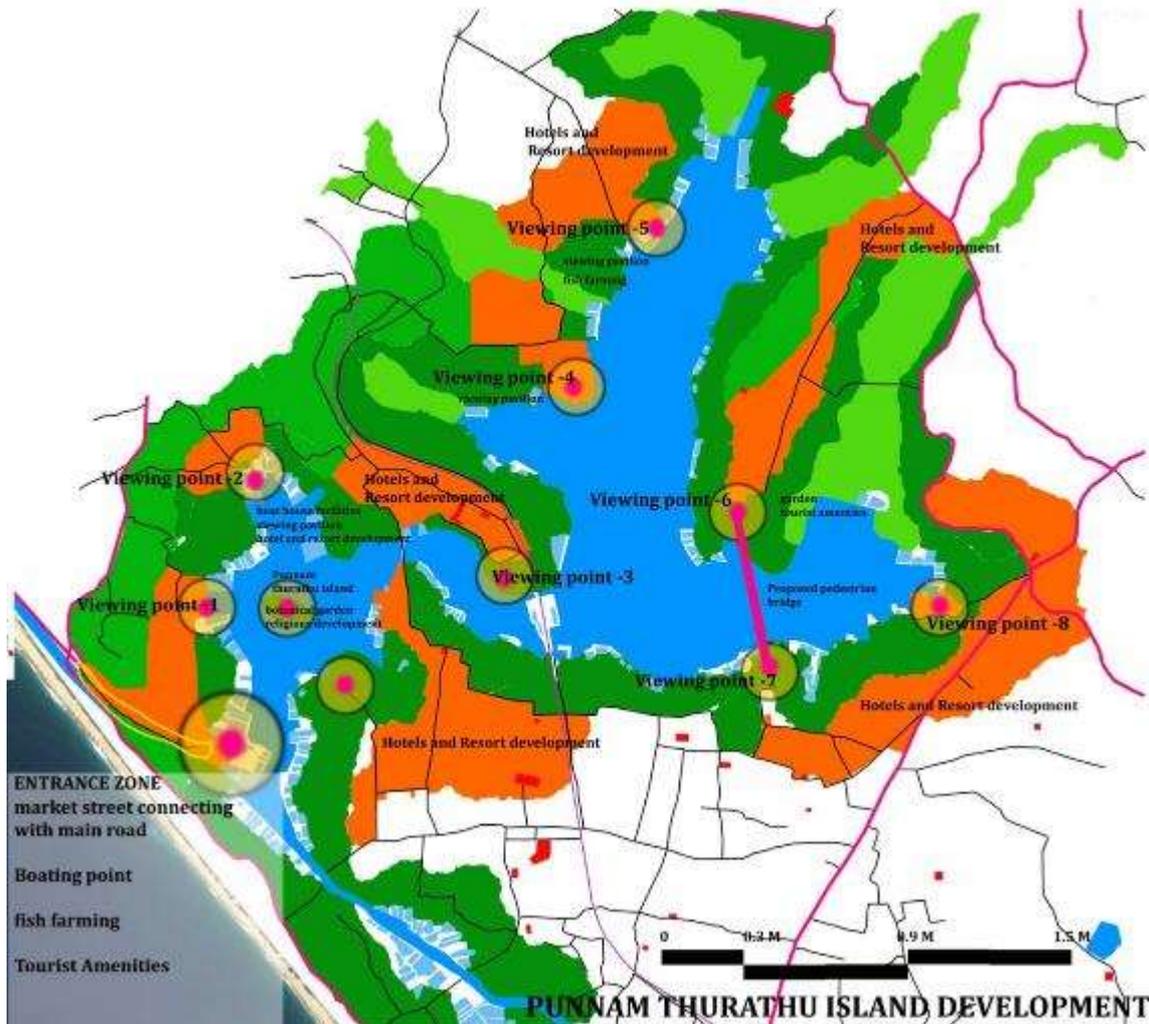


Figure 75: Proposed Tourism Activities along the Golden Island

Activities to be taken up include:

- Improvement of connectivity mainly from Trivandrum and Varkala town, as it is the major entry point to this back water
- Providing the signage's on the way
- Alternate entry point to the island and improvement of the existing entry point by providing proper path ways
- The designated platform structure for boat which is safe for every age group
- Provision of basic facilities inside the temple
- Awareness among the people by small campaign
- Templates of flora about its type and importance

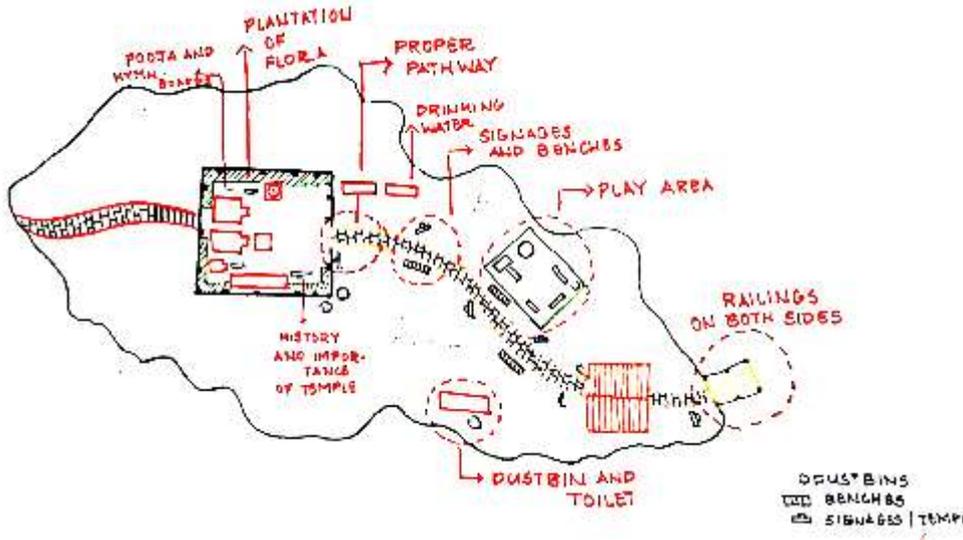


Figure 20: Location of Infrastructure Facilities in the Island

4.8 Identification of Future Area for Development with Urban Design Guidelines

The area earmarked along the sea in the figure mentioned below has high potential area for development. They are in immediate vicinity to the north cliff and helipad. These areas are less densely development as compared to the area in the north cliff and helipad is highly dense. The sprawl of development - hotels and resorts are spreading on either side of the north cliff. The northern side area is - Odayam, Manthara, Vettakada beach and southern side area is - Enikkal and Chilakkur beach.

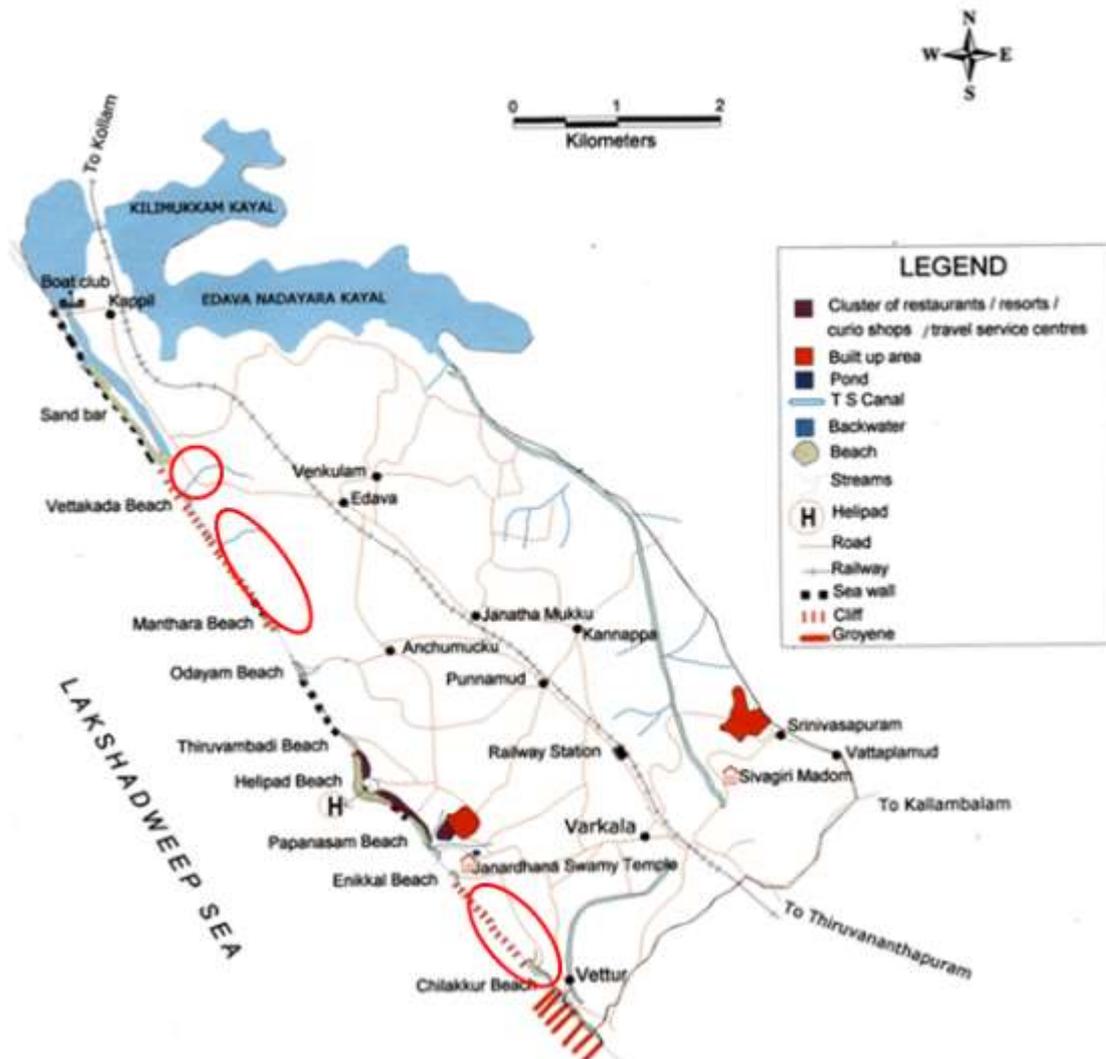


Figure 21: High Potential Areas for Development along Kappil Lake
A. Beach tourism in Chilakkur

The average beach area in Chilakkur in the peak tourism season is 8750 sq. m. and 1500 sq. m. in the off-season. The Chilakkur area has some fishermen's colony and groins to prevent the attack of the sea. Compared to other areas the sea in Chilakkur beach is rough, especially in an off-season period. But in a peak season, the beach is beautiful with a panoramic view of the sand and the view of fishermen's boats including country boats.

B. Beach tourism in Vettakada

The beach in Edava panchayat has an available beach area of 450 sq. m. in the peak season and only 250 sq. m. in the off-season.

These two cliffs have high potential area to develop in near future. To control the since coastal areas are sensitive zones, tourism activities dictate proper planning and protection measures. Concentration of developments in the narrow stretch of landmass has already caused problems like overcrowding, insufficient infrastructure, environmental issues, unhealthy competitions etc. The landuse / land cover analysis demonstrated potential tourism sites towards the northern region, and sufficient hinterlands towards the east, which has to be developed through proper planning and encouragement.

Following urban design guidelines to be followed:

- Strict implementation of CRZ norms
- Bio fencing (5- 10 m) from cliff edge
- Footpath width from limit of bio fence
- Immediate prevention of all development activities from 100 m of cliff edge
- Strengthening water drainage system on larger scale

E. CONCLUSION

The Main output of this paper to provide guidance to planners. Non-government organisation and policy makers in deciding whether tourism could work for particular ecofriendly tourist destination and integrating it with needs of local community and it can be sustained over the long term.

The paper briefly demonstrates the suggested development of the town of Varkala, a famous religious tourist destination in the state of Kerala, and 7 panchayats surrounding the town. The area considered for development, herein, showcases the dominant existence of Vegetation, Urban plantation and Agricultural activities. However, the increasing number of tourists and unregulated development along the cliffs of the town has resulted in the destruction and pollution of natural environment.

The physical infrastructure in the region needs to be upgraded to satisfy the existing and the anticipated demand of tourist & local population. This paper, thus, provides a list of planning principles that can help overcome the existing shortcomings in the region and ensure balanced development. Based on the projected resident and tourist population, the paper proposes a land use plan which shall guide the development activities till the year 2041.

In addition to this, it proposes Local Level area based planning with the aim of utilizing the potential of various tourist spots and places that can enhance the overall quality of life of neighbourhoods and the region as a whole.

The town is home to an array of religious monuments and natural and geological spots such as beaches and cliffs which have the potential to attract tourists, if developed in a certain manner. Thus, it has been proposed to develop places like the North Cliff, the Papanasam beach and the Varkala Tunnel in order to tap their tourism potential and regulate the kind of development taking place therein. Secondly, various potential tourist spots have been identified which can be developed in order to attract more tourists and generate tourism-related activities. Thus, 'Local Area Planning' has been adopted as a tool to refurbish the existing spatial fabric of the region and to establish Varkala as an exotic tourist destination on the national & international charts.

Special Sessions

SS01.1. Water management in South Asia: From conflict to cooperation

1004 MONITORING IMPACT OF LAND USE & LAND COVER CHANGE IN LIVELIHOOD ZONES ALONG THE NARMADA RIVER RIPARIAN BUFFER ZONE, MADHYA PRADESH, INDIA

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ABSTRACT

Riparian zones are dynamic components of the landscape that support many ecosystem functions vital to the health and productivity of watersheds. Stretched over 7126.1 sq km of area, Narmada riparian buffer zone supports livelihoods in three states in India, namely Madhya Pradesh, Maharashtra and Gujarat. Construction of dams and expansion of urban areas has modified the Narmada riparian zone while deteriorating the riparian health and livelihoods. For the purpose of the study, extraction and delineation of Narmada riparian zones were done from 30 m Digital Elevation Model or DEM. Shape files of Livelihood zones and land use & land cover of this area from 2004 to 2015 was acquired from Food and Agriculture Organization and Central water commission of India respectively. Using this data, spatial change on eleven major land cover & use classes was measured. A sample area was identified for detail study. The livelihood zones were then assessed individually to see the relationship between the change of land use and land cover and livelihood changes in that zone. From the measurement it was found that Forest and Scrubland area has greatly reduced and have been transformed into agricultural land and gullied areas. Scrublands and forests provide biomass over which various livelihoods are dependent. Percent change of areas was analysed with respect to existing livelihoods in the region. The loss of scrublands has also led to caused severe erosion and sedimentation on river beds. The sedimentation has caused changes in geomorphology of banks, riparian flora and fauna and subsequently affecting related livelihoods. This paper presents a case study of this livelihood change in the riparian zone triggered by land use & land cover alteration in the area studied as above.

Keywords: Land Use and Land cover change, Riparian buffer zone, Narmada River, livelihood zones,

1. INTRODUCTION

For centuries the river’s diverse and productive ecosystems have provided a wealth of natural resources supporting the livelihoods of millions of people living along the banks of the river and its tributaries (Ketelsen, 2017). Land Use and Land Cover change in riparian zones is expected to present serious challenges to availability of water and nutrients. As a result of land use and land cover change and possible changes in plant community composition, structure, and forage quality the net primary production and therefore feed availability will change as well.

1.1 Interrelationship between riparian zones and livelihoods

Water supports livelihoods of all people through water-consuming agricultural and industrial activities, through consumption and sanitation and through environmental services (Simon E. Cook, 2009). As per United Nations report on Water and Jobs almost half of the global workforce is employed in eight water and natural resource-dependent industries: agriculture, forestry, fisheries, energy, resource intensive manufacturing, recycling, building and transport. As the global water resources deplete due to pollution and area loss, so do the associated livelihoods. The riparian edges has different type of landforms which are point bars, flood plains, riparian forest, scrubland etc. These numerous resources in turn support a variety of livelihoods (fig.1).

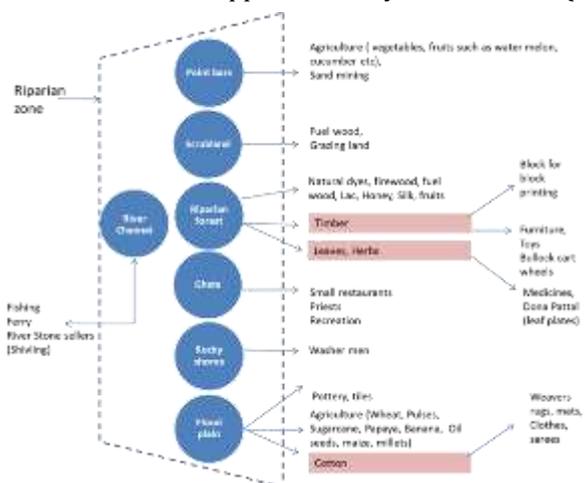


Figure 1. Interrelationship between riparian landforms and livelihoods source author

The forest support a diverse array of livelihoods and also provide a rich life to the people living around. The ‘Baigas’ of Amarkantak from Achanakmar Biodiversity Reserve in Madhya Pradesh rely heavily upon forest for medicinal herb extraction as these are the traditional medicine men of the tribal community. ‘Ojha’ community of the Hoshangabad district of Madhya Pradesh depends entirely upon extraction of leaves and bamboos for their livelihood (Dona Pattal or

organic plate making and Bamboo mats weaving), and Vishwakarma community of same district make Lacquer toys from ivory pale wood of Doodhi tree (*Wrightia tinctoria*) harvested from nearby riparian forests (table 1) These raw materials are extracted from various zones of riparian ecotone. The scrubland and forest communities provide a resource base for many traditional livelihoods.

1.2. The livelihoods in the Narmada valley riparian zone

River Narmada is said to be the lifeline of Central India. Stretched over 92,672.42 Sq.km sq km of area, Narmada riparian zone supports livelihoods in three states in India, namely Madhya Pradesh, Maharashtra and Gujarat. It is a major perennial source which provides drinking water, fishes, water for irrigation of farms, dense forests, rich plains and plenty other sources which are means of survival and sustenance for the people living in the region. For example, the forests which are close to river have a great diversity and provide numerous resources which in turn support lot of indigenous household industries and livelihoods.

Riparian zone has dynamic environments characterised by strong energy regimes, substantial habitat heterogeneity, a diversity of ecological processes and multidimensional gradients (Vyas et al., 2012). Agriculture, fishing, biomass extraction are the most common occupation in the riparian zone. Communities such as fishermen families living on the river banks, boatmen, priests are the major inhabitant of the riparian zone. As the river is considered holy and sacred along the entire length religious ceremonies are performed on the river banks. The river supplies water to the diverse agricultural zones along the course of the river.

A number of dams have been built along the entire course to harness hydro power from the river. The issues of livelihood are subject to great regional variations, and range from subsistence based economies, small scale household industries and peoples to formal and registered employment and activities. Many aboriginal communities continue to live near the banks in the primitive manner depending entirely upon natural resources. However this number is constantly reducing as the ecosystems are under constant pressure by urbanisation. The present study analyses the impact of land use land cover changes on livelihoods along Narmada riparian zone.

2. BACKGROUND STUDY ON NARMADA RIPARIAN BUFFER ZONE (RBZ)

Riparian buffer zone (RBZ) is an area on flood plains of river and shows characteristics trees, usually accompanied by shrubs and other vegetations along a river, stream or shoreline that is managed to maintain the integrity of the waterway to reduce pollution and to provide food, habitat and thermal protection for fish and wild life. The unique ecological functions of riparian zones are linked to dynamic biophysical processes and interactions across multiple spatial and temporal scales. Riparian buffer zones help in controlling soil or sediment erosion, maintaining water quality, provide habitats for different aquatic organisms, flooding & temperature control and construct a stable river bank (Vyas et al., 2012).

Considering the importance of the of Narmada RBZ, it has been subject of study for a long time. Status of Riparian Buffer Zone and floodplain areas of was assessed by Vyas et al. (2012). Micro level assessment study was also performed on tributaries of Narmada river such as Chandi Nalla (Chaurasia et al., 2015; War et al., 2014) and Bhagner stream (Bashir et. al., 2015). So far no study has been done on Monitoring impact of Land Use & Land Cover change in livelihood zones along the Narmada RBZ with relation to livelihoods. This paper proposes a method to analyze changing patterns of Land Use and Land Cover and their impact on livelihoods on Narmada RBZ. The riparian buffer zone of river are getting highly degraded.

3. STUDY AREA & DATA USED:

Narmada basin lies between east longitudes 72° 38' to 81°43' and north latitudes 21° 27' to 23° 37'. The basin is bounded by the Vindhyan ranges at north, Maikala range at east, Satpura ranges at South and Arabian Sea at west. Since, Narmada basin covers a huge area (92,672.42 sq km), a smaller zone namely Central Narmada Sub Zone covering 7126.1sq km area is selected for the study (Fig.2).

30 m Digital Elevation Model or DEM were used to extract of Narmada riparian buffer zone. Shape files of Land Use and Land Cover map of Narmada basin and broad Livelihood zones for the year 2004 , 2008 and 2014 and were acquired from Central Water Commission and Food and Agriculture Organization of India respectively. The images were then used for subsequent analysis.

4. METHODOLOGY

The methodology for monitoring Land Use and Land Cover change is comprised of 3 steps which are 1) Delineation of Riparian Buffer Zone within Central Narmada Sub Zone , 2) Analyzing Land Use and Land Cover change within Central Narmada Sub Zone, 3) Identification of livelihoods through secondary data and correlating livelihood changes to field studies

4.1. Delineation of Riparian Buffer Zone within Central Narmada Sub Zone

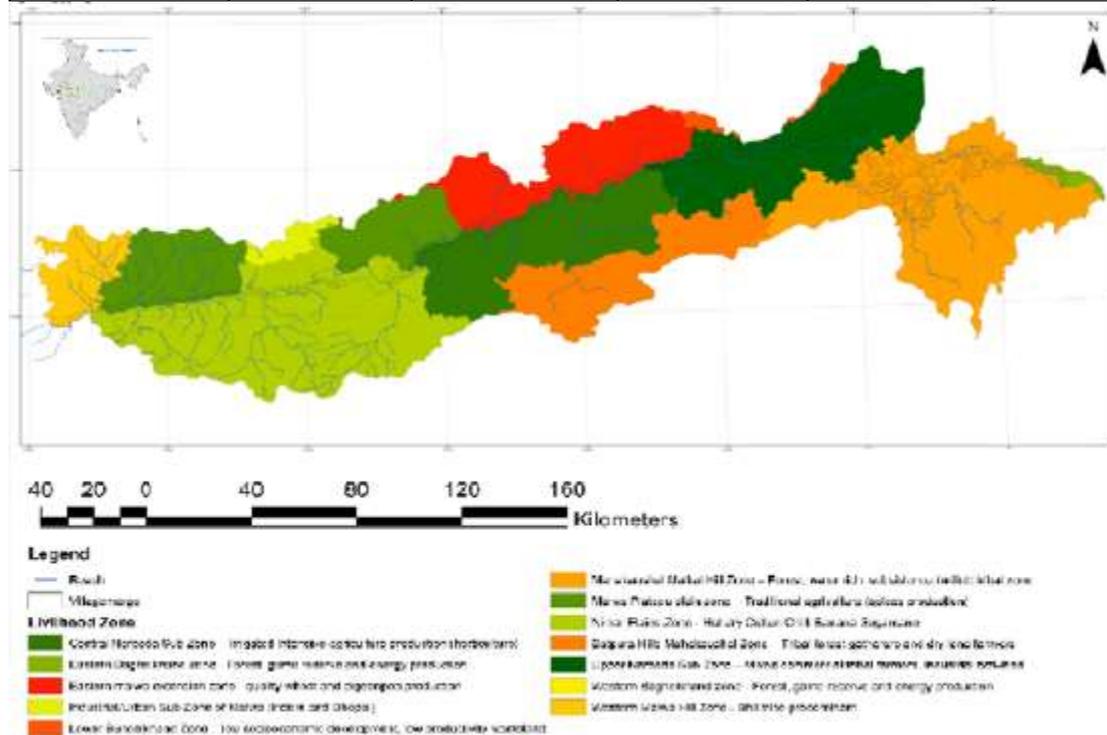
There are three major livelihood zones in buffer zone namely Upper Narmada valley, Middle Narmada valley, Lower Narmada valley. Central Narmada Sub Zone falls within Middle Narmada Valley zone.

After selection of the study area the next step is to draw a buffer zone around the river. The exact width of a buffer zone required for riparian corridor protection is widely disputed. Buffer width recommendations found in the literature vary

from as little as 25ft to as great as 300ft (Palfrey and Bradley, 1982). River Narmada is a eighth order stream midway and becomes 12th order stream at the confluence with the sea. It is also one of largest river basins of the world. Buffer recommendations given by Yale university (Riparian Buffer Zones: Functions and Recommended Widths, prepared by Ellen Hawes and Markelle Smith, April, 2015) suggests that a fifth order river should have a buffer of 300m; Hence buffer of river Narmada should be greater than 300m. The flood plains exceed 700m in certaiin areas while in certain other areas they are within 300m. As the major objective of the study is to identify livelihoods along the course of the river and their relationship to the river hence the entire village boundary on both sides of the river was considered to delineate the RBZ (fig#). The width of the villages varied from 500m to 1000m with an average width of 600m. The Riparian buffer zone area was used as a mask to clip Land Use and Land Cover layers and used in subsequent analysis.

4.2. Analyzing Land Use and Land Cover change within Central Narmada Sub Zone

Land use/land cover	Total (2004) sqm	Total (2008) Sqm	Change (2004-2008) sqkm	Total (2015)	Change (2008-2015) sqkm	Total change (2004-2015) Sqkm
Build up	10139215.06	10139215	0	30418572	20.27936	20.279357
Current fallow	31695117.49	31695117	22	8042038	-23.6531	-2.097177
Deciduous forest	4275121.273	4275121	-6	54979396	50.70427	44.840181
Double / triple	491903458.7	491903459	482	613960180	122.0567	603.82096
Gullied	4945942.15	4945942	-5		-4.94594	-10.13922
Kharif only	157650496.2	157650496	148	8895061.9	-148.755	-1.244153
Other wasteland	12032106.68	12032107	2	42487362	30.45526	32.348147
Rabi only	186356164.7	186356165	176	152131020	-34.2251	141.99181
Scrub/Deg. forest	69305437.19	69305437	59	39687799	-29.6176	29.548584
Scrubland	18472539.85	18472540	8		-18.4725	-10.13922
Water bodies	93614483.54	93614484	83	129591622	35.97714	119.45241



Map 1 Livelihoodzones of River Narmada

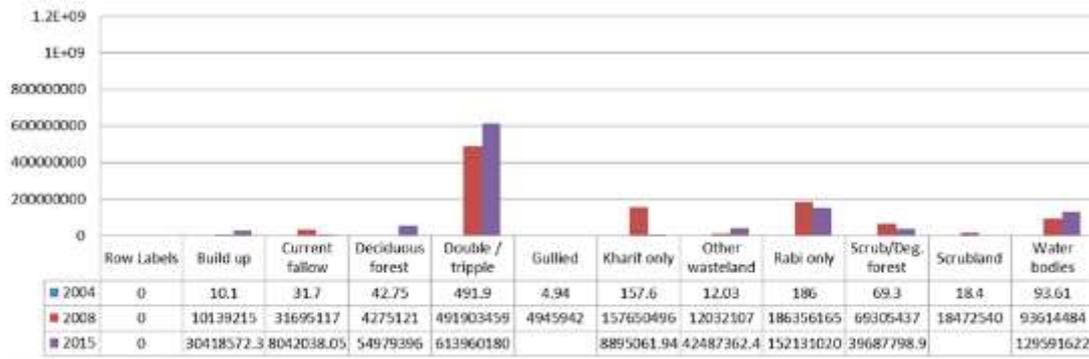


Figure 2 Table Land use land cover change summary of riparian buffer zone of Central Narmada sub zone

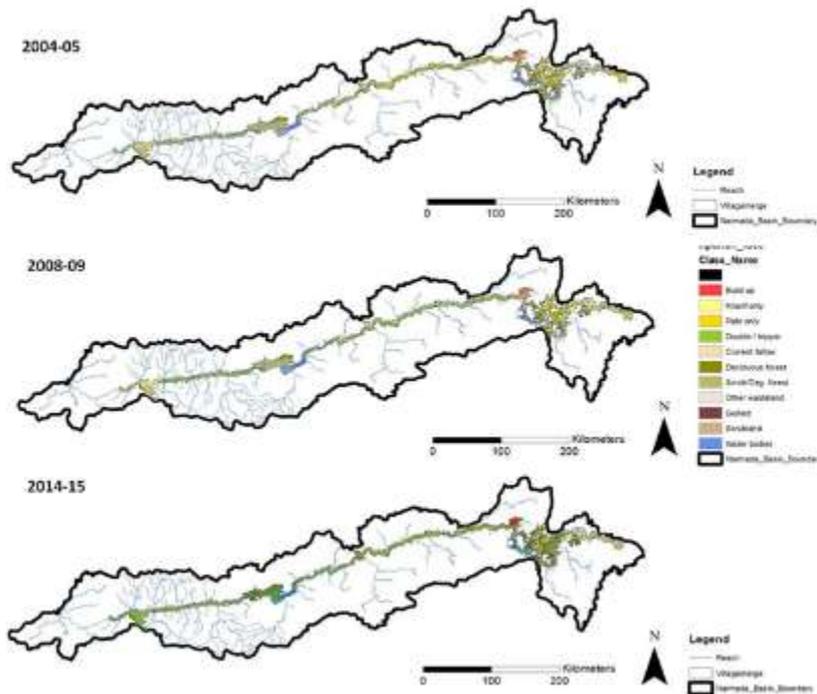


Figure 3 Riparian buffer zone of River Narmada

The land use land cover change study has indicated that the double triple cropping area has increased manifolds in the region 122%. The site visit confirm the same observation. Borewells and pumped supply from Narmada river allow multiple crops. The area of scrubland which is observed in Narmada river edges and flood plains has decreased 55%. Site visits have suggested that anthropogenic activities such as sand mining etc. can be a cause for this. The scrublands edge are essential for ecosystem productivity of a riverine landscape. They help purify water, control floods etc. Numerous resources such as grasses, lac (*Laccifer lacca*), fruits etc are harveset from these zones. Agriculture has replaced other livelihoods such as of the region which are forest and scrubland dependent.

4.3 Identification of traditional livelihoods

Literature review of District Gazettier of Hoshanagbad and Seoni districts and site visits led to identification of 32 different type of livelihoods in the study area. These are listed in table 2 with description. While some number of households practicing a livelihood has increased there has been a decline in certain other livelihood households. Table2 List of traditional livelihoods of Central Narmada Region

Sno	Type livelihood	Description	Photograph	Image source
1	Ayurvedic drug manufacture	Sellers of medicinal herbs such as Bramhi, Harad etc. These herbs are extracted from forests and river valleys. A nursery is maintained by herb collectors in the front and backyard of their houses. Some of the plants grow in the houses while some are collected from forest areas.		Author

2	Dona Pattal (leaf plates)	The leaf plates and cups are made from leaves of Bauhinia are used as disposables. the usage of these plates are less frequently seen nowadays due to replacement with foam or plastic disposable plates			(2018)
3	Tusser and Kosa silk production	Manufacture of varieties Tusser silk, Eri silk (such as Tusser feeding on Sal trees and Terminalia species, Eri on Castor-oil plant leaves etc.).			
Figure 76 Silk saree					
4	Lacquer wood work	A typical wood work from Wrightia tinctoria tree which is coated and polished with wax.			
5	Natural color preparation	Natural color are prepared by drying of herbs, leaves flowers etc.			
6	Lac bangles production	Lac is the scarlet resinous secretion of a number of species of lac insects. The harvested sticklac is crushed and sieved to remove impurities. The sieved material is then repeatedly washed to remove insect parts and other soluble material. The resulting product is known as seedlac . <i>Kerria lacca</i> can be cultivated on either cultivated or wild host trees Dhak (<i>Butea monosperma</i>), Ber (<i>Ziziphus mauritiana</i>), Kusum (<i>Schleichera oleosa</i>) Lac coated wooden sticks and bangles			
7	Rope , broom manufacturing, Bamboo and cane works	Making of brooms from palm leaves,			
8	Chatai (floor mat), baskets	Making of bamboo mats which were used as partitions inside houses and used along walls			

9	Wheels of Bal gadi (Wheels of Bullock cart)	Wheel manufacture			
10	Cotton ginning and weaving	Removal of seeds from cotton			
11	Dal (pulses manufacturing)	Dal (pulses manufacturing)			
12	Tel ghani (Mastaerd, sesame etc) and ghee ()etc	Grinding of oil seeds to produce oil			
13	Dehusking and crop processing	Dehusking and crop processing of wheats, pulses etc			
14	Agricultural implements	Manufacture of ironore farming implements			
15	Phool kheti (Marigold farming)	Farming of marigolds on the river flood plain			
16	Vegetable farming	Vegetable farming			
17	Wheat cultivation				
18	Earthen making pot	Making of earthen pots			

19	Leather shoes	Removal of leather from animal and making of bags and shoes			
20	Lime production	Lime manufacture			
21	Ironsmithy	Making of iron implements and utensils			
22	Cement factory	Lime Stone quarrying for cement production			
23	Silver and goldsmithy	Making of gold and silver ornaments			
24	Structural clay products (bricks, tiles)	Structural clay products (bricks, tiles) Making of roof tiles and blocks			
25	Bidi rolling	Manufacture of Tobacco filled leaves of Tendu			
26	Brass work, Kaskut (Brass and Zinc) Bronze Kaansa utensils	Brass work, Kaskut (Brass and Zinc) Bronze utensils			
27	Mining	Mine of Argentiferous galena, silver, coal, sand for cconstruction			
28	Sandstone Quarrying	Sandstone Quarrying			
29	Kachar kheti	Kachar kheti (farming on point bars or sandy banks of river Narmada) of watermeons, cucumber etc.			
30	Dyeing	Dyeing of textiles and threads			

31	Fishermen	Fishermen			
32	Plantation	Plantation of banana, sugarcane, mango, kathal, amrud, nimbu etc.			

Change of livelihoods in Central Narmada Sub Zone

Identification and correlation of traditional livelihoods

Conclusion- changes of LULC effecting the livelihoods

Sno	Type livelihood	Change in household numbers practicing a livelihoods (increase/ decrease)	Associated land cover	Reasons
1	Ayurvedic drug manufacture	Decrease	Forest	Decrease in forest area
2	Dona Pattal (leaf plates)	Decrease	Forest	Decrease in forest area and access to forests
3	Tusser and Kosa silk production	Decrease	Forest	Decrease in forest area and access to forests
4	Lacquer wood work	Decrease	Forest	Decrease in forest area and access to forests
5	Natural color preparation	Decrease	Forest	Decrease in forest area and access to forests and market pressure have replaced natural dyes with chemical dyes.
6	Lac bangles production	Decrease	Forest	Decrease in forest area and access to forests
7	Rope , broom manufacturing, Bamboo and cane works	Decrease	Forest	Decrease in forest area and access to forests
8	Chatai , baskets	_ Decrease	Forest, shrubland	Decrease in forest area and access to forests
9	Wheels of Bal gadi (Bullock cart)	Decrease	Forest	No more requirement as change in ploughing technology has happened.
10	Cotton ginning and weaving small scale	Decrease	Farmland	Change in technology and modern machinery has replaced small scale workers
11	Dal (pulses manufacturing)	Increase	Farmland	
12	Tel ghani (sarson, til etc) and ghee etc	Increase	Farm based	
13	Dehusking and crop processing	-	Farmland	
14	Agricultural implements	Decrease	Farmland	Change in technology and modern equipments have replaced traditional equipments
15	Phool kheti (Marigold farming)	Increase	Farm based	
16	Vegetable farming	Increase	Land	
17	Wheat cultivation	Increase	Floodplain	
18	Earthen pot making	Increase	Floodplain	
19	Leather shoes			

20	Lime production	Decrease		Change in technology
21	Ironsmithy	Decrease		Change in technology and new machinery
22	Cement factory	Increase	Land mining	
23	Silver and goldsmithy	Increase	Land mining	
24	Structural clay products (bricks, tiles)	Decrease	Land	Modern construction techniques and technology
25	Bidi rolling			
26	Brass work, Kaskut (Brass and Zinc) Bronze Kaansa utensils	Decrease	Land based	
27	Mining	Increase	Land	Increase demand of construction materials such as sand, aggregate etc.
28	Sandstone Quarrying	Decrease	Land	
29	Kachar kheti	Increase	Land based	
30	Dyeing	Increase	Pointbar, water	
31	Fishermen	Decrease	River	Decreases fishes number
32	Plantation	Increase	River based	
33	Broom making		Scrubland	

The study shows that ten out of thirty livelihoods identified are forest or scrubland dependent. forest and river based livelihoods have decreased significantly.

The results of land use and land cover (LULC) clearly show that changes were significant during the period from 2004 to 2015.

Reduction in scrublands and forest areas: The scrublands have decreased significantly to create more land for farming. The highly productive flood plains covered with forests or scrublands are degraded and are either infested with invasive species or have undergone severe erosion. The scrublands are seen predominantly on edges of rivers, tributaries, slopes in Narmada river riparian zone. These are also present on fragile or sensitive areas and hence they play a role in safeguarding the ecological values of landscape. Loss of scrublands in certain areas has led to increase of gullied and ravine lands.

The forest area has not much changed however there is a significant reduction in diversity of the forests. Also much of the forest area fall under protection category which inhibit extraction of forest resources. Fragmentation and discontinuity of forest patches has also led to degradation of forest and reduction in number of specific species types of species. Interviews and discussion with local people revealed that there has been a significant fall of certain species form the forest.

Change in double triple cropping area: A significant increase is seen in double triple cropping areas. Loss of landscape diversity of this area such has resulted in loss of livelihood diversity of this area. Intensive agriculture practice involves pesticides and herbicides eventually causing ground and surface water pollution. Motor pumps and canals provide year round supply for water for irrigation.

Increase in gullied area: The gullied land has increase substantially due to development occurring in the innermost zone of the river. The fallow lands have degraded and converted to gullied and eroded lands. The steep slopes which were stabilised with vegetation have been deeply affected on removal of it for various purposes. Urban development is happening right till the edge of the river which is affecting the the vulnerable slopes of the river. The gullied land is highly degraded and unfit for any use.

The increase in gullied areas indicate towards loss of vegetation cover in steep slopes and valley region. The area of water bodies have increased due to construction of numerous dams in the catchment.

Increase in urban area: Increase and almost doubling of built up area has reduced the grassland and scrubland region which were supporting many livelihoods such as of pastoralists etc. the severe reduction in numbers of livestock and pastoralists is indicated by these.

The riparian zone ecosystem of River Narmada is degrading fast due to extensive anthropogenic acivities in the buffer area. Livelihoods depending on healthy ecosystem are at risk of loss and extinction.

CONCLUSION

The forests and scrublands are located on steep slopes, ridges, fluvial plains and edges and hence are significant in safeguarding the landscape as well as resource base to rural communities.

The increase in wasteland, scrubland and gullied land is alarming and indicates towards degrading landscape of the River. The gullied land is unfit for any purpose and requires conservation as it does not support any livelihood and hence the increase of gullied area should be checked. Indegenious livelihoods have a very small foot print and remain confined to a region. A changing ecosystem can severly affect their resource base and survival. Livelihoods supported by fresh water (fisheries etc), forest and scrublands (toy makers, bamboo mat makers etc) are under stress due to changing land use in

the riparian zone of Central Narmada river. Lack of new technology, innovation, reducing resource base and confinement to the region are posing threat to many of these livelihoods. Changing market trends where they have been replaced already by intensive technology are some of the challenges that have to be tackled.

REFERENCE

- "The impact of climate change is very severe on the aquatic life of Narmada
A hierarchical framework for stream habitat classification: Viewing streams in a watershed context *Environmental Management* 199-214
A study of the Tribal people and tribal areas of Madhya Pradesh Bhopal 1967
AN INTERDISCIPLINARY ANALYSIS OF TOURIST LANDSCAPE STRUCTURE *TOURISMOS: AN INTERNATIONAL MULTIDISCIPLINARY JOURNAL OF TOURISM*
Analysis of Physico-Chemical Parameters of Kshipra River Water at Ujjain, *International Research Journal of Environment Sciences*
Drowning a history in the Narmada valley: A seat of old human settlements and evolution is now under threat *COUNTERVIEW.ORG*
<https://counterview.org/2015/06/15/drowningahistoryinthenarmadavalleyaseatofoldhumansettlementsandevolutionisnowundertreat/>
Forests of Madhya Pradesh Madhya Pradesh madhyam 1991
In the belly of the river Oxford 1995
Indian women clothing style chanderi <http://indianwomensclothingstyle.blogspot.in/2012/12/chanderi-madhya-pradesh.html>
Land Use/Cover change and its implications for Kullu District of Himachal Pradesh, India *International Journal of Geomatics & Geosciences*; Vol. 3 Issue 3, p538
Landscape research *Geolandscapes and geotourism*
Monitoring land use/cover change using remote sensing and GIS techniques: A case study of Hawalbagh block, district Almora, Uttarakhand, India *The Egyptian Journal of Remote Sensing and Space Science*
Narmada Valley Culture and Civilization Indore Academy of Indian Numismatics & Sigillography 2007
New human fossils and associated findings from the Central Narmada Valley *CURRENT SCIENCE* 1461-1465
Polluted river water threatens livelihood in Pali *Hindustan Times* <http://www.hindustantimes.com/jaipur/polluted-river-water-threatens-livelihood-in-pali/story-kE09R7ejznGq1Az0W6Efx1.html>
Report on socio economic disparities in Madhya Pradesh Bhopal Poverty Monitoring and Policy Support Unit
Riparian Areas: Functions and Strategies for Management *NAP2002978-0-309-08295-2*
River Valley Cultures of India Bhopal Indira Gandhi Rashtriya Manav Sangrahalay 2005
Rivers for life and livelihoods: classification of river health in the Ayeyarwady River Basin Myanmar Water land and ecosystems 2017
Some Issues of Income and Employment 1995
The Central Narmadā Valley: A Study in Quaternary Palaeontology and Allied Aspects Bhopal Indira Gandhi Rashtriya Manav Sangrahalaya 2007
THE FUNCTIONAL SIGNIFICANCE OF THE HYPORHEIC ZONE IN STREAMS AND RIVERS *Annual Review of Ecology and Systematics* 59-81
The Himalaya *THE BERKSHIRE ENCYCLOPEDIA OF SUSTAINABILITY: CHINA, INDIA, AND EAST AND SOUTHEAST ASIA: ASSESSING SUSTAINABILITY*
Think livelihoods, not only jobs India water portal <http://www.indiawaterportal.org/articles/think-livelihoods-not-only-jobs>
times of India <https://timesofindia.indiatimes.com/city/allahabad/Dona-Pattal-to-return-to-Magh-Mela/articleshow/55371488.cms>
Traditional Agriculture In India: High Yields And No Waste
UNDERSTANDING TRIBAL AGRICULTURE <http://www.resilience.org> <http://www.resilience.org/stories/2016-02-26/understanding-tribal-agriculture/>
Water and jobs Paris UN 2016
Water for life and livelihoods Part 1: Thames river basin district Rotherham Environment agency 2015
Water, food and livelihoods in river basins Routledge, Taylor and Francis group
J.S.Rawat Manish Kumar Monitoring land use/cover change using remote sensing and GIS techniques: A case study of Hawalbagh block, district Almora, Uttarakhand, India [Journal] // *The Egyptian Journal of Remote Sensing and Space Science*. - 2015.
Ketelsen Tarek Rivers for life and livelihoods: classification of river health in the Ayeyarwady River Basin [Report]. - Myanmar : Water land and ecosystems, 2017.
Simon E. Cook Myles J. Fisher , Meike S. Andersson , Jorge Rubiano & Mark Water, food and livelihoods in river basins [Journal]. - [s.l.] : Routledge, Taylor and Francis group, 2009. - Vol. 34.
Some Issues of Income and Employment [Book Section]. - 1995.

1040 ACCESSIBILITY CONFLICTS AND DISPARITIES IN THE URBAN WATER SECURITY OF THE DARJEELING TOWN IN EASTERN HIMALAYAS, INDIA

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ABSTRACT

Several studies have highlighted the problems of water crisis in the hill towns of the eastern Himalayas but no significant work has been done with the quantitative assessment among the different parameters that contributes to water accessibility and security of this region. The popular findings emphasizes the local water sources or natural springs referred locally as Dhara as the major sources of water and plays a pivotal role in meeting the daily water demand in most of the hill towns. However, in case of Darjeeling town with the failure of the Public Water Distribution system to cater the growing population along with the topographic nature of the region, the local water sources are located in varied patterns carrying uneven discharge capacity and accessibility. Thus the situation has given rise to a decentralisation of the local water source via private and community level initiatives. There has been a rising tussle between these two mechanisms of decentralisation, claiming the ownership of different local water sources and exerting their influences on the water security among the masses.

The present study attempts to fill the research gap assessing the Water Accessibility Index (WAI) through different parameters like Terrain Difficulty (X), Distance (Y), Dependency (Z) and total Availability of Spring Water (Q), the study finds a significant determinant WAI attributing the numerical values from 0.1 to 1.0 to different variables. The findings suggest that the areas of high water accessibility index (above 0.5) covering the Eastern Slope of the town have favourable terrain, limited population and abundant water supply, where as the areas of poor WAI (below 0.5) on the western slope is featured with difficult terrain, restrained water supply and sprinkled settlements. Thus, there exist a huge spatial disparities and accessibility conflicts which have predominantly influenced water resource management and water security in the town.

Key words: Local water sources, Water Accessibility Index, Accessibility Conflict, Urban Water security.

INTRODUCTION:

Darjeeling, a small Himalayan town, located on the average elevation of about 6710 feet is more famous for its world class tea production, scenic beauty of Himalayan landscape and highly pleasant socio-climatic environments. The town is currently inhabited by 1,32,000 population (Indian census, 2011) and like many other Himalayan tourist destinations, Darjeeling also attains the popularity to attract more than 3,00,000 domestic and foreign tourists every year. Such a huge influx of tourist particularly during the rainless months of the year often endures an acute water crisis situation in the town. Some aspects of water security in the town is also dependent essentially on the nature and flow of tourists which demands additional water for its services. During the tourist seasons the town is almost incapable to manage balance between water demand and supply and hence induces a water deficit of about 13,32,5000 gallon per day (Annual Report, 2014, Darjeeling Municipality). "Despite its prominent natural endowments, including the location's high average rainfall and abundant springs, many might be surprised to find that fresh water in the town is in short supply. In fact, regular access to water can be one of the most pressing resource challenges for Darjeeling residents and visitors" (Drew and Rai 2016). Darjeeling town resembles one of the oldest municipalities in India established in 1850 by the British empire. The municipality set up was designed to cater the requirements of the then population of about twenty to thirty thousand, but with the ever-increasing population in the town, the municipality is not in a position to cop up with the requirements of the present day population. consequently the town is facing several problems such as shrinkage of internal spacing in the town, rapid and unplanned urbanization, high population influx, poor water supply and sanitation, unscientific waste management system, air and noise pollution, and uncollected refuse, which is turning it into a miserable slum like location in the hill. All this unwanted circumstances have severely affected the pressing problem of water scarcity and water resource management has become a conflicting issue in the town. In fact, water problems in the Darjeeling region is embedded in the predominately complex hydro-geological settings lumped with the 'historically entrenched configurations of unequal spatial developments and legacies of socio-political contestations' (McFarlane, 2011).

There exists hundreds of natural springs locally called as Dhara which sustains major share of the domestic water requirements in the region (Boer 2011). The ridge top location of the town despoils it to fetch water from the low lying sources and hence is dependant solely on the locally available water sources be it the natural springs, muhan (spring source), jhora (drainage) and seasonal streams. "The Himalayan region is a source of countless perennial rivers, paradoxically the mountain people depend largely on spring [ground] water for their sustenance" (Tambe et al. 2012). Spring water is used for almost all the domestisc, agricultural and commercial purposes and hence bears immense socio-cultural importance for the origin and evolution of mountain settlements. Springs are also considered as the purest source of water and also hold a typical religious value among different religions particularly in Hinduism. Springs are often equated with place where the deities reside and is locally referred as Devithan. "Sacredness of spring water is expressed through the concept of chokho pani, meaning pure, sacred, or clean water" (Lama and Rai, 2016). Hence the availability and accessibility to natural springs have always affected the socio-economic augmentation of Darjeeling town. However the spatial distribution of these natural springs is very uneven and haphazard thereby exhibiting a complex accessibility tendencies towards the use of spring water for domestic as well as commercial purposes. On top of this, the steep slopes, mountain aquifers in the aberrantly stratified hard rocks, and unplanned growth of settlements have made

it very difficult to bring in equitable accessibility to spring water in the region. As a result different springs at different places have varied accessibility tendencies and are being used accordingly undertaken by different management institutions such as Samaj (a community based organization), private water vendors, P.H.Es and the municipality.

"In the Darjeeling region, community and market-based approaches to manage and access water operate as hybrid systems (Josi, 2015). The town receives its major share of public water supply from the Sinchel catchment area, where the two lakes such as the North Sinchel Lake and the South Sinchel Lake having the capacity of about 20 million gallons and 13.5 million gallons respectively. Since both the lakes were built during British age in Darjeeling, the lakes are not in a position to cater water demand of the present day population in the town.

Hence, Public Water Distribution system is failure to cater the water demand of the growing population in Darjeeling town. The rapid growth of urbanization, increasing population stress with the rising demand of water has led to striking challenge in the supply and management of water in Darjeeling town. In the recent years due to wanton expansion of concrete settlements over the catchment areas of the natural springs the town is experiencing drastic fall in the supply of water which has worsened the situation of water crisis enduring an estimated water deficit of about 1.33 million gallons/day. However to get access to drinking water people have adapted themselves on the alternative sources of drinking water be it the natural springs, drainages and rainwater harvesting. Such situation has given rise to a decentralisation of the local water supply system via private and community level initiatives in the region. These two mechanisms of decentralization of the existing water supply systems are highly antagonistic in nature and there has been a rising tussle between these two mechanisms of decentralisation, claiming the ownership of different local water sources and exerting their influences on the water security among the masses.

THE STUDY AREA:

Darjeeling municipal Town is situated on the lower part of *Darjeeling – Jalapahar Ridge* in the Siwalik Himalayas, between 26°31' to 27°31' N and 87°59' to 88°53' E. This range extends northward from Ghoom, at first rising abruptly to a height of 2366m, then gradually decreasing to 2100m at Chowrasta and again rising to 2149m at Observatory Hill. The town had a populaiton of about 1,32000 according to Census, 2011which is increasing rapidly due to several socio-political significance. The town represents a cosmopolitan society where majority of the people are Gorkhas.

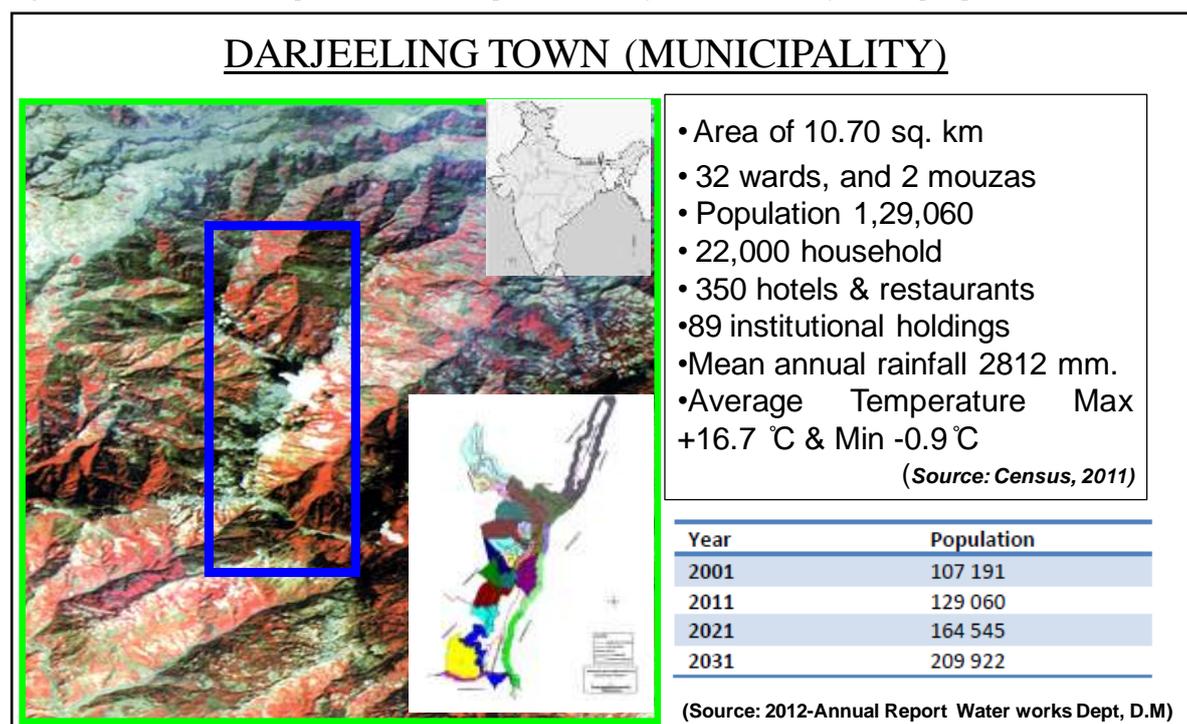


Figure 1: Location and demographic statistics of Darjeeling town

MATERIAL AND METHODS:

The present paper emphasises on the overall study of the water management system through the development of conditional framework that measures the nature of accessibility to drinking water at different places and their impact on the various mechanisms of management system in the town. The authors undertook extensive field survey in and around Darjeeling town covering the parts of Darjeeling municipality During the year 2016-17 to study the aspects of drinking water security and management in the town. The field survey was conducted with the help of a questionnaire, semi-structured interviews, and focus group discussions for the collection of qualitative data; the authors also undertook the process of measurement of water volume of the ten major springs (in litres/minute) for twelve months to generate quantitative primary data.

The study covers two major aspects, firstly the assessment of different parameters of accessibility to spring water such as Terrain Difficulty (X), Distance (Y), Dependency (Z) and total Availability of Spring Water (Q), which were used to

develop Water Accessibility Index, all the parameters that combines information for WAI are marked by numerical values ranging from 0.1 to 1.0 in which the characteristics and intensity of the parameters were also processed with the help of 5 point Likert scale; secondly the impact of such accessibility index to spring water was studied to understand the feasibility stand of private and community based water management in the town. The identification of ten major springs of both eastern and western slopes of the town were done on the basis of population dependency over the individual springs to study the variability of water discharging capacity of the springs. The volume of spring water discharge was measured following simple measure in which whole water of the spring was diverted and released from a single point and was collected in a bottle of one litre capacity and was recorded with real time value to have an estimate of the water flow per minute. Later such data of different springs were processed with the population dependency over the springs and were considered as the major element to study water accessibility and security of the region. The examination and analysis of data of the select springs based on water volume and accessibility has enabled the authors to understand the controlling factors for the feasibility and prevalence of either private or community based initiatives for the management and supply of water which may be sustainable and highly cost effective in the town. The interactions with various members of the local *samaj* (a community based organization) and dependants on the individual springs were very useful in understanding the nature and functioning of the existing water supply system across the town.

As to brought about further interpretive focus to the study most of the sources of secondary data collection have been used such as review of published literatures, journals, articles, books, magazines etc. Maps and other significant information have been gathered from the institutions such as municipal offices, forest departments, settlement office, NGOs, libraries, colleges and online sources.

ACCESSIBILITY ASSESSMENT OF THE SELECT SPRINGS IN THE DARJEELING TOWN:

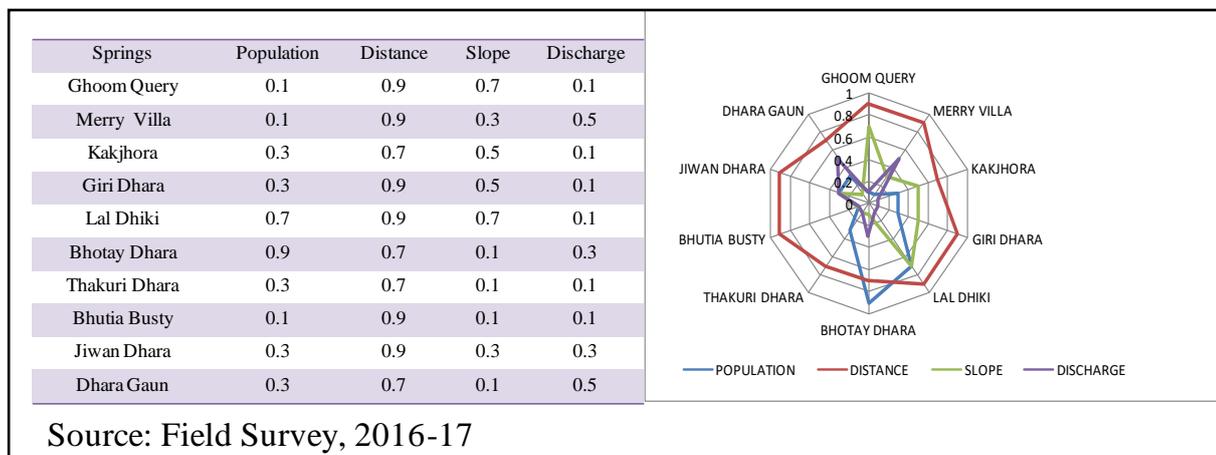
Water availability and accessibility are the two key elements to water security in any region. In the hill-urban centres like Darjeeling these elements are highly accountable for sustainable water management and its equitable distribution (Jeanne L. Nel et al. 2017). Majority of the inhabitants in Darjeeling town is dependent on the natural springs and *Jhora* (local drains) as the main source of drinking water. There are about hundreds of such springs across the length and breadth of the town (Boer 2011; Tambe et al. 2012). However these natural springs which supply water to almost whole town do not exist everywhere and exhibits several dots like (point of outlets) heterogeneous locational distribution along with varied discharging capacity. "Water source areas often only occupy a small fraction of the land surface area but supply a relatively high amount of water to the surrounding region" (Meybeck et al., 2001). Hence every part of the town has diverse tendencies with regard to access to the local water sources bounded by several factors like terrain difficulty, distance, water volume, population dependency, ownership, governance etc. (Josi et al. 2011). Such varied factors of accessibility to local water sources have given rise to different forms of water management and supply system in the town. This paper focuses to study and analyse the impact of uneven water accessibility on the existing water management system by computing Water Accessibility Index (WAI) for different Springs and their zone of influence. In order to construct the base-framework of WAI in Darjeeling town four major parameters, viz. the terrain difficulty (slope), distance, population dependency and total quantity of available water, which are likely to influence the accessibility to spring water have been included as the key elements for calculation and proceedings. All these parameters of WAI have been marked with 5 point Likert scale codes and resultant WAI are represented by the numerical values ranging between 0.1 to 1.0 which were further analysed and processed to compare and contrast among the different select springs. While giving weightage to the difficulty of terrain as one of the key parameters of WAI, it was computed by preparing a questionnaire using 5 point Likert scale, in which the terrain difficulty was categorised in 5 numerical values or codes such as steep uphill-1, gentle uphill-2, straight-3, gentle downhill-4 and steep downhill-5. Similarly the another parameter population dependency was computed as the total number of dependants per spring by referring 5 point Likert scale codes such as less than 400 population-1, 400 to 800 population-2, 800 to 1200 population-3, 1200 to 1600 population-4 and more than 1600 population-5. The average distance, one of the key element of WAI, was computed with the 5 point value of Likert scale such as below 1km-5, 1km to 2km-4, 2km to 3km-3, 3km to 4km-2 and above 4km-1, by measuring the real ground distance between the spring and the core settlement area having relatively highest number of dependants. The unit quantity of total water availability of the spring was measured by taping the water source into a single outlet and by collecting the water in a bottle of one litre capacity and was recorded with real time value to have an estimate of the water flow per minute. The obtained data of water discharge per minute of all the select springs was statistically processed and on the basis of their individual monthly variation of discharge the data was marked by separate codes following 5 point Likert scale analysis.

Sl. no.	Name of the springs	Municipality Ward no.	Average water discharge (lit/min)		Average distance	Nature of slope	Population dependency (approx)	WAI	
			Lean season (Dec-May)	Normal season (June-Nov)				Dry season	Normal season
1	Ghoom Query	2	3.67	13.75	5	4 (Gentle downhill- western)	1	0.45	0.5
2	Merry Villa	6	2.17	3.495	5	2 (Gentle uphill- western)	1	0.45	0.5
3	Kakjhora	11	0.91	4.27	4	3 (straight- western)	2	0.4	0.5
4	Giri Dhara	17	25.37	194.79	5	4 (Gentle downhill- western)	3	0.45	0.55
5	Lal Dhiki	26	18.63	49.47	5	4 (Gentle downhill- western)	4	0.6	0.7
6	Bhotay Dhara	23	6.19	13.67	4	1 (Steep uphill-western)	5	0.5	0.6
7	Thakuri Dhara	31	11.51	27.62	4	1 (Steep uphill-Eastern)	2	0.3	0.35
8	Bhutia Busty Dhara	31	1.73	15.13	5	1 (Steep uphill-Eastern)	1	0.3	0.42
9	Jiwan Dhara	15	9.21	20.30	4	2 (Gentle uphill- eastern)	2	0.45	0.5
10	Dhara Gaun	14	6.76	9.59	4	1 (Steep uphill- eastern)	2	0.4	0.45

Source: Field Survey, 2016-17

Table 1: The Water Accessibility Index (WAI) of the 10 select springs of Darjeeling town

In table1 computed using 5-point Likert scale marked to four major select parameters, calculated from the data collected during the field survey by the authors in the 2016-17. It is evident from the table that different springs represent different WAI which not only varies from spring to spring but also differs seasonally. While considering the WAI parameters mostly nature of the slope or terrain resembles more diversities in terms of carrying Likert scale codes with spatial consideration and the water discharge of the spring is the another highly fluctuating parameter which has significantly influenced the WAI of the respective springs. Apart from this, the other two parameters viz. distance and population dependency show more or less common values in Likert scale which have still in combination with the other factors have categorized the whole sets of WAI into two genre as the areas of relatively low or poor water accessibility index and relatively high water accessibility index. it can be seen that the two different slopes i.e. western slopes and eastern slopes represent contrasted WAI having relatively high water accessibility and low water accessibility respectively. The figure1. shows the influence of different parameters and their interdependency on the computation of WAI of different springs.



Source: Field Survey, 2016-17

Figure 2: Comparative representation of different parameters used for WAI computation

The table1 further shows that there exist a high variation in seasonal range of water discharging capacity of the natural springs which in turn influences the tendencies of water accessibility of the respective springs. The people are more accessible to spring water during normal seasons as all the springs have high range of average water availability of about 20 to 60 litres per minute but the same springs are less accessible during dry months (from December to May) when their water discharging capacity decrease significantly. Some of the springs even become dry during the months of April and May while the others become very insignificant to cater almost constant water demand in the area.

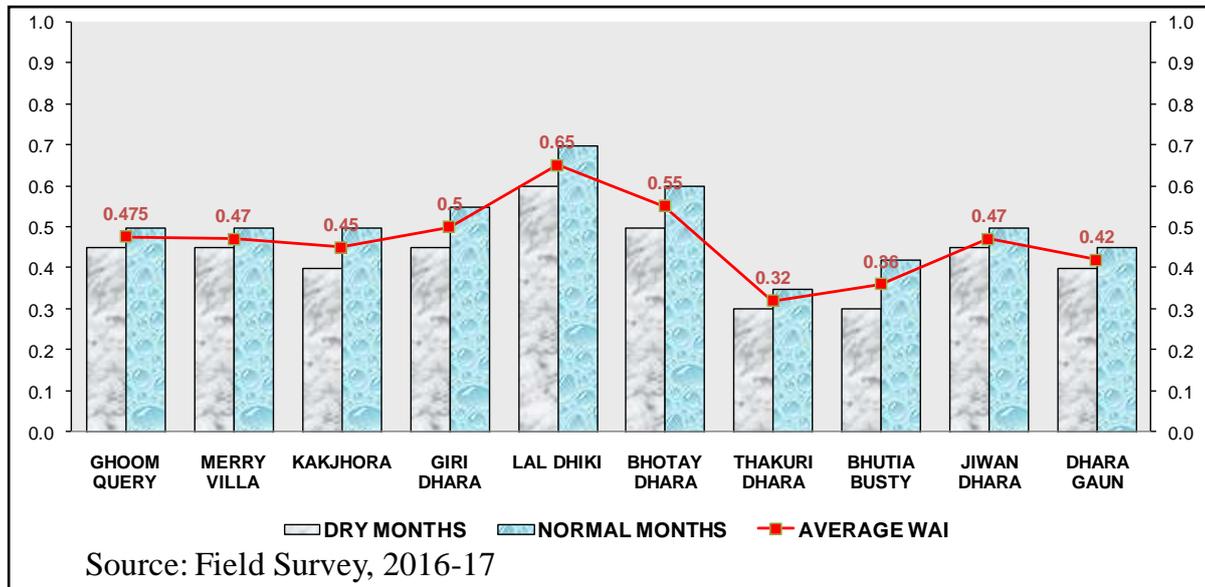


Figure 3: Seasonal trend of WAI of the selected springs

The fig. 3 shows the trend of seasonal variation of the WAI indexes of all the select springs in which it is vivid that there is a significant gap between the WAI of the dry months and the normal months of the year. The highest average WAI of about 0.65 is found in Laldhiki spring which holds the central market location, very adjacent to the passing road with comparatively high water discharge throughout the year. Whereas the lowest WAI of 0.32 is associated with Thakuri Dhara which is located at the steep corner eastern-slope of the village where the discharging capacity of the spring is also not enough to cater its nearby population.

DECENTRALISATION OF WATER MANAGEMENT IN DARJEELING TOWN:

Improvement of water management and distribution system to secure water availability and accessibility is an inevitable phenomena in any growing urban centres. Similarly in Darjeeling the ways of water management system has undergone several stages of evolution and modification. Initially the town has centralised water supply system for all the citizens but however today such centralised system have been modified and there exist a hybrid system of a combination of public, private and community based initiatives (Josi, 2015). Failure to provide requisite supply of drinking water in the town, centralised public water distribution system seems futile to the urban poor who are compelled to survive on the alternative sources of water. A public report of the Darjeeling Waterworks Department (2012) notes that 95 per cent of the existing pipeline and valves were laid by 1930. This system is in great need of repair, revitalisation and improvement (Drew and Rai, 2016). Consequently, the 'Decentralization of water resource management' has become one of the most susceptible and intervening act to take on the situation of water crisis in Darjeeling municipal area. such decentralisation of water management system is taken up by the two robust initiatives be it the private water vendors, which is highly profit oriented management system and the community based initiative which is for non-profit services. Both the institution of decentralised water management system have a strong tussle of holding their control over the locally available water sources such as the natural springs to supply water in the town. There exists more than 32 natural springs in Darjeeling town (Boer 2011). The community and private initiatives have always been the most dominant institutions who are managing the storage and distribution of water from these springs and thus some of them are openly accessible to all and some have restricted access. Various samaj (a community based organizations) have come forward with a common will and service to manage the natural springs and are acting as a medium for decentralization of water management system in the region. As samaj looks after the demand and supply of water of its own members and hardly the outsiders are provided water from the managed springs there still exist accessibility conflict to local water sources to general public. On the other hand, most of the springs are located on private land (82%) (Tambe, 2012), and are being managed by the individual water vendors who supplies water only to its customers who have to pay significant amount of money to the spring owner quarterly or annually. The residents are compelled to pay for water as the public water supply is highly irregular and not enough to cater the water demand of every household and this has given rise to a robust water market in the town. There are numerous systems in place to accommodate this market. Some of the distribution is very small scale with enterprising individuals selling water that they have sourced from nearby springs, some supplies water from their private springs and some sells water in litres through private water tankers for earning handsome profit (Drew and Rai). On the contrary to private water supply, the different *samaj* are focusing on supplying water to their people for welfare purpose. *Samaj* are self funding and basically made for the social welfare and upliftment of the community itself. "*Samaj* is a self organized grass root level social institution. In Darjeeling there are around 130 different Community based organizations" (Joshi et al., 2011). Since *the Samaj* of each village or an area is meant for social assistance and welfare of their community, the efforts to acquire and ensure equitable water resources are a natural extension of the purpose of *samaj*. " A large number of springs dot the landscape around the town, these water sources provide a non-centralised distribution system that many *samaj* are able to utilise" (Drew and Rai 2016). Hence different samaj have come forward to strengthen the water accessibility and security in the town. In a nutshell it could be

summarised that the water management system in Darjeeling town have undergone transformed from a simple centralised to a hybrid decentralised system to sustain the management of water supply system at a local level.

FINDINGS AND CONCLUSION:

Sustainability refers to the most desirable situation where there is an equilibrium of resource availability and consumption. But the growing hill town like Darjeeling is far behind to attain such kind of sustainability particularly in terms of water management and supply. It is evident from the above study that the town suffers from the restricted supply of water enduring a huge accessibility conflicts between private and community based mechanisms to manage and supply water from the local sources. While considering the analysis of the WAI of the select springs it was found that the entire town is divided into two zones having diverse water availability, accessibility and security phenomena. The western slopes of the town is more accessible with relatively favourable supply of spring water to the local residents. WAI is also highly variable from springs to springs, seasons to seasons and from region to region with unequal supply and distribution. There is a rising tussle regarding the water accessibility between the private and community based institutions and it is often seen that the local water sources or springs having high accessibility are more actively controlled by the community based organisations or samaj and the low accessibility springs are being captured by the private water vendors. The conflict is always there in terms of water accessibility be it managed by the community or by private institution for in case of community management water is equitably distributed among the members of the samaj but are sometimes restricted to the outsiders or non-members, where as the private water supply system is limited to the rich people and deprives the urban poor. Hence the urban poor who own no springs are forced to live in a situation of water poverty in Darjeeling with no concerns from the government, community or any other agencies. As a consequence there exist a huge spatial disparities and accessibility conflicts which have predominantly influenced water resource management and water security in the town.

REFERENCES

- Chettri, B., and Tamang, L. (2013). Population Growth and Associated Problem: A case study of Darjeeling town. *International Journal of Humanities and Social Science invention*, 2 (5), 63-67.
- Darjeeling District Census 2011 data. www.census2011.co.in/.census/district/html. (Accessed on 5 May 2014).
- Darjeeling Municipality. (2012). *An Annual Report of Darjeeling Municipality*.
- Drew, Georgina & Roshan Rai. "Water Management in Post-colonial Darjeeling: The Promise and Limits of Decentralised Resource Provision", *Asian Studies Review*. 40.3 (2016) 321-339. (in case of journal)
- Joshi, D. (2014). Feminist solidarity? Women, water, and politics in the Darjeeling Himalaya. *Mountain Research and Development*, 34(3), 243-255.
- Joshi, D., Rai, S. K., and Samuel, T. (2011). *The Perennial Springs of Darjeeling, a survey to community based conservation*. Ashoka Trust for Research in Ecology and Environment (ATREE), Eastern Himalayas Program Darjeeling .Darjeeling, India.
- Khawas, V. (2003). *Urban Management in Darjeeling Himalaya: A case study of Darjeeling Municipality*. Mountain Forum. www.mtnforum.org/research/library/khawv03e.htm. (Accessed on 9 September, 2013).
- Moench, M., Dixit, A., Janakarajan, S., Rahtore, M. S., & Mudrakartha, S. (2003). *The fluid mosaic: Water governance in the context of variability, uncertainty, and change*. Kathmandu, Nepal & Boulder, CO: Nepal Water Conservation Foundation & Institute for Social and Environmental Transition.
- Mukherjee, S., Shah, Z., and Kumar, M. D. (2007). Sustaining Urban Water Supplies in India: Increasing Role of Large Reservoirs. *Water Resources Management*, 24 (10), 203-205
- Negi, Chandra Singh. "Declining Transhumance and Subtle Changes in Livelihood Patterns and Biodiversity in the Kumaon Himalaya", *Mountain Research and Development*, 27-2. May 2007. 114-118. <http://www.jstor.org/stable/25164097>
- Rai, R. P. (2011). Solid waste management in Darjeeling Municipality. In M. Desai (Ed.) & S. Mitra (Co-ed.), *Cloud stone and the mind: The people and environment of Darjeeling hill area* (pp. 176- 180). New Delhi: K. P. Bagchi & Company.
- Sen, D. (2012). Illusive justice: The gendered labour politics of subnationalism in Darjeeling tea plantations. In S. Roy (Ed.), *New South Asia feminisms: Paradoxes and possibilities* (pp. 131-150). New York: Zed Books.
- Sharma, P. K., Ramakrishnan, R., Hutin, Y., Manickam, P., & Gupte, M. D. (2009). Risk factors for typhoid in Darjeeling, West Bengal, India: Evidence for practical action. *Tropical Medicine and International Health*, 14(6), 696-702.
- Shiva, V. (2002). *Water wars: Privatization, pollution, and profit*. New Delhi: South End Press.

1085 THE ROLE OF SOCIAL MOVEMENT FOR EQUITABLE WATER ACCESS IN URBAN, CASE FROM DHARAN AND DHULIKHEL OF NEPAL

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1 INTRODUCTION

According to [UN](#) report (2014) the world's rural population has already stopped growing, but it can be expected nearly 1.5 billion urbanites to be added in the next 15 years, and 3 billion by 2050. Similarly, World Bank (2016) reported South Asia's urban population is poised to grow by almost 250 million people by 2030. Between 2000 and 2011 the region's urban population expanded by 130 million. Urbanization has a long term impact by the convergence of living standards between urban and rural areas as economic and social benefits spill beyond urban boundaries. But these positive trends can be undermined by the pressures of urban population growth on infrastructure, basic services, land, housing, and the environment. Estimates suggest that at least 130 million of South Asia's urban residents live in slums and are disproportionately deprived of basic infrastructure and access to basic services. Urban land is expanding much faster than urban population, a phenomenon known as urban sprawl. It is driven in part by increasing urban land consumption by the wealthy and the increasing separation of rich and poor communities within cities. Sprawl undermines the efficiencies of urban living, and it marginalizes poor people in remote or peripheral parts of cities, often in dense informal settlements or slums. Among the basic services, relationship between water and cities is crucial. Cities require a very large input of freshwater and in turn have a huge impact on freshwater systems.

Nepal comes under the five most populous countries in the South Asia region along with India, Pakistan, Bangladesh and Afghanistan. According to World Bank current access to water of urban residents in Nepal is 90.9 % (2015) which has declined than previous decades of 1990 which constitute 96.5 %. This declining trend in water access in urban residents and elevated growth of population size of town is because of many rural villages have been merged into the adjoining municipalities. This process of urban expansion without the development of proper basic facilities has led to create a phenomenon of core and periphery within the cities of Nepal. The core area includes the economically and politically dominating community. Peripheral region usually lies around to the core cities while slums which are found scattered within the core with low economic status and politically powerless are also considered as peripheral community.

Based on this contextual setting, we try to argue that this misbalanced economy creates tension and triggers 'social movement' eventually enhancing 'spread effect' of urbanization from core regions to peripheral areas to minimise imbalance. This paper examines the challenge of equitable water distribution in peripheral regions and the perspectives and contribution of social movements to address the unfulfilled water need. We will draw empirical cases from two towns of Nepal namely Dharan and Dhulikhel cities which has witnessed urban movement for access to water in peripheral regions. This paper will draw out perspectives and experiences on how organized citizens conduct social movements and what are the outcomes of these urban movements. The findings helped us to reveal what has been achieved by the social movements in terms of water access and redistribution. Section 2 elaborates on theoretical approach used in the study. Section 3 describes the methodology, section four deals with context of urbanization and water supply status in towns of Nepal, section 5 analyses of urban social movement in case study cities and last section draws conclusion from the analysis.

2 ANALYTICAL FRAMEWORK

Initially, this paper will look through theory of core and periphery which divides the study cities under two groups- 'core and periphery' (Friedman, 1966). Core area is considered as economically, socially and politically active whereas peripheral region is weak in all the aspects. It is considered that there is continuous struggle between core and periphery for the resources which sometimes take a form of Urban Movement. An urban social movement is "a conscious collective practice originating in urban issues, able to produce qualitative changes in the urban system, local culture, and political institutions in contradiction to the dominant social interests institutionalized as such at the societal level" (Castells' (1984, p. 278). There may be reason to define urban social movements by their opposition to the state if it can be shown that the state is the major opponent of the urban working class on issues regarding the modification of the urban environment, and that such opposition to the state defines a historically specific form of urban conflict (Fincer, 2013). Further, urban social movement believed in the potential for radical change of noninstitutionalized urban political action. The urban social movement refer to a level of an effect, not to type of organizations. The effect could be urban (improvements in public services) or political (changes in power relations). This 'material' emphasis meant that the focus was always on what was said (Pickvance, 2003) . The urban water movement sector as social movement is based on the sector's orientation on and preferences for social change (McCarthy and Zald, 1977). We will try to analyse the output of these social movements from the cases referred

3 METHODOLOGY

This research has used review of existing literatures, news in daily newspaper and in-depth interviews for collection of secondary data. Key informant interview (KII), in-depth interview with locals, focus group discussion (FGD), local stakeholders workshop are some of the sources for primary data. The analysis is qualitative comparative analysis of case study sites of two cities of Nepal.

4 BACKGROUND : CONTEXT OF URBANIZATION AND WATER SUPPLY STATUS IN NEPAL

Nepal is one of the ten least urbanised countries in the world. However, it is also one of the top ten fastest urbanising countries. In 2014, the level of urbanisation was 18.2 per cent, with an urban population of 5,130,000, and a rate of urbanisation is of 3 per cent (UN DESA, 2014).

There is a trend towards the development and creation of new municipalities and a concurrent decrease in the number of Village Development Committees (VDCs). Muzzini and Apericio (2013: p.28) argue that the reclassification of rural into urban areas is an important driver of urban growth. The development of new municipalities is largely due to the merger of VDCs in Nepal (Devkota, 2014). The number of municipalities has increased drastically in recent years. At the time of the 2011 census, there were 58 municipalities (CBS, 2012). 62 new municipalities were declared in 2011/12, a further 72 in 2014, and 25 in 2015, which brings the total to 217 after implementation of new local levels of governance as according to the new constitution. (P.K. Pradhan, personal communication, 29th October, 2015 as cited in Bakaria, 2014 and The Himalayan Times, 2017). The level of urbanization in Nepal remains low but the pace of urbanization has remained faster and is likely to remain so in the future. Only 17.1% of Nepal's population resided in 58 designated urban areas according to the 2011 census. However, with the addition of 159 municipalities in 2014/15, 40% of Nepal's population reside in 217 designated urban areas (NUDS, 2017).

In spite of high number of residents, only 32.9% of households have access to piped water supply in urban Tarai as compared to 81.2% of households in urban hill. However, quality and quantity of drinking water is insufficient in all urban regions. Slum dwellers and squatters are largely excluded from the formal water supply network (UN-HABITAT, 2010: p. 64). The time, resources and effort needed to fetch water has become a challenge to the urban poor, who are often compelled to buy water from private tanker services (UN-HABITAT, 2010: pp. 63-65). This is especially the case as urbanisation in the developing world and is much related to the failure of responsible agencies, which have left multitudes with insufficient and unsafe services while few upper tiers of society gets good by centralised systems (Malama and Kazimbaya- Senkwe, 2004).

Safe drinking water is considered as human right as considered by Nepal's constitution. According to Constitution of Nepal 2015, under Fundamental Right and Duties Section three article 35 and sub article, the Right relating to health and sub article 4 says, "Every citizen shall have the right of access to clean drinking water and sanitation." This statement clearly provides legal strength for demand for clean water. However, in order to have individual pipe connection in dwelling or yard of a house legal documents like land ownership certificate, approval of building construction certificate including citizenship certificate. Due to this legal provision many of the squatters are deprived of the clean drinking water and sanitation as they cannot have individual pipe connection in their houses.

5 CASE STUDIES

5.1 Dhulikhel

Dhulikhel lies in the mid-hill region of east-central Nepal. Dhulikhel is part of the Kavre Valley in Kavrepalanchowk district, which comprises Dhulikhel, Banepa and Panauti as major urban centers with a population of 66,405. Dhulikhel Municipality is a rapidly emerging satellite city of Kathmandu—the capital city of Nepal and it bears prime importance from commercial point of view and trade link to Tibet—the autonomous region of China. Kathmandu University, Dhulikhel community hospital, hotel/restaurant/lodge, business, agriculture and a community managed drinking water system are an integral part of the local economy. Dhulikhel municipality was previously divided into nine wards. As per the decision made by the Cabinet on 2015, it is now divided into 13 wards annexing Kavre Nitya Chandeswori Village Development Committee. The central Dhulikhel gets drinking water from a community managed drinking water supply project. The system has been operational since 1991.

Context of Core and Peri Urban

Dhulikhel Village Panchayat used to depend upon local sources of water along with a water distribuion system built in support of Indian Embassy until the period of early 80's. As the water supply was not sufficient, local leaders started exploring additional water supply system to the village. They approached German support agency (then GTZ) that was working in Bhaktapur, a nearby city of Dhulikhel. After the series of consultation and field visit, GTZ agreed to support Dhulikhel with a water supply project. As the budget for water supply plan was too high for a village and it was deemed ineligible to have project of that size. Hence the decision to upgrade Dhulikhel village Panchayat into Dhulikhel Municipality was made. The population of town was only 6000 while it needs 10000 of individuals to be the municipality. So Dhulikhel incorporated some adjoining rural villages (Bajrayogini, Srikhandaapur Village Panchayat and some parts of Kavre Village Panchayat) in 1986. However, the proposed water supply project was designed for area that covers previous Dhulikhel village panchayat only that includes ward no 2,3,4 and 5 of newly formed municipality leaving behind the annexed surrounding villages. For our study, previous Dhulikhel Village Panchayat that comprised of ward no 2,3,4 and 5 are called the core region as they have individual pipe water connection and other surrounding village that were merged to Dhulikhel i.e. ward no 1,6,7,8 and 9 of new municipality but were deprived of the water supply are termed as the peripheral region.

Water Supply Situation in Peripheral Wards

After the completion of GTZ supported drinking water supply project in 1990, core Dhulikhel had drinking water supply for 24 hours a day whereas the periphery used to rely on their usual sources such as spring with limited water supply.

This inequitable practice of water supply in terms of both quality and quantity has gradually created a contestation between core and periphery community. Core people claimed that the water supply project was designed for them only and therefore were not ready to share the water to the peripheral settlement. In the contrary, people from periphery argued that- since they were also part of the same municipality, water has to be equally distributed to them as well. This was the main reason behind the contestation between these communities. Beside this—the periphery community felt the dominance of core people who are united for their geneological integrity in several decision making events.

Formation of Struggle Committe and Urban Movement

The locals of peripheral region united to form a struggle committee in the year 2006 to demand the acces to drinking water from the existing supply system. They argued that they belong to the same Municipality and has been paying equal tax to the authority as the core cities people do. They initaly started dialouge with Municipality and Dhulikhel Drinking Water and Sanitation Users' Committee. They had series of appeal for pipe connection.

For example, in 1994, Dhulikhel invited the then Prime Minister, Mr. Girija Prasad Koirala to formally inagurate the GTZ supported water supply project. However, the people from periphery stood against the inaguration ceremony until the water was supplied to their settlements as well. Discussions were held between them and ultimately the inaguration ceremony was halted. Again in 1998 after the local government election, the then His Majesty King Birendra was invited to inagurate the system. Same group of people from periphery went to royal palace with a request letter (*Binti Patra*) of 1130 signatures so as to halt the inaguration program until the water was distributed to periphery. As the king was interested to visit Dhulikhel and inagurate the system- both core and periphery peole had a negotiation under which core had to support periphery on further improvement of ongoing water supply system to their settlement. Finally they agreed on distribution of water from the central system using optimum use of local sources as the short term solution and explore other alternative sources and projects for the longer term solution to address drinking water problems in periphery region. After the agreement- this water supply system was formally inagurated by then king Birendra.

However, DDWUC stalled on its decision and water was not supplied in pheripheral community as promised earlier. The peripheral region people was outraged and retaliated against this disparity. As a result, in the year 2008, mass demonstration and highway blocking was the major social movements displayed by the peripheral community. They also broke the intake pipe of water supply connected to Dhulikhel core city. Creating a swarm, equipped with sledgehammers and excavation tools, the angry locals destroyed the pipe line due to which the water supply had completely halted in the whole core region. Dhulikhel was without water for two weeks. Residents of core had to go through hard times in collecting water from nearby streams and standpipes. They had to rely on alternative sources like local springs, tankers by limiting the use of water with the basic/ unavoidable activities only. Passengers suffered a lot while the road was blocked during the protest. Thus, the inequality between core and periphery specifically on water resource sharing further worsened. The leaders of protest committee said, as state had already become republic state, and being the resident of such state the core community should not think the water supply system as their own individual property.

Outcome

After the mass protest of 2008 by periphery region, DDWUC finally decided to share water. Now, nearly more than 1000 HH in peripheral region has water connection from the existing Dhulikhel Water Supply Scheme, however, it is inadequate. This extension of service to the peripheral region automatically validate the residents to have voter right and right to declare candidacy for the comittee's 4 yearly election. As a result, representatives from each peripheral ward has been included in the decision making board i.e. DDWUC. As a part of initiation to address the aformentioned agreement between core and periphery community, municipality explored an alternative source in Kushadevi VDC which is about 15 km far from Dhulikhel. Now, it has been agreed as one of the major source for Asian Development Bank (ADB) funded Kavre Valley Integrated Water Project.

5.2 Dharan Sub-metropolitan city

Dharan is one of three sub-metropolitan cities in eastern Nepal, in the Sunsari District, and is situated on the foothills of the Mahabharata Range in the north with its southern tip touching the edge of the Tarai region at an altitude of 1148 ft. (349m). It serves as a gateway trading post between the hilly region and the plains of Tarai region. Major educational hubs from traditional Sanskrit education (Pindeswor Campus, Nepal Sanskrit University), Medical Sciences (BPKIHS), Purvanchal Engineering Campus (Tribhuvan University), Central Department of Food Technology Hattisar Campus among other educational institutions as well as hotels, production industries, retail businesses, agriculture, religious places, and local users managed drinking water system are an integral part of the local economy in Dharan. As it is proposed to be the headquarters of the one of the new federal states of Nepal and the weather is fairly moderate, the inflow rate of migrants from other districts is high and noted up to 41.5% in 2011 by Central Bureau of Statistics, Nepal which clearly indicates that existing limited water plans will not be able to address the concerns of water security of the rapidly burgeoning population.

Dharan municipality was previously divided into nineteen wards. As per the decision made by the Cabinet on May 8, 2014, it is now divided into 27 wards annexing Panchakanya and Bishnupaduka VDCs to upgrade the municipality to sub-metropolity in December 2014. Dharan has population of over 200,000 and all these local residents and increasing number of migrants to this hilltop city are reeling under an acute shortage of drinking water. Many of them have been forced to walk long distances, queuing for hours to fetch water or use untreated water from local rivulets. Dharan Drinking Water Corporation has only been able to supply 15 million liters of water whereas the demand is 30 million

liters per day. Dharan receives 1800 mm rainfall annually, mostly falling between late June and early September. According to government of Nepal, about 98% of Dharan households have access to piped water but this water supply is largely confined to rainy season, with the supply being intermittent, untreated and unsafe. There are several water issues and challenges to be addressed in terms of climate adaptive equitable water management strategies and practices in the context of Dharan's rapid urbanization, increased inflow of migrants, expansion of infrastructure development, tourism services, changing climate and modern farming practices.

Context of core and periphery

Dharan is the fast growing city that lies in the eastern part of Nepal with population growth rate of 2.29 % and 41.5 % people migrated from other districts (CBS, 2011). Dharan being a foothill town, it has been major market hub since early days. Within the city, the squatters have been occupying the land from a long time and with the pace of urbanization and establishment of B.P. Koirala Institute of Health Sciences in 1997 brought a considerable increase in squatter settlement. The growth rate of the squatter families before 1989 was 50 to 100 families every year which rose to the rate of 300 to 400 families per year after 1997 (Agrawal, 2002). In Nepal, squatters comprise an estimated 10% of the urban population, but some urban areas like Dharan have three times higher (MOUD, 2015).

In Dharan there are about 84 squatter settlements with 6621 HH and population size of nearly 35000. Most of these settlements reside in the flood plain areas of Seuti and Shardu River and some in sloppy hills and nearby forest areas. The people in squatter have migrated from the hills for employment and for getting rid of the hardships in hilly areas. These squatter inhabitants crush stones and/ or work in informal sectors for living whereas those inhabiting near forest area cut trees and sell woods in the market for their livelihood (Agrawal 2002).

In Dharan, government owned corporation named Nepal Water Supply Corporation (NWSC) supplies drinking water at household level. For the new private connection of water pipe, NWSC needs land ownership certificate and a recommendation from the Municipality. This provision curtailed the connection of water at the individual household at squatter settlements.

For our study, in case of Dharan, we consider houses that have individual land ownership and thus have privilege for individual water connection as a group of core community who are economically sound. All of the squatter settlements are considered as periphery community which consist nearly 6000 households. These areas are economically weak and high prevalence of parasitic infection due to poor water supply (Chongbang et al., 2016). They have provision of communal tap in the squatter settlement however water is insufficient for them.

Social Movement for Private Connection

A national level NGO called *Nepal Basobas Basti Samrakchan Samaj* (NBBSS - Nepal Settlement Protection Society) works on inclusive society and upliftment of slums led this movement. At earlier stage, NBBSS had submitted their concern letter time and again to District Administrative Office, Municipality and Water Supply Corporation. However, they did not respond to any of those concerns and kept on ignoring the delegations.

The suppressed and infuriated group of people then united and a manageable dissatisfaction changed into uncontrollable riot. On February 1, 2010, squatters padlocked the room of Chief Executive Officer of Dharan Municipality demanding for private pipeline connections in the squatter settlement. They also picketed at Nepal Water Supply Corporation (NWSC) for the whole day chanting slogans. They protested rallying from the squatter settlements with placards and slogans then changed into a mass gathering after reaching the office of Dharan Municipality. Similarly, they warned to padlock NWSC office from February 9 if their demands went unheard. They had demanded municipality to provide approval for pipeline connections and later the issues was settled down after dialogue and negotiation with NWSC and municipality. Municipality agreed to provide recommendation to NWSC on the basis of the NBBSS recommendation. Thus, the squatter people started getting individual drinking water connections.

Outcome

Municipality and leaders of squatter settlements reached to an agreement that Municipality will provide recommendation letter for installation of individual connection with support letter of Nepal Basobas Kendra. Finally, Dharan Water Supply Corporation started installing private connection of pipe to individual households. After this movement, 700 household slums have private water pipe connections.

"Individual water pipe connection not only gives us potable and easy access of water but after payment of monthly bills, it becomes a legal evidence/ document to prove that we live in cities. This creates us for many opportunities".

Slum leader of Dharan

Recently, a water supply project funded by Asian Development Bank has recognised squatter settlement as beneficiaries of the project for connecting private water supply. This has assured them with regular supply of drinking water for the near future.

6 DISCUSSION

Based on the empirical case studies, there are similarities as well as differences in terms of social movement.

In both the cases, urban social movement were triggered after major national movement i.e. "Peoples' Movement in Nepal" called as *Janandolan* 2006. In both the sites, it is observed that the dispute started from peaceful protest for drinking water which gradually developed and took a bigger form that rightly triggered after the national level political

reform movement. The stakeholders claimed that they had contestation and demand for drinking water even before but the protest was triggered after the National Republican movement. The national movement made squatter people think that they should not be treated as second level citizen when country is itself moulding in a new structure and that ultimately motivated people to protest. This reflects that these movements are guided by the concept of human right to water as a public good.

In both the cases, there is still inadequate water access but it is due to the participation of their representative in the decision making process. The peripheral region have felt that they belong to the same community or to the city dwellers. "Water policy development and reform is primarily a politically- not technically-driven process" (Seppala, 2002, p. 379). Similarly in one of our case study town Dharan, the legal requirements were changed for water access through the social movement.

In both sites it was observed that either with their influence or power or some legal provision core always wants to hold its power, treat peripheral people as an intruder and resists from allowing others to share the resources.

7 CONCLUSION

With the urban social movement, the peripheral region has achieved the water access and felt no more hegemonic by the core region. This type of local level urban movement has brought some policy changes which need to be learnt in future by other cities as well in order to manage future conflicts related water service. Water policy and development practice need to be sensitive and inclusive and decision need to be made on the basis of reform generated by movements on water politics.

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REFERENCES

- Agrawal, U. (2002) Urban Development Strategy for Dharan Municipality. Masters in Urban Planning , Institute of Engineering, Tribhuvan University
- Bakrania, S., (2015) Urbanisation and urban growth in Nepal. Helpdesk Research Report. GSDRC applied Knowledge resources.
- Castells, (1984,) *The City and the Grassroots*. Berkeley and Los Angeles: University of California Press
- CBS. (2012). National Population and Housing Census 2011: National Report. Kathmandu: Central Bureau of Statistics, Government of Nepal. <http://countryoffice.unfpa.org/nepal/drive/Nepal-Census-2011-Vol1.pdf>
- Chongbang, R., Dongol, P., Chakrawarti, A. and Khanal, H. (2016). Parasitic Infections among Children of Squatter Community in Dharan Municipality, Sunsari, Nepal. *International Journal of Applied Sciences and Biotechnology*, 4(2), p.203.
- Devkota, K. (2014). New Municipalities: A Decision Without Vision. Nepali Headlines [online]. <http://nepaliheadlines.com/new-municipalities-decision-without-vision/>
- Friedmann, J. (1966) Regional Development Policy: A Case Study of Venezuela.
- Government of Nepal, Ministry of Urban Development (2017). National Urban Development Strategy (NUDS). Government of Nepal : URBAN DEVELOPMENT AND PHYSICAL PLANNING DIVISION
https://sustainabledevelopment.un.org/content/documents/3627EGM%20IRD%20Report_rev_20130816rev-20140128-20140316-Final.pdf
- Malama, Albert, and Kazimbaya-Senkwe, Barbara Mwila. (2004) Privatisation from Above and from Below: A Comparative Analysis of the Privatisation of Water and Sanitation and Solid Waste Management Services in the City of Kitwe. City Futures Conference. Chicago: University of Illinois.
- McCarthy, John D., and Zald, Mayer. (1977) Resource Mobilization and Social Movements: A Partial Theory, *American Journal of Sociology* 82: 1212-41
- MoUD. (2015). National Urban Development Strategy 2015. Kathmandu: Ministry of Urban Development, Government of Nepal. <http://www.moud.gov.np/pdf/NUDS-2015-final-draft.pdf>
- Muzzini, E. and Aparicio, G. (2013). Urban Growth and Spatial Transition in Nepal. Washington D.C.: World Bank. <http://dx.doi.org/10.1596/978-0-8213-9659-9>
- Pickvance, C. (2003). From urban social movements to urban movements: a review and introduction to a symposium on urban movements. *International Journal of Urban and Regional Research*, 27(1), pp.102-109.
- Ruth Fincher (1987) Progress Report: DEFINING AND EXPLAINING URBAN SOCIALMOVEMENTS, *Urban Geography*, 8:2, 152-160, DOI: 10.2747/0272-3638.8.2.152
- Shakya, S. (2005).An Extensive Study of the Urban Poverty Situation and Its Environmental Implications In the Squatter settlements of Kathmandu and Dharan.
- The Himalayan Times., (2017). Pace of urbanisation rapid in Nepal, says report. March 26, 2017 <https://thehimalayantimes.com/nepal/pace-urbanisation-rapid-nepal-says-report/>
- UN DESA. (2014). World Urbanization Prospects: 2014 Revision. New York: United Nations Department of Economic and Social Affairs. <http://esa.un.org/unpd/wup/FinalReport/WUP2014-Report.pdf>
- United Nations, Department of Economic and Social Affairs, Population Division (2014). World Urbanization Prospects: The 2014 Revision, CD-ROM Edition.
- World Bank (2016) Leveraging Urbanization in South Asia Managing Spatial Transformation for Prosperity and Livability Peter Ellis and Mark Roberts

SS01.2. Water management in South Asia: From conflict to cooperation

1101 WATER SHARING BETWEEN INDIA AND PAKISTAN: AN OPPORTUNITY FOR COOPERATION AND PEACE-BUILDING

ABSTRACT

Bitter political rivalry between India and Pakistan has led to the two countries fighting four wars since both countries achieved Independence from the British Empire in 1947. Political tensions over the Kashmir dispute and cross-border terrorism continue to simmer. This has complicated Indo-Pakistan water sharing relations in the past and will persist in the future. In the aftermath of the 2016 Uri attack on the Indian Army brigade, the Indian Prime Minister stated that blood and water could not flow together. There have been many disputes over India and Pakistan's shared waters, especially over construction of dams on the Indian side of the border (such as Baglihar Dam on River Chenab and Kishenganga project on the tributary of River Jhelum by India) and demand for greater share of the water in India (since currently it is less than 20 percent under the Indus Waters Treaty). Climate change is also exacerbating the situation and it could only worsen in the future as the Indus is one of those rivers that have maximum dependence (151 percent) on glacial meltwater. Furthermore, politico-security issues such as the role of the distribution of waters of the Indus in the Kashmir dispute and the threat of using nuclear weapons by Pakistan against India if the latter chokes water supply have escalated the resource conflict to the level of being labelled a potential water war. However, one must remember that despite political and military antagonism, the principles of the IWT have been adhered to by both countries, even during the wars. The Indus (and its tributaries) is the lifeline of Pakistan and the effects of environmental change are being felt on both sides of the border. Instead of revising the treaty and wrestling over riparian politics, India and Pakistan could work towards integrated basin management as water security is emerging as a critical issue in both countries. Groundwater management in the border regions are left out of the negotiations even though the aquifers are shared and are fast depleting, especially in the Punjab provinces on both sides of the border. Water management negotiations are the biggest confidence-building and peace-building measure, which could potentially transform relations between the two countries in other sectors too. In this context, the paper would trace the history of water sharing relations between India and Pakistan amidst political and military hostility. It would throw light on the conflicts between the two nations over the distribution and management of the waters of the Indus Basin from a geopolitical perspective. The debate between 'environmental conflict' and 'environmental cooperation' (at the regional level) will be used to provide a theoretical background to the paper. Finally, it would analyse how joint river and groundwater management could help build trust and confidence between them and explore mechanisms that could bolster such initiatives. The prescriptive approaches of "regional peace-building" and "conflict transformation" will be analysed to understand the future of hydro-diplomacy between the two countries.

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1221 REVISITING TRANSBOUNDARY WATER MANAGEMENT IN SOUTH ASIA: THE BRAHMAPUTRA CASE**Nora Babalová**

South Asia Democratic Forum (SADF)

ABSTRACT

The impacts of climate change, water scarcity, and water diversion activities have the potential to trigger regional instability in various areas around the globe. The natural place to look at is the Brahmaputra River, an international watercourse that crosses national boundaries between China (Tibet), India, and Bangladesh. In an attempt to study the current state of cross-border water resource management in the Brahmaputra basin, the present paper analyses the relations of major riparian states over the Brahmaputra River; explores the main hindrances to effective cross-border cooperation; examines social and environmental impacts of large-scale hydropower projects; and identifies relevant types of approaches to water management. This paper investigates the Brahmaputra basin not as mere physical space divided by national borders, but as a 'shared space', where domestic politics intersects with international relations. It argues that the management of the Brahmaputra's water resources is influenced by the lacking sense of shared space which translates into weak regional cooperation. This paper argues that the management of the Brahmaputra's water resources is influenced by the lacking sense of shared space which translates into weak regional cooperation.

Key words: Water Management, Dams, Brahmaputra, China, India, Bangladesh, South Asia

1. INTRODUCTION

'Transboundary water management is policy arena where domestic politics and international relations intersect' (Xie & Jia, 2016, p. 681).

The Brahmaputra River originates in the Tibet Autonomous Region of China and passes through Southwest China, two Indian states, and Bangladesh. The Brahmaputra is known as Yarlung Tsangpo in Tibet, the Jamuna in Bangladesh, and as the Brahmaputra in India. For consistency, the present paper uses the term 'Brahmaputra' to identify the river throughout the whole basin. The Brahmaputra is part of a larger complex known as the Ganges, Brahmaputra, and Meghna river system. Most of these riparian countries are 'currently undergoing rapid industrialization while also facing the pressing needs of improving their water management capacities and fighting climate change'; and it is thus cause for concern how these countries will cope with the 'challenge of realizing sustainable water resource management' (Xie & Jia, 2016, p. 678). As rivers originating in Tibet provide water and livelihoods for millions of people living in downstream areas (Buckley, 2014), it is imperative that actions towards meeting the national objectives of upstream countries are not taken unilaterally. In this paper, actions that fall in this category are constructions of large dams or water diversion projects.

In recent years, the number of large-scale dams along the Brahmaputra River increased in response to China's and India's rising energy needs, growing populations, rapid urbanization, and high poverty levels. Given the rugged and high-altitude terrain of the Brahmaputra basin, it was long thought impossible to access the river's enormous energy resources (Watts, 2010). Therefore, the Brahmaputra River has fewer dams than the other two major South Asian river basins, the Indus and Ganges (Samaranayake et al., 2016). The Brahmaputra was in fact one of the world's last undammed rivers until China began constructing a series of dams on sections upstream from the Brahmaputra Canyon, as the waterways of mainland China were already packed with dams (Chellaney, 2013; Buckley, 2015).

The rivers of Tibet²⁸⁴ are seen by China as a new resource of hydropower since they hold the highest hydropower potential in the world (Buckley, 2015). In India, the Brahmaputra flows through two Indian states of Arunachal Pradesh and Assam, and accounts for about thirty per cent of the country's water runoff, hence constituting a major source of potential hydropower as well (Chaturvedi, 2013). Bangladesh, on the other hand, faces the biggest threat from the upper riparian countries' activities (China and India) since up to seventy per cent of Bangladesh's population resides in the river's basin (Samaranayake et al., 2016). The creation of comprehensive basin-wide water management plan is hindered by unresolved disputes, including border claims and clashes over water diversion: the territorial dispute over Indian-administered Arunachal Pradesh and the general lack of trust with regard to the ongoing dam constructions in Tibet and Northeast India are major hindrances to larger cooperation between China and India.

The present paper examines the Brahmaputra basin not as mere physical space divided by national borders, but as a 'shared space', where domestic politics intersects with international relations. This is because challenges related to climate change, increasing water scarcity, and large-scale water diversion projects are international by nature and thus require collaborative approach. This paper argues that the management of the Brahmaputra's water resources is influenced by the lacking sense of shared space which translates into weak regional cooperation, as evidenced by the fact that the basin remains one of the least coordinated river systems in the world (Xie & Jia, 2016, p. 678). This paper analyses the geopolitical (interstate) and regional (intrastate) aspects of the Brahmaputra case; the social and environmental impacts of large-scale hydropower projects on downstream ecosystems and river-dependent populations; identifies relevant types of approaches to water management; and explores major hindrances to effective cross-border cooperation

²⁸⁴ The hydropower development in Tibet is an essential part of China's campaign to 'Open Up the West' launched in 2000 in order to encourage economic development in Western China (Samaranayake et al., 2016).

between the basin countries. By applying two research methods, case study and content analysis, the Brahmaputra case is investigated within the limits of quantitative evidence. The following research queries are central to the studied subject: How does the current transboundary river management work in the Brahmaputra basin? What are the social and environmental impacts of large dams on downstream ecosystems and river-dependent populations? What are the limits of 'climate-friendly' hydroelectric industry? What are the main hindrances to effective cross-border cooperation in the Brahmaputra River Basin?

2. CONCEPTUALIZING TRANSBOUNDARY WATER COOPERATION

Approaches to transboundary water management often tend to overlap. We focus on those that integrate environmental, social, and political variables.

First, the ecosystem approach combines 'technological solutions with sensitivity to history, culture and the politics of resource management', while emphasizing the importance of shared understanding of common challenges (Price & Mittra, 2016, p. 21); it incorporates various disciplines, such as hydrology, ecology, geology, and even anthropology and sociology, since it considers that both peoples and cultural diversity are integral elements of the ecosystems (Price & Mittra, 2016). The ecosystem approach seeks to balance the principles of the Convention on Biological Diversity²⁸⁵, notably biodiversity conservation, sustainable use, and equitable benefit-sharing from the use of natural resources (Price & Mittra, 2016, p. 22). Among the major proponents of the ecosystem approach are global initiatives like the International Union for Conservation of Nature (IUCN) or the World Wildlife Fund (WWF).

Second, the Integrated Water Resources Management (IWRM) attempts to address water-related issues around the globe by exploring interconnected aspects of water quality, water use, and water governance (Gamble et al., 2017). It can be defined as a practical framework (Lenton & Muller, 2009) for the coordinated development and management of water, which aims to maximise the 'resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems' (Gamble et al., 2017).

Third approach highlights the importance of adaptive resource management and institutionalized forms of cooperation (Pahl-Wostl, 2008). The term 'adaptation' or 'adaptive capacity' refers here to the 'ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences' (Pahl-Wostl et al., 2008, p. 8). In this context, adaptation can occur as a result of expected or unexpected climate change. This approach is especially important when coping with increased uncertainties of climate change as the 'conditions under which such regulations were passed may no longer be fulfilled', meaning that new 'risks need to be negotiated in participatory processes rather than being prescribed by law' (Pahl-Wostl et al., 2008, p. 11). An institutionalised form of water governance like this one would include a firm relationship between structure (water management regime), process (adaptive water management), and outcomes (sustainability of water system), making all elements that guarantee the functioning of a regime interdependent (Pahl-Wostl, 2008). This approach is based on a 'regime theory' which identifies an institutionalized form of cooperation as 'sets of governing arrangements, that include networks of rules, norms, and procedures that regularise behaviour and control its effects' (Keohane & Nye, 1977, p. 19).

3. RIPARIANS' QUEST FOR WATER

3.1 China

Since 2000 China has been unilaterally developing upstream projects (Xie & Jia, 2016, p. 682). China's broadly discussed water transfer plan, the South-to-North Water Diversion Project (SNWDP), which transfers water from the Yangtze River to the water-stressed cities of Beijing and Tianjin, dramatically changed the face of China's countryside, leading to massive displacement of people (Kaiman, 2014; Ghassemi & White, 2011). Holding a record number of the world's worst dam-related disasters²⁸⁶, the human costs of China's massive water projects have always been high (Lovell, 2016). For example, the world's biggest existing hydropower project, the Three Gorges Dam on the Yangtze River in the Central China region, caused the displacement of at least 1,7 million Chinese and is still causing persistent environmental problems (Chellaney, 2013); this project alone has submerged 13 cities, 140 towns, and 1,350 villages; the same dam caused the deaths of some 968 people downstream during the record-breaking flood in the summer of 2010 (Lewis, 2013).

²⁸⁵ The ecosystem approach is based on the following twelve principles of CBD: (1) Objectives for management of land, water and living resources are a matter of societal choice; (2) Management should be decentralised to the lowest appropriate level; (3) Ecosystem managers should consider the effects of their activities on adjacent and other ecosystems; (4) Recognising potential gains from management, there is a need to understand the ecosystem in an economic context — programmes should reduce market distortions, align incentives to promote sustainable use, and internalize costs and benefits; (5) A key feature of the ecosystem approach includes conservation of ecosystem structure and functioning; (6) Ecosystems must be managed within the limits of their functioning; (7) The ecosystem approach should be undertaken at the appropriate scale; (8) Recognising the varying temporal scales and lag effects which characterise ecosystem processes, objectives for ecosystem management should be set for the long term; (9) Management must recognise that change is inevitable; (10) The ecosystem approach should seek the appropriate balance between conservation and use of biodiversity; (11) The ecosystem approach should consider all forms of relevant information, including scientific, indigenous and local knowledge, innovations and practices; (12) The ecosystem approach should involve all relevant sectors of society and scientific disciplines ('Principles of the ecosystem approach', 2017).

²⁸⁶ For instance, in a serial dam collapses in 1975, after a typhoon hit Henan province in Central China, at least 83,000 Chinese were killed and millions left homeless (Chellaney, 2013).

Recently, China has shifted its dam-building focus from internal rivers in the Han heartland to international rivers that originate in remote and ecologically sensitive parts of the Tibetan Plateau (Chellaney, 2013, p. 234). Now, with its plans to construct large dams on the upper reaches of the Brahmaputra, China plans to divert water from some major rivers in Tibet to feed its 'desperate thirst for clean water' (Buckley, 2014, p. 13); but the diversion of the Brahmaputra's water is a matter China does not discuss in public to avoid bitter reactions from international community and downstream riparians, notably India and Bangladesh (Chellaney, 2009). To do research on Tibet can therefore be extremely difficult; this is also because reporting on a protest in Tibet amounts to leaking state secrets, in response to which Tibetans may face harsh responses by the Chinese government (Buckley, 2014, p. 18)

Following the Zangmu Dam, China's first hydroelectric dam on the Brahmaputra in Tibet, which became fully operational in October 2015, China has announced its plans to construct several more dams along the upper reaches of the Brahmaputra (Samaranayake et al., 2016). One of the announced plans is a mega dam at Metog²⁸⁷ (Lewis, 2013). If created, this dam would be the world's biggest hydroelectric project. However, both Tibetans, for whom Metog is a sacred region, and environmentalists, who warn about seismically active and fragile character of the area, are worried about this project (Watts, 2010). While the dam would probably save a sizable amounts of carbon dioxide, it could also lead to conflict over downstream water supply: blocking of the upper reaches of the Brahmaputra could devastate the fragile ecosystem of the Tibetan plateau and withhold the river's sediments from the fertile floodplains of Assam in Northeast India and Bangladesh (Watts, 2010; Lewis, 2013). Besides the environmental aspects, there are also political and security implications as the dam is supposed to be located close to the McMahon Line,²⁸⁸ a disputed and militarised boundary between China and India. One way or another, the construction of dam at Metog per se would dramatically change the living conditions in this region.

Despite the obvious risks, China continues²⁸⁹ to construct mega-dams in remote areas even at the risk of damaging biological and ethnic diversity and diminishing cross-border flows (Chellaney, 2015, p. 238). Furthermore, it is likely that dams planned in Tibet will not benefit local population since the generated energy will be transferred to power-hungry and water-stressed cities of Beijing and Tianjin farther east while many Tibetans will be deprived of their land; however when protests against hydropower projects occur, they are either prohibited or violently suppressed (Buckley, 2015).

3.2 India's water resource quest

India's 'dam mania' started in the 1960s with the construction of the Bhakra Dam in northern India, which became the symbol of India's green revolution²⁹⁰, and was hailed by the then Prime Minister Jawaharlal Nehru as a 'Temple of Modern India' (Bosshard, 2015). Despite initial successes and high expectations, badly managed irrigation schemes have resulted in waterlogged, saline soils and diminishing harvests, in response to which Nehru described the situation as the 'disease of gigantism' in dam building (Bosshard, 2015). India's most controversial dam project, however, is the Sardar Sarovar Dam²⁹¹ on the Narmada River initiated in 1979 (Mitra, Wolf, & Schöttli, 2006). The project resulted in the displacement of more than 250,000—primarily indigenous—peoples (Bosshard, 2015).

In India, Arunachal Pradesh is considered a new hotspot of global dam building and the future powerhouse of the country. India, along with China, is now building more dams than any other country on the globe (WCD, 2000). Not surprisingly, China is concerned about New Delhi's efforts to construct dams in Arunachal Pradesh as it could further strengthen India's 'actual control' over the disputed region (Samaranayake et al., 2016). Arunachal Pradesh is the most geographically isolated state in India and is home to more than twenty indigenous tribal groups; however the state's sparse inhabitation makes it an attractive prospect for dam builders (Overdorf, 2012).

A total of 168 massive dams were proposed in Northeast India, the majority of which are to be located in Arunachal Pradesh, including the largest of them all, the Lower Subansiri Hydroelectric project, which is located on the Subansiri River, a Brahmaputra tributary (Yong, 2014; Overdorf, 2012). Besides the latter, other major hydroelectric power plants of more than 1,000 MW capacity are planned for the Brahmaputra's tributaries, such as Dibang, Siang, Siyom, and Lohit (Overdorf, 2012).

Protests against mega-dams occur either against domestic or upper riparians' projects, but are barely reported in the media (Sharma, 2012); several anti-dam organisations took place in 2014 in Assam which raised voices against the

287 Motuo in Chinese

288 The McMahon Line constitutes a border between India and China, extending from east Bhutan to Myanmar. Historically, the Line is based on a British colonial claim, drawn as the frontier between British India and Tibet at the Shimla Conference in 1914. In 1949, however, the newly formed People's Republic of China refused to accept the McMahon Line. India, on the other hand, regarded the McMahon Line as a permanent international border. This discord became a major cause of tension between China and India in the 1950s and one of the main reasons for the Sino-Indian war of 1962. Today, the border is known as the Line of Actual Control that separates Indian-ruled land from Chinese-controlled territory. (Mitra, Wolf, & Schöttli, 2006; Florcruz, 2013).

289 China and its state-run companies represent the largest global producer of hydropower and their objective is to further increasing this capacity to at least 450 gigawatts by 2030. China is the biggest financier and builder of dams (both at home and abroad) and boasts a greater number of large dams on its territory than the rest of the world combined. If dams of all sizes are counted, the total number of dams in China is close to 90,000, the majority of which was built during the post-Mao period (Chellaney, 2013).

290 In the Indian context, the Green Revolution refers to the period from 1967 to 1978, during which an economic and agricultural development strategy introduced by Western aid organisations was applied to make India self-sufficient in food grains (Mitra, Wolf, & Schöttli, 2006).

291 The Sardar Sarovar Dam was first envisaged in the 1940s by Jawaharlal Nehru to control the immense Narmada River system. The World Bank financed the dam construction even though the project did not comply with the government's conditional environmental clearance. In the mid-1980s, the Narmada Bachao Andolan (Save the Narmada Movement), a coalition of social movements and NGOs, created strong international public pressure to stop the dam. As a result, the World Bank had to withdraw from the project in 1994 after an independent review found systematic violations of its social and environmental policies. (See Mitra, Wolf, & Schöttli, 2006; Bosshard, 2008; 2015)

completion of China's hydropower project on the upper reaches of the Brahmaputra in Tibet; some activists even threatened to lay siege to the Chinese embassy in New Delhi (Lewis, 2013; Karmakar, 2014). On the other hand, demonstrations against large domestic dam projects recently occurred in Tawang²⁹², in a small town in Arunachal Pradesh, during which at least two participants were killed by the police (The Third Pole, 2016); in November 2016, during a meeting on 'Policy Dialogue for Governance of the Brahmaputra River' in Arunachal Pradesh, a group of anti-dam leaders confronted government officials, clarifying that they are neither against small dams nor against dams as such, but they cannot support the construction of large dams that can spoil their livelihoods, fearing that large dams will flood fertile agricultural land, destroy the fauna and flora, cause the displacement of people, and eventually the loss of cultural identity (Duarah, 2017). The lack of trust is partly caused by the fact that many tribal people who lost their land due to development projects have been denied compensation years after displacement (Chakma & Shimray, 2016).

3.3 Bangladesh

As the lowest riparian, Bangladesh has been the strongest promoter of multilateral cooperation on the Brahmaputra River. Besides the fact that the Brahmaputra is Bangladesh's largest water system, providing approximately sixty-five per cent of the country's river water per year, part of the reason is also the reality that up to seventy per cent of Bangladesh's population resides in the basin, compared to only one per cent of China's and three per cent of India's (Samaranayake et al., 2016). Bangladesh is faced with various natural challenges like floods, riverbank erosion, or diminished water flow, but climate change projections forecast even more floods and stronger cyclones in the near future (McVeigh, 2017).

4. SOCIAL AND ENVIRONMENTAL IMPLICATIONS OF LARGE DAMS: THE 'DISEASE OF GIGANTICISM'

'Human welfare cannot be measured only through economic growth and development, but also should consider the current ecological limits of the planet, allow for fair distribution, and promote an efficient allocation of resources' (Salgado, 2015).

Large dams significantly affect downstream ecosystems and river-dependent populations, and can have disastrous ecological consequences by influencing or reducing the flow of water downstream (Yong, 2014). Some of the identified effects of megadams on natural resources include extensive conversion of land, alteration of the hydrological systems, and disruption of freshwater ecosystems (Salgado, 2015). Major reasons responsible for the increase in producing more large-scale dams in the Brahmaputra region are urbanization, poverty reduction benefits (Welford, 2010), and preference for technocratic solutions with regard to energy production, which is often disrespectful of traditional knowledge and traditional ways of living.

The damage that dams cause to river ecosystems can be immense, 'turning free-flowing waterways into lifeless lakes, killing plants and trees, blocking fish migration and breeding, driving species to extinction, and devastating established patterns of human life' (Lewis, 2013). In Arunachal Pradesh, for instance, it is expected that more than 50,000 acres of forest will be submerged by the proposed hydroelectric projects (Overdorf, 2012). It is not surprising that the impacts of large dams often become the subject of a dispute between the government and civil society (Salgado, 2015). On the one hand, dams can play an important role in enhancing economic growth and social development, but on the other, the consequences of dam building may inevitably impoverish the affected masses (Welford, 2010). In order to avoid such a negative scenario, the respective decision-makers need to explore and assess all alternatives and their impacts before they take a final decision, to find out whether a large dam would fulfill a) the needs of the region and b) the environmental requirements of the disaster prone Brahmaputra basin. Such alternatives might include renewable energy collected from sunlight, wind, and tides (Bosshard, 2015) or a small-scale hydroelectric schemes (Salgado, 2015).

5. EVALUATION OF ATTEMPTS TO ADDRESS WATER ISSUES

Global initiatives advocating for solutions in transboundary water management, in this case principles put forward by the United Nations Watercourses Convention (UNWC), World Commission on Dams (WCD), the South Asia Water Initiative (SAWI), and CNA research study.

The United Nations Watercourses Convention (UNWC), a global framework convention adopted by the UN General Assembly in 1997, emphasizes that in order to achieve equitable and reasonable utilization of water, any decision-making body needs to consider a) geographic, hydrological, climatic, and ecological factors; b) social and economic needs of riparian states; c) dependency of the people on a given watercourse; d) the effects of the use of the watercourses in one watercourse state on other watercourse states; e) conservation, protection, development and economy of use of the water resources; f) the availability of alternatives to a particular planned or existing use. Most importantly, all riparian states shall always enter into consultations in a spirit of cooperation, allowing the exchange of data on a regular basis.

The often cited World Commission on Dams (WCD), which was established in response to growing opposition to large dam projects in 1998, reviews the development effectiveness of dams and develops standards and guidelines for future dams and dam building activities ('The WCD Framework,' 2008). In its seven 'strategic priorities', the WCD highlights the importance of a) public acceptance of key decisions (i.e., recognising rights, addressing risks, and safeguarding the entitlements of all groups of affected people, particularly indigenous and tribal peoples, women and other vulnerable groups); b) exploration of possible alternatives, including the participatory impact assessment;²⁹³ c) post-project

²⁹² Tawang is one of the unresolved border issues between India and China. To the north it borders Tibet and to the south west it lies next to Bhutan (Mitra, Wolf, & Schöttli, 2006). This region was occupied by Chinese troops in 1962 and, together with the rest of Arunachal Pradesh, China continues to claim this entire area and considers it part of South Tibet. (See also footnote 5.)

²⁹³ Impact Assessment includes all people in the reservoir, upstream, downstream and in catchment areas whose properties, livelihoods and non-material resources are/were affected. It also includes those affected by dam related infrastructure.

monitoring and evaluation process of existing dams; d) sustaining rivers and livelihoods by preserving ecosystems; d) recognising entitlements and sharing benefits, for instance through joint negotiations with adversely affected people; e) ensuring public trust and confidence, incorporating incentives and sanctions; and f) sharing rivers for peace, development and security, creating mutual interest in a peaceful and lasting collaboration.

The South Asia Water Initiative's (SAWI), a joint World Bank-UK-Australia-Norway partnership, is dedicated to increasing regional cooperation among riparian states of the Indus, Ganges, and Brahmaputra basins, in an attempt to deliver sustainable water management and in the age of climate change. In doing so, SAWI advocates for the following principles: a) Integrated Water Resources Management (IWRM) approach which includes the adaptation to climate change; b) enhanced transboundary cooperation; c) the principle of inclusivity and multidisciplinary; d) participation and deliberation while ensuring transparency, legitimacy and accountability. With regard to the Brahmaputra such cooperation shall be achieved through strengthening of shared understanding, knowledge and capacity building, investment planning, and reducing vulnerability to flood and erosion.

Authors of the CNA research study (Samaranayake et al, 2016) suggest how the management of Brahmaputra's resources could be improved on a domestic, bilateral, and basin-wide levels. Apart from the aforementioned frameworks, this study provides recommendations for the international community regarding the long-term security implications of discord among Brahmaputra riparians. First, on a domestic level, while China should expand access to more detailed information regarding its dam construction plans on the Brahmaputra to improve trust; India should enhance hydrological data sharing between the center and its northeast governments and inform the local governments about all dam construction projects plans in the region; Bangladesh as the third main riparian needs to seek assistance from the international community to conduct evidence-based assessments of human security impacts in the Brahmaputra basin (Samaranayake et al, 2016, p. 90). Second, bilateral recommendations advise China to consider hydropower as a potential area of cooperation with India, including sharing of hydrological data, humanitarian and ecological cooperation; likewise, if India seeks clarification on China's plans for dam construction and their potential impacts, India should provide the same information about its own plans; Bangladesh, on the other hand, should seek water flow and rainfall data from India and China year-round and request site visits to dams and barrages in both upper riparians (Samaranayake et al, 2016, p. 92-95). On a basin-wide level, China should convene a further dialogue with India and Bangladesh to discuss shared water challenges; India should apply the elements of ecosystem management and ecological protection into discussions of cooperation with both China and Bangladesh; and Bangladesh needs to encourage dialogue with India and China and utilize the capabilities of its active think tank community to analyse specific aspects of basin-wide management of the Brahmaputra with upper riparian counterparts (Samaranayake et al, 2016, p. 95-97).

5.1 Evaluation

Recommendations included in the UNWC, the WCD seven strategic priorities, the SAWI four key principles, and the CNA report, were selected based on their relevance to the subject matter of this chapter. These sets of recommendations present a balanced combination of both universal and region-focused principles (especially those outlined by SAWI and CNA), where the rules should be based primarily on the work of experts in the field, including teams of anthropologists, natural scientists, NGOs, and those who hold local knowledge. What needs to be achieved in the context of the Brahmaputra is a shared vision for future water sharing projects and an improved mutual understanding of the individual needs of all the actors involved. States shall be obliged to meaningfully interact with tribal communities on projects that affect their lands; real-time information exchange between upstream and downstream countries is necessary in order to prevent natural disasters and catastrophic consequences and; in coping with extreme events from climate change, adaptive management practices are of equal importance as well. In addition, decision-making processes and planning shall always focus on long-term impacts and its interlinked aspects, especially in regard to indigenous or tribal peoples, who could face displacement and should thus always participate in decision-making processes. And, when some of these negative impacts (e.g., displacement of people) cannot be avoided, relevant compensation measures must be put in place to lessen the suffering.

CONCLUSION

International concerns about the environmental and social impacts of large-scale dams has been increasing since the beginning of the twenty-first century. Both urbanization and states' preference for technocratic solutions for energy production are responsible for the rapid growth of large-scale hydropower projects in South Asia. Some of these solutions, however, are disrespectful of traditional knowledge and local ways of living. Large-scale hydropower projects in areas prone to natural disasters may result in negative social and environmental impacts that can spur new migration or refugee flows.

The current water management of the Brahmaputra's water resources is negatively influenced by the lack of cooperation within the region on managing shared water resources. The lack of cooperation hinders the creation of comprehensive basin-wide water management plan due to which there is no institution capable of promoting effective collaboration. This is because several disputes like border claims or clashes over water diversion remain unresolved. In particular, the territorial dispute over Indian-administered Arunachal Pradesh and the general lack of trust with regard to the ongoing dam constructions in Tibet and Northeast India are major hindrances to larger cooperation between China and India. Although the two countries have agreed to share hydrological data, there is still no institutionalized form of cooperation. Therefore, enhancing responsibility towards downstream countries and regions, especially towards the lowest riparian, Bangladesh, remains on the agenda.

REFERENCES

- Bosshard, P. (2008, June 11). New Independent Review Documents Failure of Narmada Dam. *International Rivers*. Retrieved April 8, 2017, from www.internationalrivers.org
- Bosshard, P. (2015, January 12). 12 dams that changed the world. *The Guardian*. Retrieved April 8, 2017, from <https://www.theguardian.com/environment/blog/2015/>
- Brahmaputra Focus Area Strategy: 2013-2017 (2017). *South Asia Water Initiative*. Retrieved March 15, 2017, from <https://www.southasiawaterinitiative.org/brahmaputra>
- Buckley, M. (2014). *Meltdown in Tibet: China's Reckless Destruction of Ecosystems from the Highlands of Tibet to the Deltas of Asia* (Illustrated ed.). New York: St. Martin's Press.
- Buckley, M. (2015, March 30). The Price of Damming Tibet's Rivers. *The New York Times*. Retrieved March 28, 2017, from <https://www.nytimes.com/2015/03/31/>
- Chakma, T., & Shimray, G. A. (2016). South Asia: India. In *The Indigenous World 2016* (pp. 328-341). Copenhagen: International Work Group for Indigenous Affairs.
- Chaturvedi, M. C. (2013). *Ganga-Brahmaputra-Meghna waters: advances in development and management*. Boca Raton: CRC Press.
- Chellaney, B. (2009, August 3). The Sino-Indian Water Divide. *Project Syndicate*. Retrieved January 16, 2017, from <https://www.project-syndicate.org/commentary/>
- Chellaney, B. (2011). *Water: Asia's new battleground*. Washington, D.C.: Georgetown University Press.
- Chellaney, B. (2013). *Water, peace, and war: confronting the global water crisis*. Lanham: Rowman & Littlefield, Inc.
- Duarah, C. K. (2017, January 12). Protests Against Dams on the Siang Continue in Arunachal Pradesh. *The Quint*. Retrieved February 27, 2017, from <https://www.thequint.com/>
- Economy, E., & Levi, M. A. (2014). *By all means necessary: How China's resource quest is changing the world*. Oxford: Oxford University Press.
- Floracruz, M. (2013, March 5). Line Of Actual Control: China And India Again Squabbling Over Disputed Himalayan Border. *International Business Times*. Retrieved April 10, 2017, from <http://www.ibtimes.com/line-actual-control-china-india-again-squabbling>
- Gamble, D., Roberts, C., Atiyha, A., Ray, W., & Irvine, K. (n.d.). *Water Resources Conceptual Framework: How are water resources managed in different places?* Center for Global Geography Education. Retrieved April 20, 2017, from <http://cgge.aag.org/>
- Ghassemi, F., & White, I. (2011). *Inter-basin water transfer : Case studies from Australia, United States, Canada, China, and India*. Cambridge, UK: Cambridge University Press.
- IANS. (2016, September 23). With thousands of dams upstream, China has water as weapon against India. *The New Indian Express*. Retrieved April 7, 2017, from <http://www.newindianexpress.com/nation/2016/sep/23/>
- International Rivers. (n.d.). About dams. *International Rivers*. Retrieved May 15, 2017, from <http://www.internationalrivers.org/en/node/287>
- International Rivers. (2008, February 29). The World Commission on Dams Framework - A Brief Introduction. *International Rivers*. Retrieved March 28, 2017, from www.internationalrivers.org
- International Rivers. (n.d.). Northeast India. *International Rivers*. Retrieved February 20, 2017, <https://www.internationalrivers.org/campaigns/northeast-india>
- Kaiman, J. (2014, December 12). China's water diversion project starts to flow to Beijing. *The Guardian*. Retrieved April 7, 2017, from <https://www.theguardian.com/world/>
- Karmakar, R. (2014, November 25). Assam protests China dam on upper Brahmaputra. *Hindustan Times*. Retrieved April 7, 2017, from <http://www.hindustantimes.com/india/>
- Keohane, R. O. & Nye, J. S. (1977). *Power and Interdependence*. Boston: Little, Brown and Co.
- Lenton, R., & Muller, M. (Eds.). (2009). *Integrated Water Resources Management in Practice: Better water management for development*. London: Earthscan.
- Lewis, C. (2013, November 4). China's Great Dam Boom: A Major Assault on Its Rivers. *The Yale School of Forestry & Environmental Studies*. Retrieved April 8, 2017, from http://e360.yale.edu/features/chinas_great_dam_boom_an_assault_on_its_river
- Lovell, S. (2016, January 25). China's Mega Hydro-Projects are Coupled with Devastating Impacts. *Pulitzer Center*. Retrieved April 7, 2017, from <http://pulitzercenter.org/>
- McVeigh, K. (2017, January 20). Bangladesh struggles to turn the tide on climate change as sea levels rise. *The Guardian*. Retrieved March 28, 2017, from www.theguardian.com
- Mitra, S. K., Wolf, S. O., & Schöttli, J. (2006). *A political and economic dictionary of South Asia: an essential guide to the politics and economics of South Asia* (1st ed.). London: Routledge.
- Overdorf, J. (2012, April 23). Part 1: How many dams can one state hold? *Public Radio International*. Retrieved February 24, 2017, from <https://www.pri.org/stories/>
- Pahl-Wostl, C., Kabat, P., & Möltgen, J. (2008). Requirements for adaptive water management. In *Adaptive and integrated water management : coping with complexity and uncertainty* (pp. 1-22). Berlin: Springer.
- Price, G. & Mittra, S. (2016). *Water, Ecosystems and Energy in South Asia : Making Cross-border Collaboration Work ; the Research Paper of the Chatham House*. London: The Royal Institute of International Affairs.
- Principles of the ecosystem approach. (n.d.). *Convention on Biological Diversity*. Retrieved May 15, 2017, from <https://www.cbd.int/ecosystem/principles.shtml>
- Ramachandran, S. (2015, April 03). Water Wars: China, India and the Great Dam Rush. *The Diplomat*. Retrieved March 28, 2017, from <http://thediplomat.com/2015/>
- Rieu-Clarke, A., Moynihan, R., & Magsig, B. (2012). *UN Watercourses Convention : User's guide*. S.l.: IHP-HELP Centre for Water Law, Policy and Sciences (under the auspices of UNESCO).
- Roy, D., Barr, J., & Venema, H. D. (2011). *Ecosystem Approaches in Integrated Water Resources Management (IWRM): A Review of Transboundary River Basins*. United Nations Environment Programme and the International Institute for Sustainable Development.
- Samaranayake, N., Limaye, S., & Wuthnow, J. (2016, May). Water Resource Competition in the Brahmaputra River Basin: China, India, and Bangladesh. *CNA*. Retrieved November 16, 2016, from <https://www.cna.org/>
- Salgado, N. (2015, January). Many Small vs a Few Big: Alternatives to Megadams in the Chilean Patagonia. *The Solutions Journal*, 6(1), pp. 34-39. Retrieved June 15, 2017, from <https://www.thesolutionsjournal.com/article/many-small-vs-a-few-big>
- Sharma, T. (2012, March 9). Fighting India's mega-dams. *Chinadialogue*. Retrieved April 7, 2017, from <https://www.chinadialogue.net/article/show/single/en/4799>

- South and East Asia : UNWC's Global Relevance (2017). *UN Watercourses Convention*. Retrieved March 15, 2017, from <http://www.unwatercoursesconvention.org/>
- United Nations Declaration on the Rights of Indigenous Peoples : the General Assembly Resolution ; the Report of the Human Rights Council* (pp. 1-12, Rep. No. 07-49830). (2007). UN Human Rights Council. Retrieved March 27, 2017, from www.iwgia.org
- Watts, J. (2010, May 24). Chinese engineers propose world's biggest hydro-electric project in Tibet. *The Guardian*. Retrieved February 20, 2017, from www.theguardian.com
- Watts, J. (2010). *When a billion Chinese jump: how China will save mankind — or destroy it*. New York: Scribner.
- Welford, R. (2010, July 13). The future of dam building. *CSR Asia*. Retrieved May 15, 2017, from http://www.csr-asia.com/weekly_news_detail.php?id=12084
- World Commission on Dams (2000). *Dams and development: a new framework for decision making*. London, UK: Earthscan Publications Ltd.
- Wuthnow, J. (2016). Water war: this river could sink China-India relations. *The National Interest*. Retrieved January 05, 2017 from <http://nationalinterest.org/>
- Xie, L., & Jia, S. (2016). Diplomatic water cooperation: The case of Sino-India dispute over Brahmaputra. *International Environmental Agreements: Politics, Law and Economics*, 17(5), 677-694. doi:10.1007/s10784-016-9339-4
- Yong, Y. (2014, March 5). World's largest hydropower project planned for Tibetan Plateau. *Chinadialogue*. Retrieved February 19, 2017, from <https://www.chinadialogue.net/>

1289 REDEFINING ACCESS TO WATER: CASE OF SLUM DWELLERS OF HYDERABAD**S.V Sreepada¹, S Goswami²**¹Asst. Professor, GITAM University, Visakhapatnam, India²Asst. Professor & Area Chair, Environmental Planning, CEPT University, Ahmedabad, India**ABSTRACT**

While availability of water has been widely discussed, access to water has always been one of the least discussed issues in India. The importance of access and availability of water has been raised by the UN in SDG's at international level, however India's definition and interpretation of access to water has been meekly restricted to availability of source (improved/ unimproved drinking water facility). The data collected by various national organizations like Census of India or National Sample Survey Organization, are often compiled to understand indicators of water availability, yet a collective and an informed approach is lacking in the current scenario. When it comes to urban poor and slums, access to water is probably even crucial, especially when availability does not assure accessibility. Therefore the primary objective of this paper is to understand the importance of redefining access to water and to identify the parameters which determines access to water.

In order to examine why access to water is important and how access to water is defined and interpreted by different agencies, wide range of literature was reviewed. In order to examine the parameters affecting accessibility, primary survey was conducted in ten selected slums from across the whole Greater Hyderabad Municipal Corporation (GHMC). The slums were selected based on its location within the city, and legal status. From the selected slums a total of 110 households were selected using stratified random sampling method. The questionnaire was designed to capture physical, economic and social parameters which determines access to water. Interviews were conducted with the key persons representing different layers of service provider. Focus group discussions were conducted with women, and kids from selected slums.

It was evident from the study that, access to water is just not having a facility at a prescribed distance, but a reliable, efficient and affordable service with safe quality and adequate quantity of drinking water should determine the accessibility. One of the major observations of the study include that the tagged households as having access to water according to current definition really do not have enough water to at least meet their needs. It is evident from the study that, understanding of access to water as of today is dominated by the mechanical approach of service provider only. It should be relooked from the view point of consumers.

Key words: Access to water, Availability of Water, Water Supply in Slums, Slums in India

1 BACKGROUND

According to Census 2011, India's urban population share has increased from 27.81% in 2001 to 31.16% in 2011 which is 377 million approximately. With the current rate of urbanization it is projected that by 2031, about 600 million people will reside in urban areas i.e., an increase of over 200 million in just 20 years (GOI, 2013). The urban sector in India is currently facing the biggest challenge in providing basic services like water supply to the increasing population. Around 65% of the slum population is covered in individual tap connections and are supposed to be having access to water, but report of HPEC, 2011 suggests that at the present state of service delivery, the average Indian receives 37 LPCD to 298 LPCD for a limited duration. Insufficiency of water often pushes people to pay tenfold higher than an average price and walk longer distances to obtain water. Women bear the maximum brunt. They are forced to spend time and energy collecting water for the household use, resulting into loss of earnings as well as leisure time.

Global monitoring of water access has been at place since 1930's initiated by League of Nations Health Organization which was later taken forward by WHO and UNICEF. Since then there has been many policies and programs and directed to improve the water availability to the urban poor and the slum dwellers. The MDG's recognizing the need addressed and included the target of halving the people without sustainable access to safe drinking water by 2015 which was recently carried forward in SDG as Goal 6 (UN, United Nations General Assembly Draft outcome document of the United Nations summit for the adoption of the post-2015 development agenda, 2015). This was adopted by the Indian government through 11th five year plan where the development is focused on the service provision in slums through programs like Basic Services for Urban Poor (BSUP) and housing programs like (IHSDP) programs (MoHUPA, 2011). These programs addressed the access to water by making an attempt to provide sufficient coverage of water infrastructure.

Internationally there are many definition of access to water. The JMP which is formed to monitor the progress of drinking water and sanitation by WHO & UNICEF defined sustainable **access to safe drinking water** as people **using an improved water source for drinking purposes**. India following the footsteps of these international policies derived its definition for access to drinking water source from these programs. A report published in 2011 by Census of India on "Houses, Household Amenities and Assets –Drinking water data" defines access for the first time. The definition has two major components, the first one being distance to the location of source and the second one being the source of drinking water. According to the definition, any urban household having source of water in 100 meters of distance is considered as having access to water source.

This definition of having source of drinking water within 100 meters of distance is often interpreted as having access to water. The flagship document of Ministry of Finance, Government of India, Economic Survey 2011-12, which is an important document in highlighting and directing various policies in the country, also interpreted the availability of drinking water source as having access to drinking water source.

It can be inferred that “access to water” is confined to the definition of “access to drinking water source” which is addressed by our national programs by improving the infrastructure coverage for water supply. As a contradiction, many studies suggested that despite the availability of facility within 100 meters, quantity, quality, sufficiency, timings of supply, duration of supply, frequency of supply, storage capacities, and economic conditions of the household plays vital role in access to water.

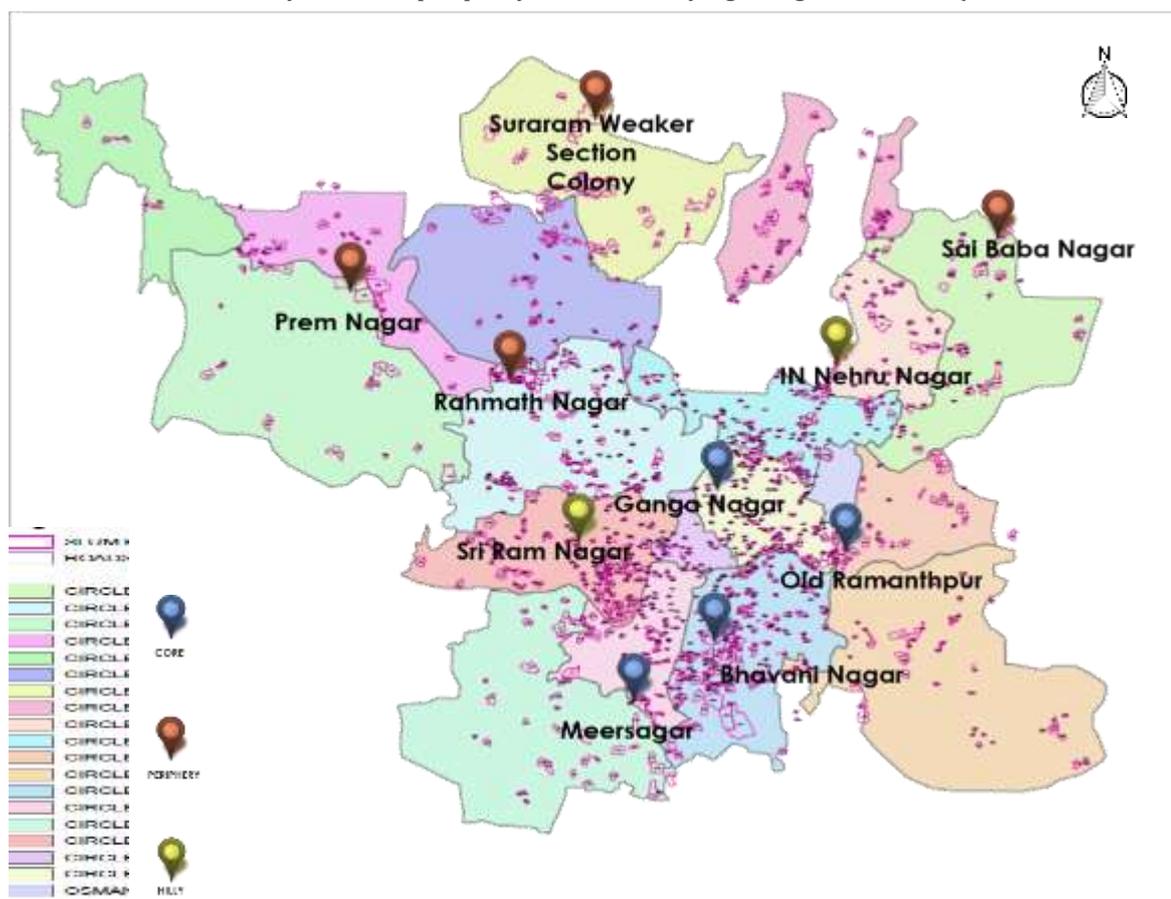
2 APPROACH AND METHODOLOGY

The primary objective of the study is to understand how access to water is interpreted at national and global level. It was studied through understanding of the various national and international literature. Secondary data for study were collected from official reports, documents, research publications and media coverage.

The secondary goal to understand the definition and the parameters that affect accessibility was studied through literature study and mostly from the data collected through primary surveys from the selected slums within the Greater Hyderabad Municipal Corporation (GHMC) boundary. The primary survey specially focused on understanding the selected physical, social, economic parameters from research papers, journal articles, news and print media. The hypotheses is hence tested in the selected ten slums of Hyderabad.

2.1 Selection of the Slums

Slums are the visual evidence of the prevailing disparities in our societies that are most susceptible pockets in receiving adequate infrastructure, especially drinking water. Even amongst these settlements, the location, size and the status (notified/non-notified) plays an important role in deciding the access to water. Therefore, the selection of the slums were done on the basis of the settlement typology and the geographical location in the GHMC area. These ten slums are spread across the whole GHMC area, covering all the five zones. For a better understanding, the slums are studied in context of the locations such as hilly, core and periphery area with varying recognition status (notified& non-notified).



Source of Map: GHMC

Figure 77 Map showing selected slums from various circles in GHMC area.

Table 27: Table showing the details of selected slums in GHMC area.

Area	Zone	Name of the Slum	Status of the Slum	Total Population	Total Households
Core Area	South Zone	Meersagar	Notified	3466	552
	East Zone	Old Ramanthpur	Notified	1720	415
	South Zone	Bhavani Nagar	Non-notified	3574	789

Periphery Area	Central Zone	Ganga Nagar	Non-notified	2242	545
	North Zone	Suraram Weaker Section Colony	Notified	5821	1414
	West Zone	Prem Nagar	Notified	9699	2399
	East Zone	Sai Baba Nagar	Non-notified	5039	1189
	Central Zone	Rahmath Nagar	Non-notified	5909	1470
Hilly Area	North Zone	IN Nagar	Notified	5366	1396
	Central Zone	Sri Ram Nagar	Non-notified	1924	484

Source of data: (GHMC, 2013)

The main occupants of these slums are daily waged laborers with less than one lakh rupees income per annum. The average household size of these selected slums ranges within 4-5 persons per household. The total number households and the population of the selected slums can be inferred from Table no: 1.

2.2 Identification of Key Stakeholders

To understand the interwoven issues related consumer- infrastructure- service; various stakeholders were identified. They are consumers (residents of the slum, in charge/ head of the slum), Service providers (Greater Hyderabad Municipal Corporation, Hyderabad Metropolitan Water Supply & Sewerage Board). The service delivery people includes – tanker drivers, linemen who are key role players in delivering service.

2.3 Selection of Sample Households & Key Informants

From the selected slums a total of 110 households (Core-40 HH, Periphery- 40 HH and Hilly area-30 HH) were surveyed. The households selection is based on stratified random sampling where the households with necessary water infrastructure according to the existing definition were selected. A survey was conducted in the months of January and February of 2017. The questionnaire for primary household survey captured the physical (Type of source, distance, quality, quantity available, round trip time to collect water, timings of supply, Part of the day, frequency and duration of supply), economic (Income of the family, establishment costs, monthly expenditure, and other expenses spent towards accessing water) & social parameters (Caste, Religion, Location of the house within the slum) of access. To understand the system of supply interviews were conducted with the commissioner and staff of GHMC, MD of HMWSSB and technical director. The consumer side issues and challenges are understood through the primary surveys, focus group discussions with the varying age and working groups, and personal interviews with the presidents of the selected slums.

To understand the challenges from the service delivery perspective interviews with linemen, water tanker drivers were conducted. Water is delivered through free tankers, which are ideally sent after a complaint is registered with HMWSSB, however in some areas water is sent periodically.

3 DEFINITION OF ACCESS TO WATER

There has been multiple definitions used internationally by various organizations to study the access to water. The National Statistics Office (NSO) of the respective countries may use definitions in the context of their country. These adopted definitions are generally modified from UN and World Bank, might vary from the definitions used in calculating in MDG's & SDG's estimates. These definitions are generally based on factors like – distance of the source, time and the quantity of water. As there is no internationally one clear standardized definition of access to drinking water, the differences are understood through adopting a process of framing core questions and data summary sheets circulated to the signatory countries.

3.1 International definition and national adoption

After the global monitoring has started, it targeted the improvement of various policies and kept updating the information on the status of facilities which consisted the initial tracking of access to drinking water. This monitoring programme was further carried forward by WHO, which was recently joined by UNICEF to monitor the progress on access to drinking water (Bartram, Fisher, Brocklehurst, & Hossain, 2014). Further to monitor the progress collectively, WHO and UNICEF formed a JMP (Joint Monitoring Programme) during the initial stages of MDG's. JMP interpreted *access* from the recent SDG target 6.1 – “By 2030, achieve universal and equitable access to safe” as sufficient water to meet domestic needs is reliably available close to home

Target language	Normative interpretation
By 2030, achieve	
<i>universal</i>	Implies all exposures and settings, including households, schools, health facilities, workplaces and public spaces
<i>and equitable</i>	Implies progressive reduction and elimination of inequalities between population subgroups
<i>access</i>	Implies sufficient water to meet domestic needs is reliably available close to home
<i>to safe</i>	Safe drinking water is free from pathogens and elevated levels of toxic substances at all times
<i>and affordable</i>	Payment for services does not present a barrier to access or prevent people from meeting other basic human needs
<i>drinking water</i>	Water used for drinking, cooking, food preparation and personal hygiene
<i>for all</i>	Suitable for use by men, women, girls and boys of all ages, including people with disabilities

India adopted the definition of access to drinking water source from Joint monitoring programme (JMP) for water and sanitation. The data for the indicator analysis are however supplied by various organizations at national level for SDG. The organizations who majorly conduct survey are Census of India, National Sample Survey Organisation (NSSO), National Family Health Survey under International Institute for population Sciences (IIPS), Mumbai. There is not any institute which defines accessibility to water but the data collected under census for availability of water source is interpreted as access to water.

The recent report published from the data collected by the Census -2011, “Houses, Household Amenities and Assets – Drinking water data” suggests that the definition of access to drinking water source has two components:

1. Distance to the location of drinking water source
2. Source of drinking water

It is often interpreted that households having access to drinking water source with the mentioned distance is considered as having access to drinking water.

1. Distance to the location of drinking water source

Within the premises: if the source was located within the premises where the household lived

Near the premises: if the source was located within a range of 100 meters from the premises in urban areas and within a distance of 500 meters in the case of rural areas.

Away from the premises: if the drinking water source was located beyond 100 meters from the premises in the urban areas and beyond 500 meters in the rural areas (Census, 2011).

It should be noted that “Premises” has been defined as a building along with the land and/or common places attached to it. A premises may not always have a compound wall or fencing. In such cases, that land or the common place as the case may be, available to the household is treated as ‘premises’

2. Source of drinking water:

The census metadata 2011, categorized sources of drinking water into –

- (1) Tap water, (2) Hand pump, (3) Tube well/Borehole, (4) Well, (5) Tank, Pond, Lake, (6)River, canal, (7) Spring and (8) Any other (Census, 2011).

The source which is majorly used throughout the year is considered and recorded as the main source of drinking water (Census, 2011).

This definition of access to drinking water sources is also interpreted as access to water. The economic survey 2011-12 interpreted this access to water sources as access to water (GOI, 2011).

Another interpretation of the access to sources of water supply can be inferred from the press information released by the Press Information Bureau, GOI stated by Ministry of Drinking water & Sanitation where data derived from census being considered as access to water instead of availability/access to water sources (Ministry of Drinking Water & Sanitation, 2013).

Along with Census, NSSO and NFHS also collects data about the aspects of drinking water. Along with the data required for the MDG, additional aspects like distances traveled to fetch water, time taken to reach, waiting time, quality, sufficiency and details of the supplementary sources, storage mechanisms and method used in taking water. The water used for household activities, it’s sufficiency and rates are also surveyed with a sample based survey (NSSO, 2014). National Family Health Survey (NFHS), collects data on the source of drinking water (categorized as per JMP), location, time taken to reach the sources, responsibility of water in the house and if any efforts to make the water safer to drink

(NFHS, 2014). However these organizations do not have a standardized definition or approach in understanding the access to water as a single entity, but act as enumerating bodies.

From the above list of definitions it can be understood that there is no one common definition explaining the access to water. However in India it can be understood that the definition and data about 'accessibility to drinking water sources' are interpreted as 'ACCESS TO DRINKING WATER'.

3.2 Dilemma of the definition/ Understanding from the local cases:

Water is considered as a public good and has been a part of constitutive right to life and it is the state's duty to provide clean drinking water to its citizens under Article 21 (Anand , Wankhade, Raman, Deb, & MJ, 2016). In addition to the states initiatives, service level benchmarks (SLBs), which are developed by MoUD, have set certain benchmarks like coverage, sufficiency, continuity, quality etc. which should be followed by the state. Even though the SLB's indicators cover certain important elements contributing to access to water, they are not integrated with the location and type of source criteria of the definition. SLB's are clearly service provider's perspective where as there is need to understand the consumer side's availability and accessibility to the resource. Even though many of the slums that are upgraded and provided infrastructure under many national and local programs, there are still accessibility gaps.

Another recent report India Exclusion report-2015, a section on tracing exclusions in water supply and sanitation also suggests the effects of time and quantity issues faced by the households residing in slum areas in accessing water. The social outcomes of having low availability and uneven timings of supply are strongly argued. The data for this section of the report is taken from Census, NSSO (Anand , Wankhade, Raman, Deb, & MJ, 2016).

In addition to the above report, an article by Biraja Kabi Stapathy, analyses that it is important to consider timings of supply, quality of supplied water for a good health quality of a household. He argues that the water coverage is merely a factor and it should be added along with the continuity, quality and safe handling storage factors when considering access to safe drinking water (Satapathy, 2014). The paper on informal markets and willingness to pay for water by L.Venkatachalam, touches upon the issue of being supplied insufficient amounts of water in slums in urban areas, hence forcing them to buy water from informal markets or approach unreliable sources (L.Venkatachalam, 2014).

The literature study projects the importance of the parameters that has to be considered before tagging a household as having access to water. But, a complete absence of specific definition and an interpretation of accessibility to water source as accessibility to water has to be re thought. To understand the accessibility to drinking water, firstly the parameters that affect and promotes accessibility has to be studied. Therefore an effort has been made in this study to examine the physical, social and economic parameters that may influence the access to water in slums.

4. ANALYSIS:

The following chapter explains the major findings of the household surveys and personal interviews with various stakeholders. The analysis is categorized into three major headings – 1) Physical 2) Social and 3) Economic parameters which are further explained through detailed indicators.

4.1 Physical Parameters:

There are many sources through which water is collected by the households. In the case of these selected slums there are private agencies and the local water board supplies water through various modes. The local water board HMWSSB, draws water from the major 6 water sources and treated at various collection and reservoir levels and supplied to the consumers. The water is supplied through individual taps inside the house, tap inside the premises of the plot, community tap outside the premises and tankers.

The water collected is categorized on the basis of usages. The two usages are for

1. Drinking and cooking purposes
2. Other purposes which include bathing, washing of clothes, utensils, cleaning of house and flushing of water closes/ sanitation purposes.

Depending on the quality of water, and the quantity available, the water is collected from the same source for both the purposes or from multiple sources for the different uses.

According to the definition all the households have access to water technically however, in the current survey conducted in these 10 slums, around 56% of the sample households use water from the single source for both the purposes and 44% of the sample households use water from multiple sources depending upon the usage.



Individual tap inside house



Tap inside premises



Tankers



Community tap outside

Table 2 Percentage of households collecting water from various source across location

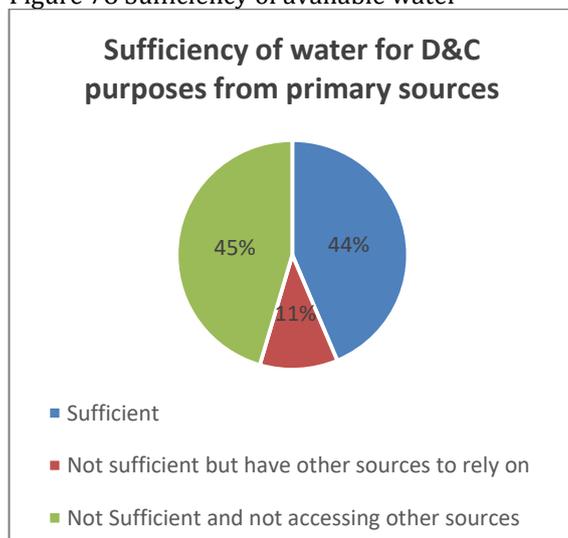
Location of Slums	Households Collecting water from following mode of supply for drinking and cooking purpose				
	Individual tap inside the house	Tap inside premises	Community tap outside the premises	Tankers	Responded Households
Core	0 (0)	25 (63)	15 (38)	0 (0)	40 (100)
Periphery	4 (10)	14 (35)	12 (30)	10 (25)	40 (100)
Hilly area	0 (0)	7 (23)	8 (27)	15 (50)	30 (100)
Total	4 (4)	46 (42)	35 (32)	25 (23)	110 (100)

*Numbers in brackets are in percentages
Source: Primary Survey 2017.

4.2 Sufficiency of water:

Eventhough according to the current definition, the respondent households have access to water, huge insufficiencies of water collected by the surveyed respondents has been recorded.

Figure 78 Sufficiency of available water



The core idea behind this study being the sufficiency of water available to the households, it is noted from the survey that 45% of the households responded insufficiency and as not relying on other sources of water, and 11% of the households have insufficient water and they don't have any other sources to collect water from.

This problem is more in hilly areas where 83% of the households have single source & insufficiency. This problem of insufficiency is recorded to get higher during summer seasons. 99% of the respondent households reported insufficiency of water during summer seasons. The respondents gave the main reasons for insufficiency of water as duration of supply, uneven timings, frequency of supply, pressure of water supplied. The 11% of respondent households mentioned the absence of information about timing of supply, absence of facility & service, loss of income if travelled larger distances. During the study visits, it was quite evident of the closed and dysfunctional taps and long waiting ques. The inference

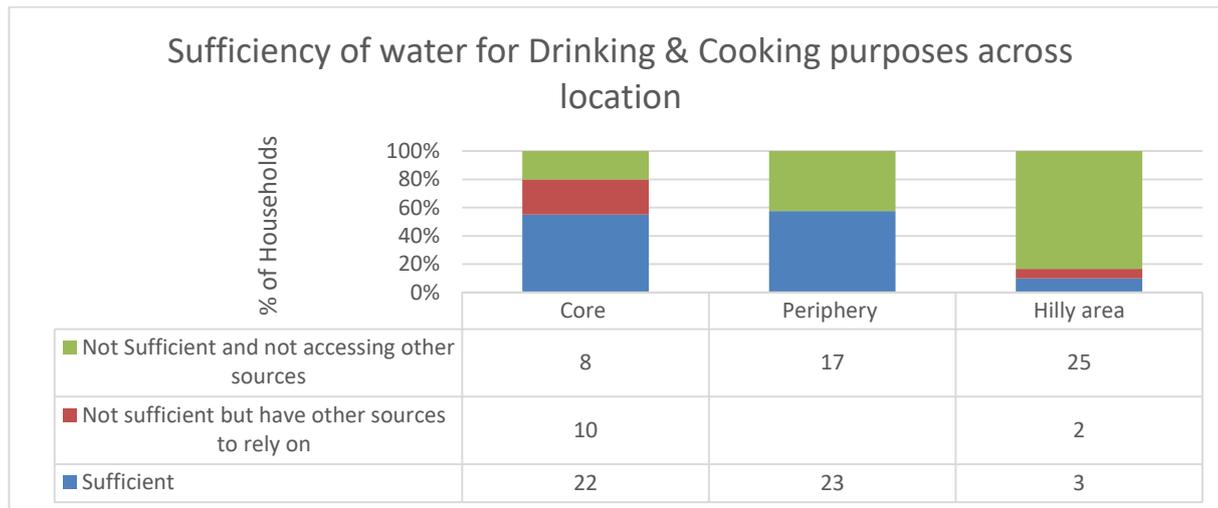
also strongly indicates that having infrastructure is not just enough but equally functioning and sufficient water availability at the consumer end is important.



Figure 79 Nonfunctional tap in a Slum



Figure 80 Taps used to tie cattle and pets in a slum



Source: Primary Survey 2017

Figure 81 Graph showing the varying sufficiency of water available to the households across the location

4.3 Quantity of water collected:

Understanding the insufficiency expressed by the surveyed households, further the data was analyzed to understand the quantities of water collected by the members of the household. When studied, an average of 24.3 liters is collected in core area, 33 liters in periphery and 18 liters in hilly area. This data when looked with correlation with the CPHEEO guidelines water required for drinking and cooking purposes per person per day is 10 litres and for other domestic purposes is 125liters, however the total per capita water collected per day for drinking and cooking purposes, the hilly areas have an average of 3 liters approximately of water availability per capita. Across the location the range of water quantity available ranged from 1.3 liters to 6.3 liters. For half of the sample households surveyed, at least 5 liters of water is also not available for drinking and cooking purpose. On the other side, the water available for other domestic purposes ranges from 1.7 liters to 80 liters. The core area has the least average quantities available and the periphery has the highest average. This was explained by the existing institution of supply. i.e., the private agencies who supply better quantities with efficiency. One important issue that has to be noticed is that this amounts of water collected for all purposes, there is an irregularity in the frequencies of supply. The average quantities might look satisfying with guidelines, but the water quantities ranges from 0.5 liters to 53 liters (these are extracted with relation to the frequency of water supplied and quantities collected).

Table 28 Average quantities of water available LPCD to the households across the location

Location of Slums	Average LPCD available		
	Average of quantity per person per day for drinking and cooking in liters	Average of quantity per person per day for other purposes in liters	Average quantity of water available for all purposes in liters
Core	10.2	14.1	24.3
Periphery	11.9	20.6	33.1
Hilly area	2.8	11.5	17.8
Average	8.8	15.8	25.8

Source: Primary Survey 2017.

4.4 Distance travelled to collect water:

To collect the required quantities of water, ideally some members or some cases all the family members travel to fetch water. The survey recorded the average distances travelled to primary, secondary and seasonal sources of water. People

travel an average of 32 meters for obtaining water for drinking and cooking purposes from the primary source. In case of insufficiency of the available water from this source, people travel an average of extra 600 meters to obtain water from secondary source. This average distance of 32 meters travelled by the household, gets 10 times higher in case of accessing a secondary source and 40 times during summer season. 12% of the sample households rely on secondary sources for water for drinking and cooking purposes and 14% approach secondary sources for domestic purposes. Out of that 12% people had to walk for an average of 600 meters, ranging from 100 to 1500 meters, for a secondary source which seasonally goes up to 3 kilometers. Along with this, the distance to access water for other purposes varies from 5 to 400 meters, which seasonally goes up to 3kms. With insufficiencies and people’s need to access more other sources to meet the requirements, increases the distance of travel.

Table 29 Average distance travelled by the household to collect water from various sources.

Average distance travelled by the households to access water in meters						
Location of slums	Primary Source		Secondary Source		Seasonal Source	
	D&C	OTHER	D&C	OTHER	D&C	OTHER
Core	7.3	10.85	845	675	619.2	668.3
Periphery	7.2	17.69	100	155	965.1	1620
Hilly	74	64	410	315	986.6	1501.6
Average	32.67	31.7	602.38	319.6	846.2	1263.3

Source: Primary Survey 2017.

4.5 Carrying Mechanism, Responsibility, Trips:

The water is carried along the distance from sources through two mechanisms, one is binde which has a carrying capacity of 10-12liters, where people have to make multiple number of trips to collect the required amount, the second one is barrel which can hold 120-180 liters, so ideally water is filled and later transferred upon the requirement from the barrels. The survey showcased that households with barrels as storage elements had better sufficiency. But not every household have space to keep a sump or a barrel to collect and store whenever water is released.

Binde
10-12 liters

make multiple number of trips.

Barrel
120-180 liters

Fill the barrels first and transfer the water upon requirement



Source: Primary Survey 2017.

Figure 82 Images showing carrying mechanisms, women & children involved in collecting water.

It is evident from the study that water when supplied to public posts or nearby taps, not everyone in the household carry water for themselves. So, the responsibility of collecting water is taken up by one or two member of the family. The study showed that mostly in every household female members collect water. Along with female members 25% of the households have children involved in collecting water. In 5% households, every member is involved. To meet the quantity requirements the person responsible in collecting water from the household make multiple trips. In the present study one single trip is considered as travelling from home to source, waiting and return from source to home. An average of 4 trips are made to collect water for drinking and cooking purposes and an average of 7 trips for other hygiene and domestic purposes. The member of the family usually walk to the source, however during summer, autos are used for carrying water. From a focus group discussion, it was told that women are facing the brunt mostly, even during extreme sickness and extreme climatic conditions they are forced to collect the whole quantity of water required for the entire household.

The average time in making trips to collect water was studied. The average time to collect required amount of water is increasing from core to hilly area. For example, it takes an average of 20 minutes to collect water in core area where as it takes an average of 1 hour 20 minutes in hilly areas. The time taken to collect water for drinking and cooking purposes ranges from 10 minutes to 3 hour 45 minutes. During summers the average of 30 minutes to collect water becomes 6 times higher i.e., 4 hours approximately just to obtain water for Drinking & Cooking purposes. This problem of long durations of collecting water is aggravated as water is collected for other purposes. On an average it takes 1 hour 20

minutes whereas during summer season it can go till an extent of 10 hours just collect water for other purposes. The collecting member of the household waits for 2-45 minutes to collect water for drinking and cooking purposes & 15 to 1 hour 40 minutes to collect water for other purposes.

Location of the slums	Average time taken by the household to collect water			
	Source of water during the Period of Survey (January & February 2017)		Source of water in April & May 2016	
	Drinking & Cooking purposes	Other purposes	Drinking & Cooking purposes	Other purposes
Core	20.7 min	52.7	4 Hrs	7 Hrs 33.5 min
Periphery	38.5 min	1 Hr	4 Hrs 20 min	8 Hrs 40 min
Hilly area	1 Hr 13 min	2 Hrs 22.7 min	4 Hrs 32.5 min	11 Hrs
Average	44.2 min	1 Hr 20 min	4 Hrs 16 min	9 Hrs (Approx.)

Source: Primary Survey 2017.

Figure 83 Time taken by the member of the households to access water across the location.

The major part of the day for the person responsible in collecting water is lost in waiting in long ques for the water. Most of the times, the person collecting water leaves their barrels near the water source or the end of their streets and proceeds with their daily work. So the data reflected as 11 hrs which is the average reflects the output of the similar water collecting patterns.

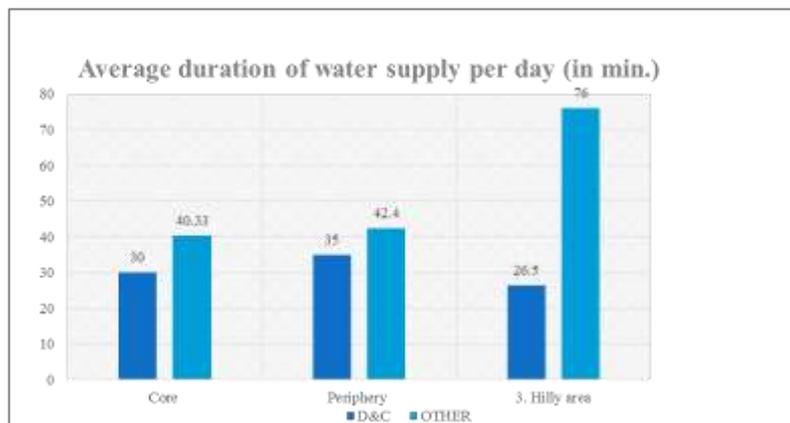
4.6 Timings of Supply, duration and information:

Water for both the purposes are supplied differently at different timings. There is also a category of households having no information about the supply. In this case there us an irregularity and fluctuation of supply timings every day, which makes it difficult for the member of the household to collect water. Here, the information of supply plays a major role. Only 36% of the households have prior information of supply plays a major role. Only 36% of the sample households have prior information and 64% do not have any information regarding the timings of supply. To cope up with this serious issue of unknown timings, most of the households leave the tap open to directly fill the buckets and most of the times which results in overflow and wastage of water. It is a very common sight to see water filled streets whenever water is released by the service provider. 37% of the households rely on neighbors to collect water where as 7% leave the barrels connected to the water taps outside the house. However the timings of supply are mentioned on the HMWSSB website and the actual timings and duration of service delivery are majorly different. It is also common to find women running after tankers to collect water. The water for both the purposes are supplied differently timings.



Figure 84 Images showing broken taps, barrels left outside the houses.

Water is supplied for an average duration of 30 minutes. The supply duration ranges from 5-90 minutes under which 5-6 households relying on these community taps should fill the required quantities. The average duration of water supplied for other purpose is 53 minutes ranges from 30 to 60 minutes. Around 50% of the household population, do not have an access of at least 30 minutes.



Source: Primary Survey 2017.

Figure 8 Duration of Availability of water for the households in minutes.

From the surveyed households none has a daily water supply for cooking and drinking purposes. When looked into detail, the households in core area have more alternate day supplied and as it goes towards hilly area people receive water once in 3 days. With 96% of the population not having service till inside of the house, and absence of information/unaware of the supply timings and frequency, the real stress is borne by the woman or the member responsible in collecting water for the entire household.

Table 30 Households and frequency of water supply for drinking and cooking purposes across the location.

Location of Slums	Frequency of water supplied					
	Alternate Day	Once in 3 to 4 days	Once in 5 to 6 days	Once in Week	Extremely Irregular	Responded Households
Core	16 (40)	9 (22.5)	10 (25)	2 (5)	3 (7.5)	40 (100)
Periphery	13 (33)	25 (17.5)	8 (20)	4 (10)	8 (19.5)	40 (100)
Hilly area	6 (20)	24 (80)	0 (0)	0 (0)	0 (0)	30 (100)
Total	35 (32)	40 (36)	18 (16)	6 (6)	11 (10)	110 (100)

*Numbers in brackets are in percentages

Source: Primary Survey 2017

The households in the slums generally store water in tumblers, bindes, buckets, barrels or sumps with in the house. The storage capacity of binde ranges from 10 to 12liters, Barrel 160 to 200 liters, sump 200 to 350 liters buckets 10 liters. From the conducted study it was also understood that the better the storage, better the sufficiency. For example, the households in the periphery area have a storage capacity of an average of 510 liters per family had better sufficiency.



Figure 85 A street with barrels to store water on either side in a slum

5 ECONOMIC PARAMETERS

A minimum bill for a household connection is 180 rupees for the water supplied from HMWSSB. Unofficially, an amount of 20-30 rupees is paid to the lineman. The amount depends on the duration of water being released. 40-50 rupees is paid to the tanker driver to collect water. The establishment costs being one rupee according to the recent G.O, the slum dwellers end up paying more to the intermediate stakeholders due to their unfamiliarity and fear of not getting a connection. Often in certain slums people pool money and get connection to access to water for other purposes. In one of the slums, people get frequent messages and notices to pay water bills even though HMWSSB did not supply with neither facility nor service. During summer seasons they pay some amount up to 50 rupees for accessing water towards house owners who have water with in their compound.

6 SOCIAL PARAMETERS

There were no caste and religion biases reflected in the surveys of focus group discussions. However, the location of the house inside a slum played a major role. Households located near the roads are treated to be financially stable and have

better access to water as they are close to the road. During another personal interviews with lineman, and the officers at HMWSSB it was highlighted that due to existing narrow lanes it is difficult to provide service till the interiors of the slums.

7 CONCLUSION:

Refreshing the whole idea behind this study of access, in spite of having the source within 100 meters there are inadequacies of water availability, mis-informed timings, forcing the people to rely on secondary sources, leading to spend more money, time and efforts. The definition of access to water has to be critically looked at with the supporting inferences like insufficiencies, longer waiting periods, and larger distances to be travelled which in turn effects the overall well being and health of the family. The study relieves the fact that there is access to facilities, yet there is an inadequacy of service and the service should be looked at an availability perspective on the consumer end rather than service provider's view alone. With the analyzed parameters i.e., the quantity, quality, frequency, duration and timings of supply the existing definition of access to water should be re-thought.

BIBLIOGRAPHY

- Alankar. (2013, Socio-Spatial Situatedness and Access to Water Economic & Political Weekly). Socio-Spatial Situatedness and Access to Water. (2013, Ed.) *Economic & Political Weekly*, Vol. 48(41), 46-54.
- Anand , G., Wankhade, K., Raman, R. K., Deb, A., & MJ, V. (2016). Tracing exclusions in Urban Water Supply and Sanitation. In *India Exclusion Report* (pp. 67-106). New Delhi.
- Bartram, J., Fisher, M. B., Brocklehurst, C., & Hossain, R. (2014, August). Global Monitoring of Water Supply and Sanitation : History , Methods and Future Challenges Global Monitoring of Water Supply and Sanitation : History , Methods and Future Challenges. *International Journal of Environmental Research and Public Health*, 8137-8165.
- Census. (2011, March 13). *Census of India*. Retrieved April 15, 2017, from censusindia.gov: http://censusindia.gov.in/2011census/hlo/Data_sheet/India/Drinking_Water.pdf
- GHMC. (2013, May 21). *Slum Free City Plan of Action*. Retrieved January 15, 2017, from Ministry of Housing and Urban Poverty Alleviation: mhupa.gov.in/writereaddata/Hyd_AP_sfcpl.pdf
- GOI. (2011). *Union Budget & Economic Survey*. Retrieved from indiabudget.nic: <http://indiabudget.nic.in/budget2012-2013/survey.asp>
- GOI. (2013, May 10). *Urban Development*. Retrieved January 14, 2017, from Planning Commission: http://planningcommission.nic.in/hackathon/index.php?sector=Urban_Development
- L.Venkatachalam. (2014, June 11). Informal water markets and willingness to pay for water : a case study of the urban poor in Chennai City , India. *International Journal of Water Resources Development*, 31(01), 134-145.
- Ministry of Drinking Water & Sanitation. (2013). Access to Potable Water. (p. 3). New Delhi : Press Information Bureau. Retrieved April 12, 2017, from <http://pib.nic.in/newsite/PrintRelease.aspx?relid=101803>
- MoHUPA. (2011). *Slums in India*. New Delhi: Government of India.
- NFHS. (2014, November 25). *National Family health survey, India*. Retrieved from IIPS Website: <http://rchiips.org/NFHS/NFHS4/schedules/NFHS-4Household.pdf>
- NSSO. (2014). *Drinking Water , Sanitation , Hygiene and Housing Condition in India*. New Delhi: Government of India. Retrieved April 10, 2017, from [http://indiaenvironmentportal.org.in/files/file/Drinking Water, Sanitation, Hygiene and Housing Condition in India.pdf](http://indiaenvironmentportal.org.in/files/file/Drinking_Water,_Sanitation,_Hygiene_and_Housing_Condition_in_India.pdf)
- Satapathy, B. K. (2014, June 14). Safe Drinking Water in Slums. *Economic & Political Weekly*, 24(49), 50-55.
- UN. (2015, July 27). *Millennium Development Goals Indicators*. Retrieved April 15, 2017, from United Nations site for MDG Indicators: <https://mdgs.un.org/unsd/mdg/Metadata.aspx?IndicatorId=30>
- UN. (2015). *United Nations General Assembly Draft outcome document of the United Nations summit for the adoption of the post-2015 development agenda*. Retrieved November 08, 2016, from United Nations.
- UN. (n.d.). *Goal 7*. Retrieved April 04, 2017, from UN web site: <http://www.un.org/millenniumgoals/environ.shtml>
- WHO, & UNICEF. (2015). *World Health Organisation*. Retrieved April 12, 2017, from WHO Website: <http://www.un.org/millenniumgoals/environ.shtml>

1301 FISHERMEN IN WETLAND REGION OF BANGLADESH: VIEWS FROM THE FIELD EXPERIENCES OF HAKALUKI HAOR

ABSTRACT

Bangladesh is a country of vast wetland. The beauty of Bangladesh lies in her water bodies which are full of natural resources. Wetland resources have been recognized as a major source of income and employment generating fields for marginalized people of Bangladesh. Hakaluki Haor is the biggest eco-based wetland network in Bangladesh. Most of the inhabitants are fully dependent on haor resources. This study attentively observes the socio- economic status of the artisanal fishermen of Hakaluki Haor of Bangladesh. It is explorative in nature. Qualitative and quantitative both approaches have been used to obtain the goals and objectives. Hakaluki Haor of Bangladesh has been selected as study area purposively. Upazillas, unions and villages have been selected through multi-stage area sampling procedure. On the other hand, Households have been selected on the basis of simple random sampling by using random number table. The main objective of this article is to identify the present socio- demographic background of haor fishermen in Bangladesh. In the context of this objective, the researchers have given emphasis on analyzing the actual situation of the household of fishermen in haor perspective. The researchers have tried to find out the social-economic and demographic scenario of haor fishermen of Hakaluki by using observation, interview schedule and key informants interview methods. By using those tools, the researchers have found various forms of findings and observations about the situation of haor fishermen. Study findings have been categorized on the basis of five capitals which are social, human, physical, financial and natural resources followed by the conceptual framework of the study. The study has explored the socio-economic state of the fishermen and most of the fishermen of the haor basin are living in the most awful and vulnerable situation of everyday life in terms of income, food security, housing patterns, health and sanitation condition, child marriage, social relation and state of interaction among the communities dwellers, family planning, decision making issue, power practice, participation in development activities, position in socio-economic institution in respective locality, and education. Child marriage is a common practice in haor area. Most of the decisions are taken by the male persons of the family. It has been observed that fishermen are mainly engaged in fishing for their existence. Therefore, the study has observed that the artisanal fishermen are facing severe crises for their existing profession. Study clearly shows fishermen are gradually shifting their artisanal profession from fishing arena because of various reasons. The researchers have discussed the several issues regarding social, economic, leasing and fishing environment of the fishermen of the Hakaluki Haor. : Artisanal, Wetlands, Haor, Hakaluki Haor, Resources, Bangladesh

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SS01.3. Water management in South Asia: From conflict to cooperation

1305 STRATEGIC ALTERNATIVES TO LIFE THREATENING SALTS**PAULO CASACA**SADF, paulo@sadf.eu**ABSTRACT**

The Portuguese head of the 'National Programme for the Promotion of Healthy Food' recently classified salt as the 'public enemy number one' in a press article issued on the occasion of a government project to tax salty food. The article explains how this substance was transformed from one of the most historically prized and essential elements in food and food processing into one of the most toxic health hazards of our time. For a considerably longer period of time, a man-made salinization process has been destroying arable land and aquifers, creating deserts and corroding urban infra-structures. Recent estimations point to 20% of cultivated and 33% of irrigated land in the world as salt-affected and degraded. Drinking water salinity and heavy metal contamination became a major health hazard in the basins and specially deltas of such important water sources as the Indus, the Ganges- Brahmaputra-Meghna or the Mekong. The unsustainable and or inadequate use of freshwater, combined with unsustainable urbanisation practices, resulted in land subsidence and sea water infiltration. They are leading to dramatic outcomes and putting at risk such large metropolis as Jakarta. Meanwhile in cooler climatic areas salt by the million tons is dumped in nature every year for de-icing roads and affecting the environment in insufficiently studied yet certainly negative ways. The reversal of the natural salinization process – through sea desalination – has been ongoing for many decades and decisively affected human life in some desert coastal areas, at considerable energy costs and a mixed environmental impact. In some areas, as in California, desalination plants have also started to operate so as to reverse earlier soil salinization linked to agricultural activity. In the European context, whereas some public authorities – such as the one mentioned at the beginning of this text – are conscious of the importance of the issue, most of them downplay it and do not understand or want to acknowledge its crucial dimension. A project I headed under the present title was summarily rejected by an anonymous jury of an European co-financed call for projects saying '...soil salinization which affects large areas of the developing world - would benefit from having more consortium members from affected, developing countries that have specific issues with salinization and impact upon food production.' That a European-funded body, presumably composed by scientists, considers salinization to be a 'developing world' problem is a clear indicator of the alarming state of denial existing on the issue. In this paper, we defend Strategic Alternatives to Life Threatening Salts to be based on a comprehensive understanding of the challenges accompanied by a global, systemic effort supported by the international community.

1. THE DESTRUCTION OF LIFE THROUGH SALINIZATION

The issue I am highlighting today, salinization, is hardly a novelty; it has been around for thousands of years and has been consensually viewed as the main factor behind the crumbling of early civilisations such as the Sumerian. The scientific knowledge needed so as to understand the crux of this particular matter is also relatively simple.

As a [popular text book to be found in the web](#) explains, salinization (and the related waterlogging process) can be seen as the result of the destruction of the natural water-salt equilibrium.

When irrigation brings more salt to the land than is drained out to rivers (and ultimately the sea), the classic result is salinization. This normally happens in hot climates where flooding irrigation is practiced; when most of the water evaporates, salt is gradually deposited in the land. Otherwise, in the case of waterlogging, a previously existing saline water table gets up to the plant roots through the influx of irrigation water. Saline water tables form under the soil due to the same disequilibria between the salt brought by water mineral erosion and the insufficient drainage (necessary so as to wash this salt to the rivers and the sea).

As the process can develop across a long period of time – encompassing at least several generations – its disastrous long-term results tend to be overshadowed by the short-term benefits of irrigation itself. This happens in spite of the fact that it is fairly easy to predict the future results of these practices.

For the last two centuries, a man-made salinization process has been destroying arable land and aquifers around the world, corroding urban infra-structures and creating artificial deserts. [Recent estimations](#) point to 20% of cultivated and 33% of irrigated land in the world as salt-affected and degraded.

Salinity and heavy metal contamination of drinking water became a major health hazard in the basins and specially deltas of such important water sources as the [Indus, the Ganges-Brahmaputra-Meghna](#) or the Mekong.

The unsustainable and/or inadequate use of freshwater, combined with unsustainable urbanisation practices, resulted in land subsidence and sea water infiltration. These are leading to dramatic outcomes and putting at risk a number of large metropolis; for instance [Jakarta, that is sinking into the Ocean](#).

There is today a novelty regarding the salinization process that makes it even more widespread than in ancient times: its extension to cooler climatic areas. Salt by the millions of tons is now dumped in nature every year for the purpose of de-icing roads; and this, of course, has strong environmental effects. Recent estimates indicate that in the US [up to 20 million of tons of salt](#) have been dumped annually, with [impressive negative environmental and health impacts](#).

The reversal of the natural salinization process – through sea desalination – has been ongoing for many decades now and has decisively affected human life in several desert coastal areas, at considerable energy costs and with a mixed

environmental impact. In some areas, as in California, desalination plants have also started to operate so as to reverse earlier soil salinization linked to irrigation.

2. SALTY OBSERVATIONS

Three years ago, travelling by midday in the Indian Northern Punjab, I was flabbergasted to see huge parcels of land being flooded as the sun stood high and temperatures bordered 40° C. I recalled the first time I arrived in Iraq, in 2004, where I saw a similar scenario in the middle of the desert, in the vicinity of the Euphrates.

Back home, in Southern mainland Portugal, when in 2003 I tried to learn some practical notions of agriculture by buying and exploiting an olive grove, I was confronted by a similar setting: I was only authorized to dig a well (and have water to drink) if I claimed I intended to use said water for irrigating the olive trees. To my surprise, I found that the salts content in water was not taken in consideration in the official analysis. The [Portuguese law](#) only recommended that salt levels remain below 640 ppm. The European legal framework – generally known for its minute detail and comprehensive dimension – is completely silent in this domain.

In 2015, in a conference organised on the fringes of COP 21, I argued for an [inclusive sustainable development strategy](#) meant to overcome the ‘climate change’ monomania. In September last year, in ‘[For a meaningful SDG agenda](#)’, I stressed how this ‘climate change’ unidimensional mind-set undermines the international environmental agenda by preventing comprehensive understandings and plans of action.

Still in 2017, as I integrated a multinational project named ‘[Strategic Alternatives to Life Threatening Salts](#)’, I was stunned yet again as I witnessed an anonymous jury refusing our project by claiming that the issue was ‘not relevant in the developed world’.

Human development in the past three centuries created unprecedented challenges to life in our planet; among them, a possible nuclear holocaust, unparalleled destruction of nature and biodiversity, and changes in the composition and functioning of hydrological, geological and atmospheric systems. These phenomena, of course, present a number of potentially hazardous impacts - among other things, on the earth’s climate.

3. SALTS AS A HEALTH HAZARD

The Portuguese head of the ‘National Programme for the Promotion of Healthy Food’ recently classified salt as ‘[public enemy number one](#)’ in a press article issued on the occasion of the presentation of a government project aimed at taxing salty food.

The article explains how this substance was transformed from one of the most historically prized and essential elements in food processing into one of the most toxic health hazards of our time.

As the author explains, Portugal has a peculiar relation with salt. The existing largest Ancient Roman salt-fish processing ruins are located in Portugal. Salted cod fish is still the quintessential national dish, and salt was indeed and for a long time the country’s number one export.

But what is the assessment we can make of the situation in the above-mentioned deltas of South and South-East Asia, where access to drinkable, unsalted water is denied to hundreds of millions?

Whereas some studies conclude that there is a [strong correlation between high salinity of drinking water and hypertension](#) in areas impacted by salinization, such as Bangladesh coastal areas, we have all the reasons to expect the health problem to be more serious in a region so deeply affected by salinization as South Asia than in a country such as Portugal. Precise studies, however, are lacking.

4. THE GLOBAL WARMING MANTRA

Googling through the drama of salinization, it is hard to escape the sight nearly everywhere: the issue is described as the consequence of ‘global warming’ or ‘climate change’.

It is clear that changes in climate can indeed exacerbate salinization impacts. If we look to [European rainfall statistics](#), we can see that from 1960 to 2015 rainfall decreased annually and most in particular in summer across the South of Europe whereas the opposite has been the case in the North of Europe, that is, rainfall increased there, in particular during the summer.

At the same time, average temperatures have been steadily rising. This situation obviously increases pressures related to salinization. Conversely, the increase in rainfall can mitigate the salinization impact of large-scale use of salt as a defrosting substance in Northern Europe.

It is however not in conformity with reality to transfer to the climate sphere the very well-known impacts of either irrigation by flooding or defrosting by dumping salts. These are completely different phenomena. The salinization is not caused by changes in climate, but it can be aggravated or mitigated by changes in climate. It is thus disappointing to see this reversal of roles being widespread in scientific literature - without any scientific evidence to sustain the claim.

I think the issue does not deserve any in-depth physical scientific discussion since, as we have pointed out, the basics of the phenomenon are pretty simple to understand and its dramatic impacts have been evident for thousands of years.

The problem is rather connected with mass psychological denial of reality when humanity finds said reality to be too hard to be faced. I still remember the explanation I got from the laboratory when I contested the absence of salinity data in the water analysis: 'everyone knows there is salt in our water, why should we go over it?'

So, the immediate conveniences of irrigation or defrosting press us to forget about their nasty long-term effects or to disguise them as unavoidable occurrences which have widespread and diffuse origins (phenomena like climate change). That is, anything rather than facing the need to change our practices.

5. CONCLUSIONS

There is every reason to believe that man-made salinization is a life-threatening phenomenon that is no less important than others, and certainly more important than man-made 'climate change'.

The widespread denial of the importance of the phenomenon is not restricted to those who do not understand it; on the contrary, it is ingrained among political decision-makers and the scientific community. The modern tendency for general attentions to flock around trendy issues while disregarding objective analysis has not been helpful in this respect.

Salinization can only be prevented within a multidisciplinary approach and within an integrated developmental vision, as it centres on the water-food-energy-health-environment nexus and is also impacted by other phenomena (including, of course, changes in climate). More significantly, its dimension and its impact need to be studied in proportion to its importance and with scientific rigour and objectivity.

South Asia is probably the region in the world most affected by the problem; hundreds of millions of lives crucially depend on a successful understanding and feasible solution. This is also a reason why to discuss the issue within the Goa regional science world conference.

1499 GEOPOLITICS OF WATER CONFLICTS IN THE TEESTA RIVER BASIN

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ABSTRACT

The Teesta basin is among the more underdeveloped areas of South Asia and deals with numerous issues spanning across economy, governance and politics, culture, environment, gender, security, and its riverine ecosystems. All these issues varying greatly in intensity and nature are nevertheless linked together by the Teesta which acts as a common thread running through them all.

The basin is known for the lack of an agreement between India and Bangladesh over sharing its waters, however, internal disputes such as the anti-dam movement in Sikkim, the struggle for Gorkhaland, and the 'Save the Buri Teesta' movement in Bangladesh are also significant issues tied to the bilateral relations between the two riparian nations.

The paper focuses on the geopolitics of water conflicts of the Teesta basin. Geopolitics is the study of the relationship between geographical factors and variables, and politics. Water conflicts are disputes over access, ownership, control and use of water resources between any two or more groups. Thus, this paper attempts to look at the current major conflicts within the Teesta basin from a political perspective based on their geographic profile.

Water resources in South Asia have been directly connected to national sovereignty and security for many reasons such as growing demand due to overpopulation and rapid urbanisation, consequent scarcity of the resource, mutual distrust among riparian neighbours, lack of multilateral and holistic initiatives for cooperation, and lack of robust dispute resolution mechanisms. The Teesta basin has a rapidly growing and urbanising population dealing with poverty and a low standard of living. The river, due to heavy damming, chemical contamination, deforestation and climate change, is experiencing erratic flows with a sharp decrease in the total volume of water. There is a dearth of trust and serious efforts to cooperate jointly over conservation of the river and development of the basin. Also, comparing the discourse on the Teesta with the actual conditions of the river and her riparians leads to the conclusion that the interests of the local stakeholders and the health, sustainability, economic value and spiritual importance of the river have not been prioritised in the negotiations over the Teesta. Thus, it can be seen that the Teesta issue is much more than a signature on an agreement.

This paper hypothesises that the phrase 'Indo-Bangladeshi conflict over the Teesta river' is inaccurate, for the Teesta conflict is neither about the river nor a conflict between India and Bangladesh (who share a good rapport), but a product of domestic politics and regional geopolitics, and has little to do with the river and her health. It does not negate the discontent over intense damming upstream and severe reduction in water flow downstream of the Teesta but states that the causes and effects of this discontent are rooted in socio-cultural and economic forces; after an extent, it is no longer about the river and her environment. On closer scrutiny, one can observe that disputes over the Teesta are a façade for various political, social, economic and geopolitical interests playing out at domestic and national levels in both countries. The consequences are borne by the river and her people in the form of environmental damage, low level of development and low resilience towards the effects of climate change. The paper attempts to unearth these interests and provide pragmatic solutions that would not only solve the political disputes, but also promote environmental sustainability, economic efficiency and social justice in the Teesta river basin.

PREFACE

Water conflicts are rarely just about water. On the surface, they are about ownership, distribution, access to, and use of water resources. However, beneath the surface are multiple layers of historical, cultural, religious, political, ethnic and economic conflicts, which manifest themselves time and again through the water conflict. Water conflicts are further complicated by the fact that they occur not only *for* water, but also *through* water and *at the cost of* water i.e. water can be not only a reason for conflict, but also a weapon for and victim (intended, or collateral damage) in conflict. This is exactly what a solo backpacking trip along the entire length of the Teesta river taught me. As I set out from the confluence of Teesta and Brahmaputra at Chilmari, Bangladesh, I met numerous locals, activists, NGOs, bureaucrats, academicians, farmers, businessmen and youngsters who spoke of various issues that beset their region. We discussed history, culture, society, politics and the environment, and the Teesta figured in each of them. For each person I spoke to, the Teesta was a mother, a goddess, a tyrant, a city landmark, a powerful resource, and nature's gift in distress. Her dwindling flows and the tussle to harness as much of her waters as possible for their farms, homes and hydropower stations formed the central theme of any discussion on the Teesta. While everyone had their own narrative depending on their profiles and locations, there was a general consensus that every riparian of the Teesta should be able to access her waters and prosper because "they too are human beings just like us".



In the wider picture, the role of geopolitics was subtle but permeating. Be it the strategically located Chicken's Neck buffered by Sikkim, or the drought-prone northernmost region of Rangpur far away from the markets and growth of Dhaka in Bangladesh, geopolitical conditions played a huge role in shaping the dispute over sharing the Teesta. Moreover, the goodwill and friendly sentiment for India among Bangladeshis, and the insistence of Indians that Bangladesh should get a fair share of the Teesta's waters made me realise that the dispute was not bilateral, but a summation of domestic friction, economic constraints, and political imperatives based in wider geopolitical realities of the South Asian neighbourhood and global phenomena such as climate change.

During my research on the Teesta, I came across a lot of papers that focused on the social, cultural, economic and scientific aspects of the Teesta basin, but very little on the geopolitics of it. I also read many articles that outlined Indo-Bangladeshi relations, the chronology of the Teesta talks and their importance for India and Bangladesh, the local dynamics of Rangpur division, West Bengal's stand on the Teesta issue, the struggle for Gorkhaland, and the anti-dam movement in Sikkim – but each issue was dealt in isolation. Nowhere could I find a comprehensive piece of work that linked together domestic issues of the Teesta **and** bilateral negotiations on sharing the river **and** the geopolitics of the region. This paper is an attempt to establish these connections and provide a clearer picture of water conflicts in the Teesta basin from a geopolitical angle and at the same time, spur more comprehensive and sophisticated work on these lines in the Teesta basin.

This conflict compels one to take a position. Throughout my travel and research, I have noticed the Teesta, at the heart of all disputes and yet silently accepting and nurturing the civilisation squabbling over her - in that lies her divinity. As I prayed at Tso Lamo, origin of the Teesta, I realised I stood for the Teesta, her environment, and their conservation, wellbeing and protection.

Being an outsider, I humbly accept that I have just about scratched the surface of the political, geopolitical, social and cultural dynamics of the Teesta basin. While I am immensely grateful for the valuable insights and help provided to me by the locals of the Teesta as well as all those I met and spoke to during this research, I apologize for any insensitivity or offense that could be perceived through the research and analysis in this paper as it is purely unintentional. Any feedback is welcome.

Gauri Noolkar-Oak

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This paper is preceded by a solo backpacking trip along the Teesta river, right from the Teesta-Brahmaputra confluence at Chilmari, Bangladesh, all the way up to Teesta's origin at Tso Lamo lake, India. I was able to undertake this adventure all by myself thanks to the wonderful people I met on the way, who generously offered me a place in their homes, lots of help, and friendships to cherish. For their heart-warming hospitality and support, I am indebted to –

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My most heartfelt gratitude goes to my family, my parents, grandparents and in-laws, for their continuous encouragement, support and appreciation throughout this fellowship. I feel lucky to not have been held back by domestic constraints and enjoy the freedom to pursue such adventurous journeys and research projects. And last but not the least, my deepest appreciation, gratitude and affection goes to my husband Amogh who stood by me, took great care of me, and helped me in every conceivable way to give my best to this endeavour, and also to my cat, Bokus, who, with his innocence and eccentricity, kept me happy and relaxed through it all.

RESEARCH METHODOLOGY AND LAYOUT OF THE PAPER

This paper presents a geopolitical analysis of water conflicts in the Teesta River Basin. The analysis is qualitative in nature and based on both primary and secondary sources of data. The primary data has been collected through a month-long journey in the Teesta basin, and various interviews, meetings and conversations with experts and stakeholders in India and Bangladesh. The secondary data has almost entirely been collected through online research.

Conflict mapping of the Teesta basin in this paper is based on a matrix of geographical space and political processes over time. Major stakeholders and their positions have been identified and through analysing the power dynamics between them, an attempt has been made to identify their underlying interests. A historical approach has also been taken to understand not only the main transboundary issue over the Teesta, but also domestic problems in Sikkim and northern West Bengal. The role of domestic politics in shaping bilateral relations on the Teesta has been analysed through the lens of Putnam's two-level game theory. The solutions provided are realistic and political in nature, but with the intention to promote environmental sustainability of the Teesta river basin, and efficient use and equitable allocation of its resources.

The paper has evolved through the following stages of geopolitical reasoning –

- a) Identification of the conflict and delineating its geographical space.
- b) Identification of major parties, their positions, intentions and interests.
- c) Analysis of the geopolitical factors related to the problem.
- d) Identifying the opportunities and constraints provided by these geopolitical factors to the major parties involved in the conflict.
- e) Formulating solutions that are pragmatic as well as promoting holistic conservation and development of the Teesta River Basin.

The paper is divided into seven parts. The first part gives a comprehensive view of the Teesta basin and its historic, geographic, demographic and economic features. The second part deals extensively with the conflicts in the Teesta basin. It is further divided into two sub-parts; the first gives a detailed account of the transboundary issue over the Teesta agreement and positions of parties in the conflict, and the second part analyses domestic conflicts on both sides of the border, namely in Sikkim, Gorkhaland and potentially in Rangpur. The third part of the paper presents collectively the case of the local communities across the Teesta basin. The fourth and fifth parts speak of two crucial aspects, namely groundwater and climate change, which have not been addressed in the overall Teesta issue. The sixth part analysis the position and impact of domestic conflicts on the bilateral relations over the Teesta. The seventh part provides a summary with pointed conclusions, and lists out probable solutions and measures from the point of view of each of the major parties involved in the Teesta dispute.

A. INTRODUCTION

The Teesta river originates at Tso Lamo, India and flows through the states of Sikkim and West Bengal in India and the Rangpur division in Bangladesh before pouring into the Brahmaputra river at Chilmari, Bangladesh. Her total length is 414 kilometres with an average annual flow of 60 billion cubic metres (BCM) of water – roughly the amount of water carried by 24 million Olympic level swimming tanks. Over 30 million people live in the Teesta river basin and are dependent on the river for drinking and domestic use, irrigation, industry, domestic needs and cultural and religious activities.

A.1. Nomenclature and History

The Teesta has various versions to her name. In the upper reaches i.e. in Sikkim, the indigenous Lepchas call her ‘Tee-sa-tha’. When she hits the plains, her Sanskrit name is ‘Tri-srota’ which translated literally means ‘three streams’ – Punarbhaba, Atreya and Karatoya – through which the erstwhile Teesta flowed and emptied into the Padma River near Rajbari, Bangladesh (Bhattacharyya A. , 1974) until 1787 when massive floods, most likely caused by an earthquake, led her to shift her course and migrate south-east and empty into the Brahmaputra instead. The Teesta rose to importance as the eastern frontier of the Mughal empire but for most of history, she played second fiddle to the Karatoya River, her easternmost stream, which is mentioned in ancient texts such as the Puranas, Mahabharata, Ramacharitmanas and Chinese traveller Hsuan Tsang’s writings. The Karatoya, once known to be “impassable” in the rainy season (Bhattacharyya A. , 1974) gradually dried up after the Teesta changed course in 1787 and is now reduced to a small stream in Bangladesh.

A.2. The River

Among the 54 rivers shared by India and Bangladesh, Teesta is the fourth largest. The total area of the Teesta river basin is 12,159 km² i.e. roughly thrice the size of the Indian state of Goa, with 2,004 km² or about 17% of it in Bangladesh and the rest in India. Within India, 6930 km² or 86% of the basin lies in Sikkim; in fact, it drains almost the entire state. The flow of the river is highly variable. At the Dalia barrage²⁹⁴ in Bangladesh, the average maximum flow of the Teesta has been recorded to be as high as 7900 m³/s while the average minimum flow has been recorded to be as low as 283 m³/s. Further damming and control of the river has reduced the flow to 28 or even 14 m³/s, especially in times of drought (Mondal & Islam, 2017). The average annual flow of the Teesta is about 60 BCM. The seasonal variation rate of the Teesta is about 1:10, i.e. 90% of her water, roughly 54 BCM, flows in the rainy season from June to September. This means that the flow through the rest of the year is a mere 6 BCM. It is this phenomenon – reduction of Teesta flow during lean season – which is the bone of contention between India and Bangladesh.

The Teesta flows through three states/divisions of two countries, namely the states of Sikkim and West Bengal of India and the Rangpur division of Bangladesh. The Tso Lamo lake, located 5280 metres above sea level (masl), is the origin of the Teesta river, which is fed by the Teesta Khangse glacier descending from the Pahaunri peak located on the India-China border in North Sikkim. The river first flows as a small stream named Lachen Chu up to Chungthang where it joins Lachung Chu and takes the name Teesta.

Figure 86: Total Area of the Teesta River Basin

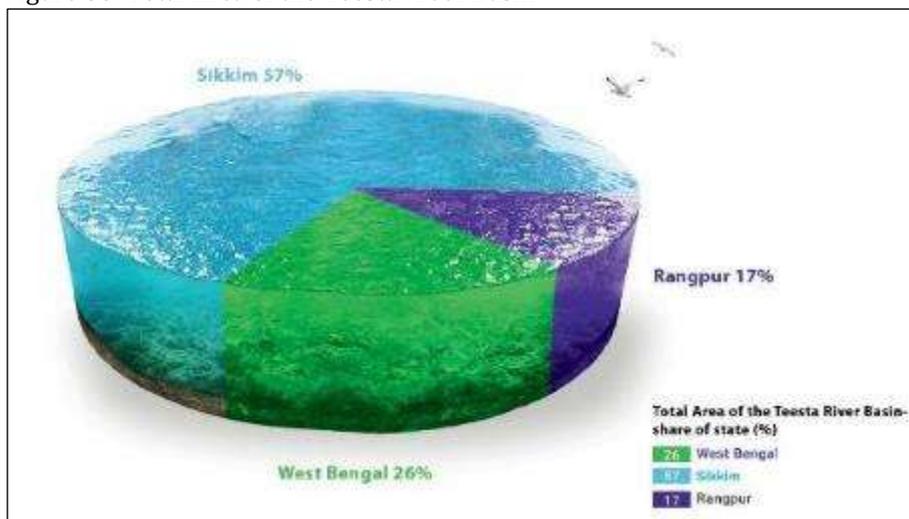


Figure 87: Total Length of the Teesta River

294 A barrage is a type of low-head, diversion dam which consists of a number of large gates that can be opened or closed to control the amount of water passing through. (From Wikipedia)



A.2.1. India

A.2.1.1. Sikkim

The Teesta cuts vertically through Sikkim and drains almost the entire state, flowing fast and furiously for 151 kms through deep gorges and narrow valleys. In just 100 kilometres, she descends from 5280 metres above sea level (masl) to 213 masl, a steep drop considered favourable for hydropower development. As she travels, she is fed by innumerable rivulets and tributaries, and briefly, she forms the border between West Bengal and Sikkim before entering West Bengal near Kalimpong.

A.2.1.2. West Bengal (northern region)

The Teesta flows as the Sikkim-West Bengal border and then through West Bengal, primarily through the northern districts of Darjeeling, Kalimpong, Jalpaiguri and Cooch Behar. She hits the plains at the Coronation Bridge at Sevoke, about 22 kms from the town of Siliguri and transforms from the turbulent, narrow river of the mountains to a slow, wide, braided²⁹⁵ river of the plains. After flowing for 142 kms, it enters Bangladesh near the town of Mekhliganj.

A.2.2. Bangladesh

A.2.2.1. Rangpur

In Bangladesh, the Teesta flows through the districts of Gaibandha, Kurigram, Lalmonirhat, Nilphamari, and Rangpur, all located in the Rangpur division, for 121 kms before joining the Brahmaputra near the town of Chilmari. Here, the river's braided course is further widened and varies from 300 to 550 m in width (Islam M. F., 2016).

A.3. Dams and Barrages on the Teesta River

The Teesta is a heavily dammed river. In its course of 414 kms, about 25 dams have been proposed or built, while 16 have been cancelled for various reasons. Most of these dams, with a total installed capacity of 4336 MW are planned/located in Sikkim.

Table 1: List of Dams in Sikkim and their Status²⁹⁶

Sr. No.	Name of Project	Installed Capacity MW	Latest Status
1	Teesta I (Teesta Stage I HEP)	280	MOU/IA cancelled as these areas fell within the vicinity of Kangchendzonga National Park
2	Teesta II (Teesta Stage II HEP)	330	MOU/IA cancelled due to non-performance of the developer.
3	Teesta III (Teesta Stage III HEP)	1200	Commissioned
4	Teesta IV (Teesta Stage IV HEP)	520	Major works still not started
5	Teesta V (Teesta Stage V HEP)	510	Project Commissioned
6	Teesta VI (Teesta Stage VI HEP)	500	Under construction (facing financial problems)
7	Lachen HEP	210	-
8	Panan HEP	300	Pre-construction works started
9	Rangyong HEP	117	Projects cancelled/not taken up as these areas fell within Dzongu area and in the vicinity of Kangchendzonga National Park.
10	Rongnichu HEP	96	Under construction
11	Sada Mangder HEP	71	MOU/IA terminated as no activities started at site.
12	Chuzachen HEP	99	Project Commissioned
13	Bhasmey HEP	51	Engineering and most items completed
14	Rolep	36	MOU/IA cancelled due to non-performance of the developer.
15	Chakhungchu	50	MOU/IA cancelled due to non-performance of the developer.

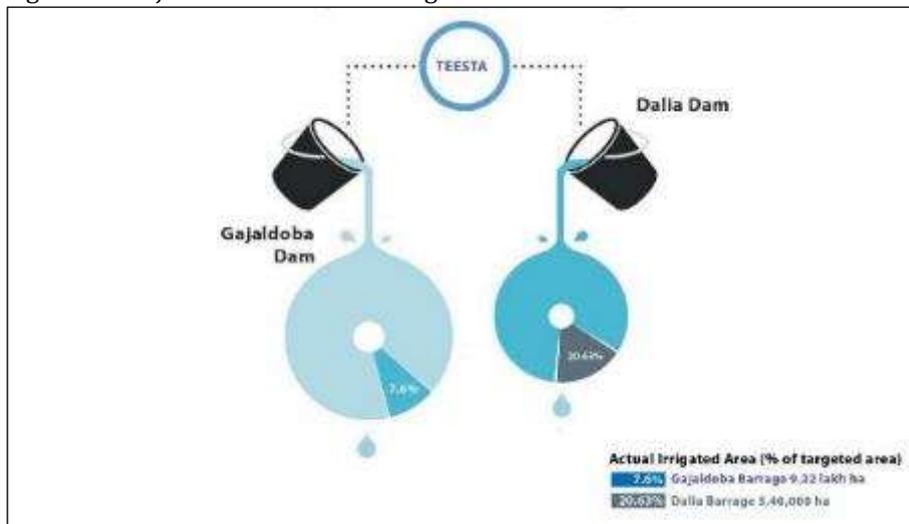
²⁹⁵ Braided Rivers exhibit numerous channels that split off and re-join each other to give a braided appearance. They typically carry fairly coarse-grained sediment down a fairly steep gradient. Additionally, the water discharge tends to be highly variable. Consequently, braided rivers usually exist near mountainous regions, especially those with glaciers (Braided Rivers, n.d.).

²⁹⁶ Obtained from Mr. Samir Mehta, International Rivers, Mumbai on 18-7-2017 and Energy and Power Department, Govt. of Sikkim.

16	Ralong	40	MOU/IA cancelled due to non-performance of the developer.
17	Rangit II HEP	66	Under construction since 2005 (facing financial problems)
18	Rangit IV HEP	120	Under construction since 2005 (facing financial problems)
19	Dikchu HEP	96	Under construction since 2006
20	Jorethang Loop (HEP)	96	Commissioned
21	Lingza	120	Projects cancelled/not taken up as these areas fell within Dzongu area and in the vicinity of Kangchendzonga National Park.
22	Thankgchi	40	-
23	Bimkyong HEP	99	Revised timeline awarded
24	Bop HEP	99	Revised timeline awarded
25	Ting Ting HEP	99	Project cancelled vide Govt. Notification No. 12/Home/2012 as milestones as per MOU not achieved.
26	Rateychu Bakchachu	40	LOI Issued
27	Tashiding HEP	97	98% completed
28	Lachung HEP	99	Revised timeline awarded
29	Lethang HEP	96	Project not granted clearance by National Wild Life Board, Gol. Project cancelled vide Notification No. 12/Home/2012.
30	Suntaleytar HEP	30	MOU/IA cancelled due to non-performance of the developer.
31	Rangit III HEP	60	Project Commissioned
32	Kalez Khola-I HEP	27.5	MOU/IA cancelled due to non-performance of the developer.
33	Kalez Khola-II HEP	60	MOU/IA cancelled due to non-performance of the developer.
34	Rechu HEP	26	-
35	Rahikyong HEP	25	Yet to start
36	Rukel HEP	33	Projects cancelled/not taken up as these areas fell within Dzongu area and in the vicinity of Kangchendzonga National Park.
37	Ringpi HEP	30	Projects cancelled/not taken up as these areas fell within Dzongu area and in the vicinity of Kangchendzonga National Park.
38	Rathangchu HEP	320	Project scraped due to religious sentiments.

After she hits the plains at Sevoke, the two major structures on the Teesta are the Gajaldoba barrage in India and the Dalia barrage in Bangladesh. Each barrage is part of multi-purpose projects (and each of the multi-purpose projects is named the Teesta Barrage Project or TBP) which are supposed to address irrigation and power needs in six districts of North Bengal and seven districts of Rangpur division in India and Bangladesh respectively. Bangladesh had begun the construction of the Dalia barrage before India commenced work on the Gajaldoba barrage. However, both were completed almost at the same time.

Figure 88: Gajaldoba and Dalia Barrages on the Teesta

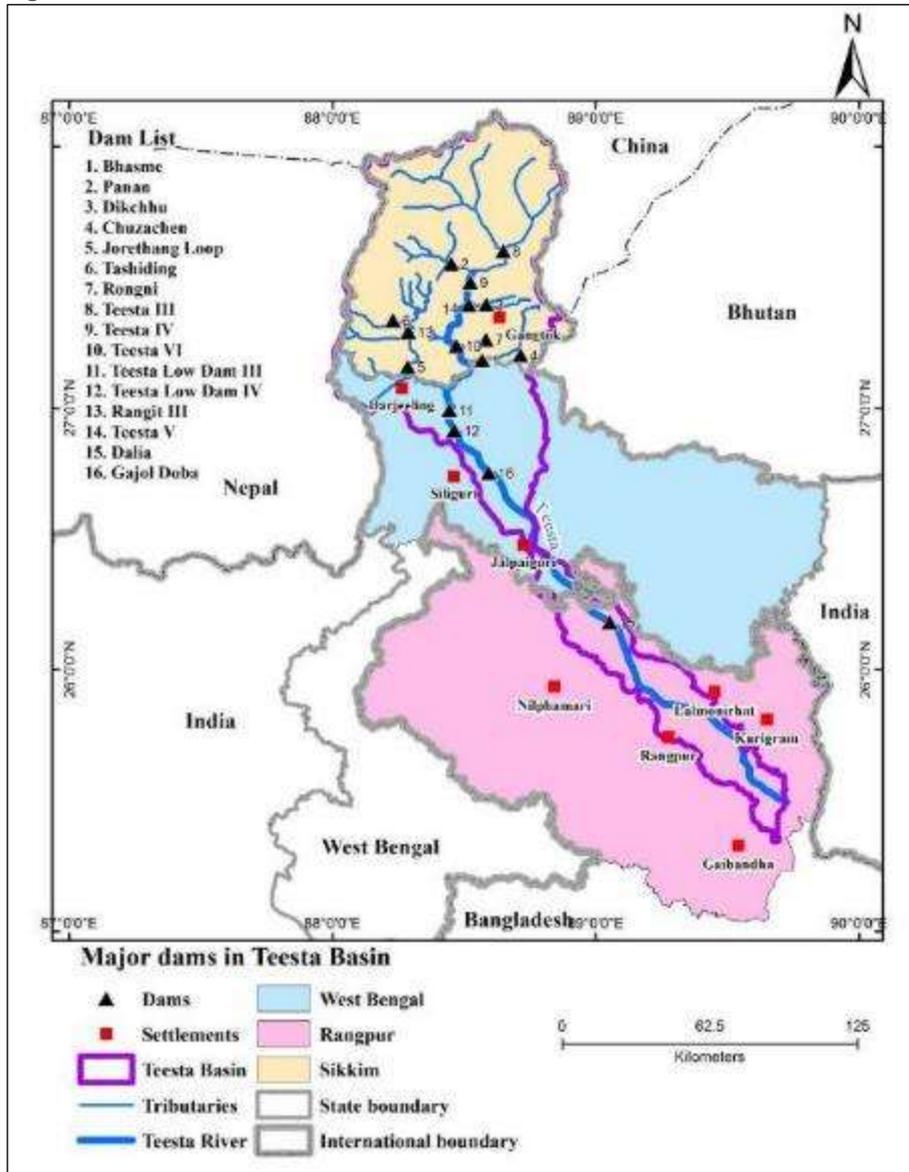


Dalia Barrage - The Dalia barrage is built in Lalmonirhat district about 16 kms south of the Indo-Bangladeshi border and is a gravity irrigation project. It is part of the Teesta Barrage Project of Bangladesh with a total target irrigated area of 5,40,000 hectares (Strategic Foresight Group, 2013), an area almost twice the size of Hong Kong. The total cost of the project is estimated to be Rs. 1,400 crores (roughly USD 220 million). Work on the project started in 1960 and Phase I was completed in 1990, which has been able to provide irrigation to about 1/5th i.e. 111,406 hectares of land.

Gajaldoba Barrage - The Gajaldoba barrage is built in Jalpaiguri district about 66 kms north of the Indo-Bangladeshi border, with a target irrigated area of 92268 hectares. It is part of Teesta Barrage project started in 1976 at a cost of Rs 69.7 crore with a target of irrigating 9.22 lakh hectares and generating 67.5 MW of hydropower in North Bengal. The Gajaldoba Barrage was completed in 1990. By 2011, after spending Rs 1,200 crores (roughly USD 185 million), the project has been able to provide irrigation water to only 66,000 hectares (less than 8%) of land and produce 20 MW of electricity (Kumar, 2013). Two canals drawn out from the Gajaldoba transfer Teesta’s water to two other river basins in the region; one canal flows west to the Mahananda River and the other flows east to Jaldhaka River. After a few years of operation, in 1996, Gajaldoba started drawing and storing excessive water from the Teesta, and the trend of steep reductions in flow every lean season began to be recorded at Dalia. Gajaldoba’s upstream location, its increasing drawing and storage of

Teesta water, and the lack of an agreement on sharing the Teesta waters have rendered the Dalia barrage and Bangladesh's TBP practically useless.

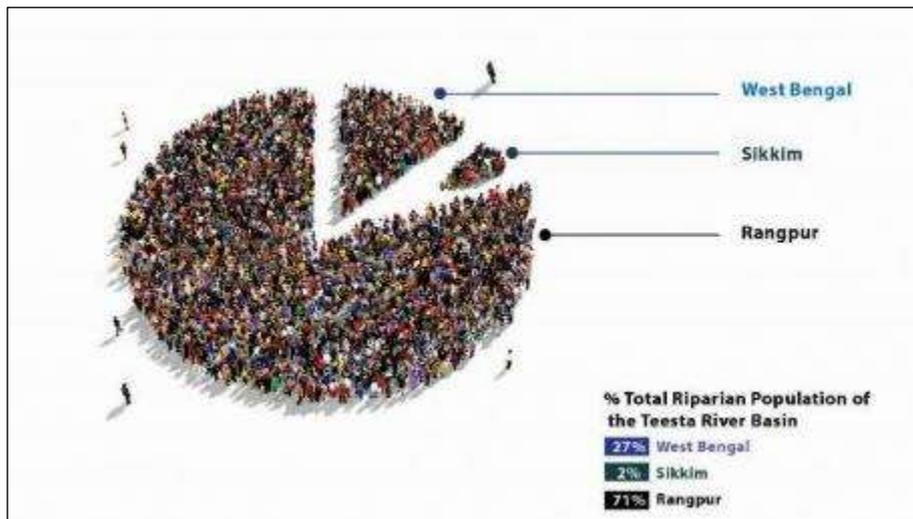
Figure 89: Dams in the Teesta River Basin



A.4. Demography

The Teesta River Basin is densely populated. It is home to around 30 million people – which is half the size of Italy's population – out of which roughly 2% are located in Sikkim, 27% are located in North Bengal and the rest 71% are located in North Bangladesh. It must be noted that the actual number of people living in the Teesta basin in Bangladesh is 9.5 million, but more than 21 million people in the country are dependent directly or indirectly on the river for livelihood.

Figure 90: Population of Teesta River Basin



Out of the 30 million people, 23.4 million or 78% of the population stays in rural areas. West Bengal alone is home to 53% of the rural population of the entire Teesta basin. The rural population is characterised by low level of economic activity, poverty, malnutrition, illiteracy and unemployment and an overall low Human Development Index (HDI) score on both sides of the border. The rural population of the Teesta basin is highly dependent on the river for survival and experiences increasing vulnerability to climate change effects in the region and especially on the Teesta.

Figure 91: Urban-rural profile of Teesta Basin



The cultural profile of the Teesta basin is diverse. Spanning from North Sikkim to North Bangladesh, the basin is home to several tribes, religious groups and communities, both native and migrant. Within a span of 12,000-odd km², the basin hosts almost all major religions, numerous ethnicities, and many communities which have stayed in the region for as long as a few centuries and as short as a few decades. Bengali is the dominant language in the basin due to the sheer size of Bengali-speaking population, but along with it, Nepali, Hindi, English, Tibetan and tribal languages such as Lepcha, Rajbanshi, Bodo, Santali etc. are spoken as well.

A.4.1. India

A.4.1.1. Sikkim

The three major communities of Sikkim are the Lepchas, Bhutias and Nepalis. The Nepalis are further split into ethnic groups such as Limbus/Tsongs, Mangars, Kiratis, Gorkhas etc. Buddhism is the dominant religion in Sikkim while many Nepali communities practice Hinduism. Since the arrival of Western missionaries, some Lepchas have converted to Christianity. Sikhism also has a presence in Sikkim in the form of two gurudwaras, one located at Chungthang and the other on the banks of the Gurudongmar Lake.

A.4.1.2. West Bengal (northern region)

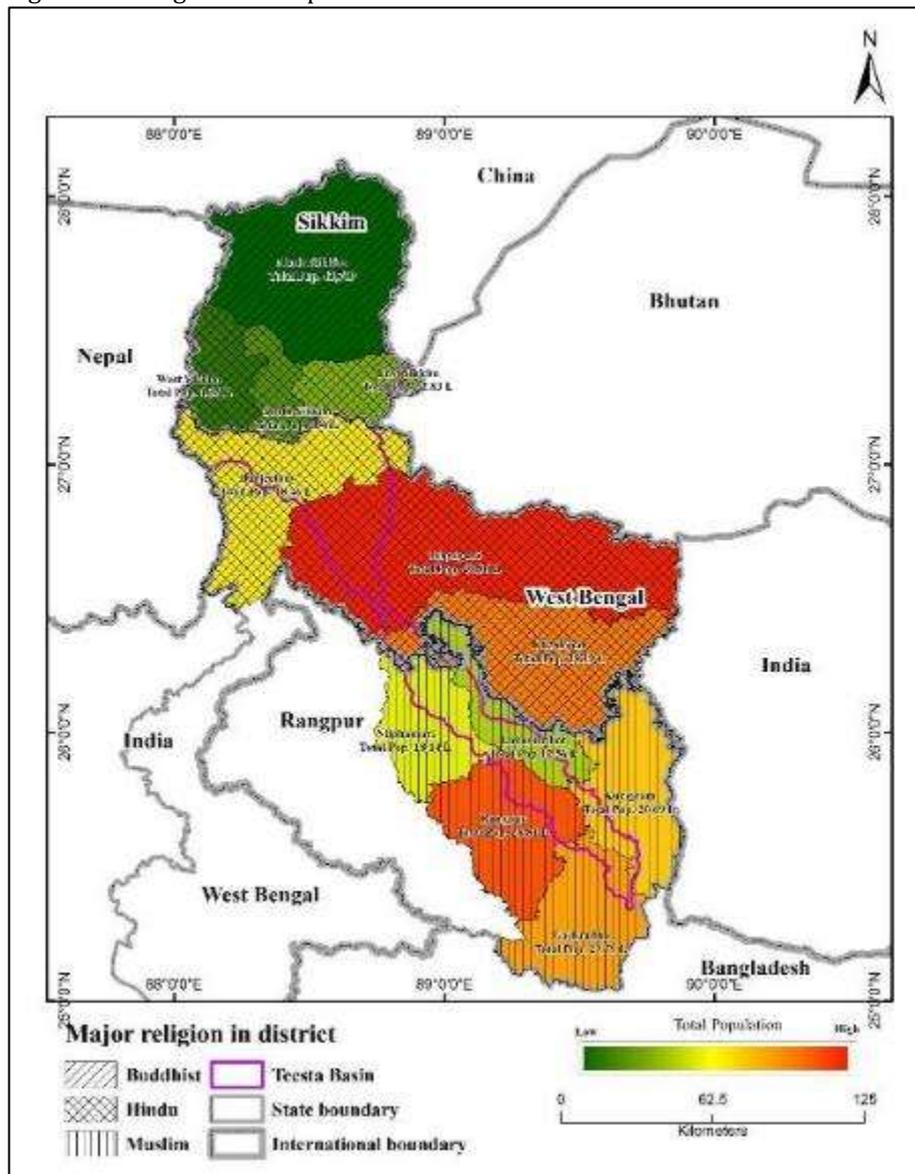
North Bengal is a mixture of ethnic Bengalis, tribal communities such as Rajbanshis, Mech, Rabha etc., Gorkhas and other Nepali communities in the Darjeeling Hills, and business communities such as Marwadis based predominantly in urban areas of Siliguri and Jalpaiguri. After Partition in 1947 and during the Liberation War of 1971, many Bengali Hindus fled East Pakistan and then Bangladesh and settled in North Bengal. Hinduism is predominant in North Bengal with pockets of animism, certain tribal religions and Islam. Buddhist communities are based in the Darjeeling Hills.

A.4.2. Bangladesh

A.4.2.1. Rangpur Division

While most of the population of the Rangpur division is Bengali, it also includes small tribal communities such as the Rajbanshis, Santhals, Oraons, Mal Paharis, Mundas, Malos etc. (Dhamai, 2014). Islam is the dominant religion of the region followed by a minority Hindu population, with pockets of Buddhism, tantric Buddhism, animism and other tribal religions.

Figure 92: Religion and Population Distribution in the Teesta River Basin

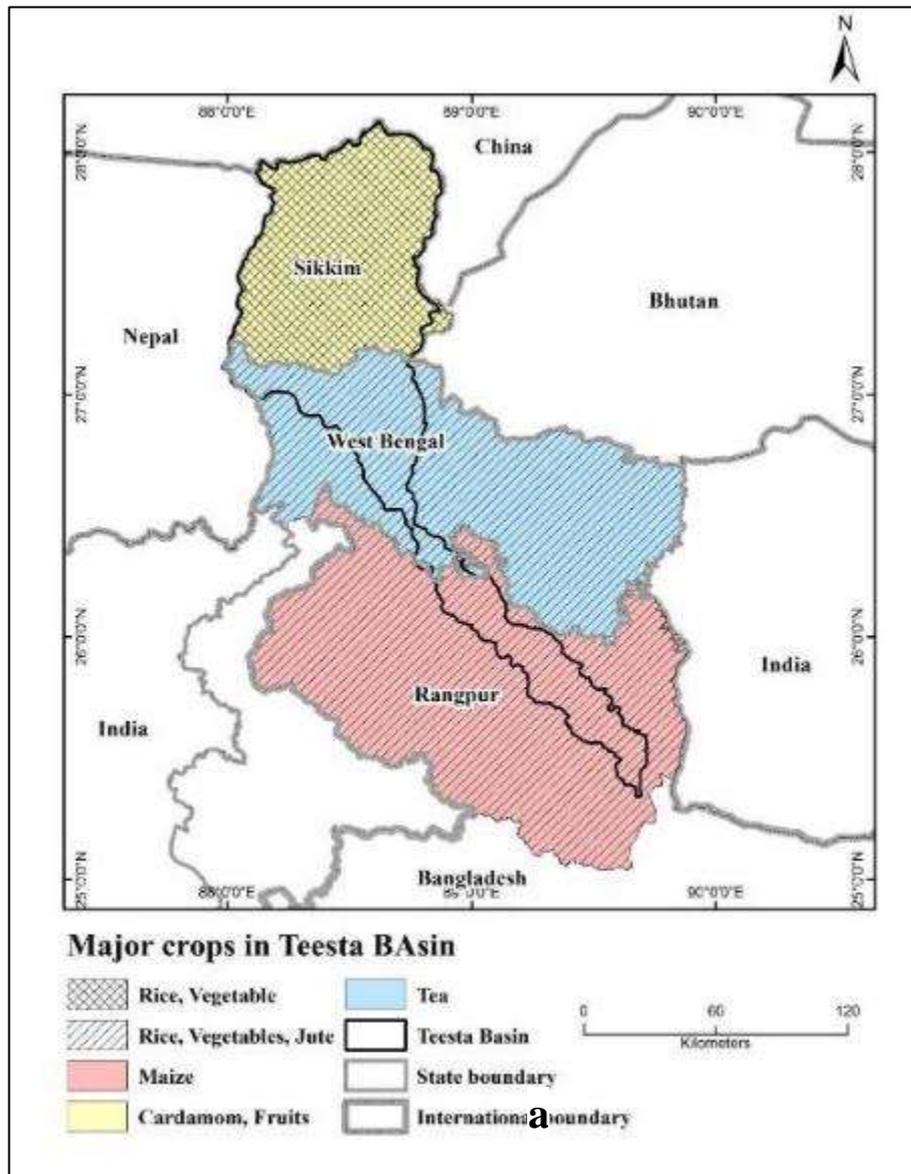


A.5. Economy

Agriculture is the single most major economic sector in the basin which employs more than 90% of its rural population. It is neither heavily mechanised nor commercialised, and subsistence farming is a regular phenomenon, especially in remote and tribal areas. The average cropping intensity²⁹⁷ is high across central and lower Teesta basin, ranging between 1.6 crops per year on the Indian side to almost 2 crops per year on the Bangladeshi side. Irrigation facilities, availability of fertilisers, pesticides and HYV seeds, use of tractors and pumping sets etc. have led to increasing cropping intensity and productivity, but have also induced a steady decline in land fertility over the years.

Figure 93: Major Crops in the Teesta River Basin

²⁹⁷ Average cropping intensity refers to the number of crops raised in the same field during one agricultural year.



In Sikkim, agriculture contributes 8% of the state GDP and employs 69% of the total workforce (Government of Sikkim, 2011). Sikkim is famous as the highest cardamom producer in India. Along with it, the state also produces ginger, oranges, potatoes, flowers, vegetables, cereals and pulses. In North Bengal, agriculture contributes 23.6% of the state GDP and employs about 43% of the total workforce (Planning Commission, GoI, 2010). Rice, jute, potato, maize and tea are the major crops grown in North Bengal. Out of these, tea is both a major cash crop as well as a famous product of the region. Half of the agricultural workforce of North Bengal is employed on various tea estates in the Darjeeling Hills. In North Bangladesh, agriculture contributes 22.25% of the GDP of the region and employs roughly 45% (Asian Development Bank, 2016) of the total workforce²⁹⁸. The major crops on the Bangladeshi side are largely the same as those of North Bengal. Here, tea is replaced by tobacco as the major cash crop. Rangpur district has been traditionally famous for its tobacco production. However, over the years due to health awareness campaigns and changes in crop patterns in the region driven by local, regional and international NGOs, the production of tobacco has dropped steeply and has been replaced with an upsurge in maize production.

There is ample scope for fisheries in the Teesta basin. In rural Sikkim, fisheries are an important source of sustenance, but there is very little commercial value attached to the activity. In North Bengal, fishing is mostly inland but experiences very little development in terms of technology and infrastructure; despite favourable conditions and the presence of a healthy market for fisheries, 40% of the fish consumed in the area is brought from Andhra Pradesh. Fisheries are still an important source of livelihood in the Rangpur division of Bangladesh with more than 90% of the rural folk resorting to fisheries as an alternate source of sustenance as well as livelihood. The village of Tista Bazar in Lalmonirhat district was once famous for its fish market; fishermen from all over the central and lower Teesta basin came there to sell their catch. However, there has been a steep decline in fisheries in Rangpur division due to the reduced and irregular flow of the Teesta and the drying up of her river bed in lean season on an annual basis.

²⁹⁸ These are national figures of Bangladesh. The dependence on agriculture for revenue and employment is higher in North Bangladesh than in other regions of the country, hence these numbers can be taken as a conservative estimate.

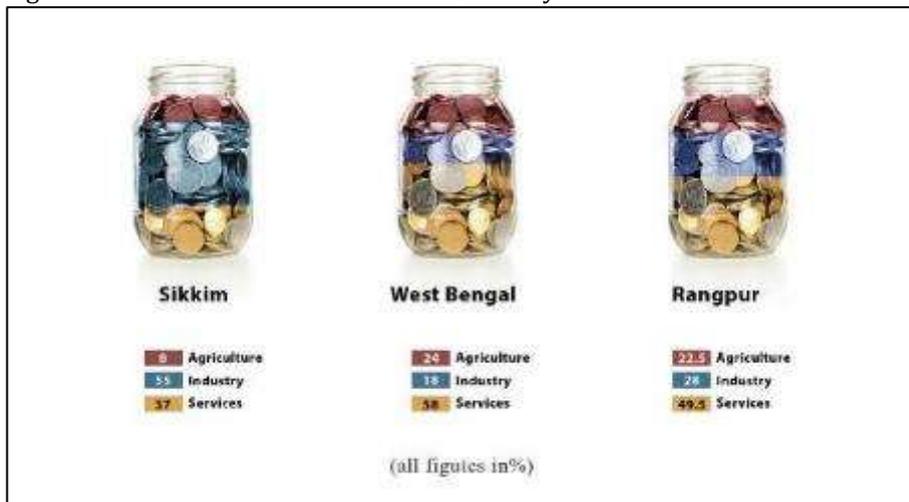
There is no significant industry in the Teesta river basin. In comparison to the state of West Bengal and the Rangpur division, Sikkim is relatively more industrialised; while industry contributes about 18% and 28% to the GDPs of West Bengal and Rangpur division respectively, the proportion of industry’s contribution to Sikkim’s GDP is 55%. However, industry in Sikkim is medium and small scale – largely distilleries, agricultural products processing units and handicrafts – and accounts for barely 0.2% of India’s total GDP (Planning Commission of India, 2014). Most of West Bengal’s industry is located in its southern and western parts; very few industrial units are located in North Bengal. Similar conditions are seen in northern Bangladesh where most of the development in industry, transport and communications is concentrated in the Dhaka division, with the Rangpur division lagging behind in almost all aspects of industrial growth and development (Islam & Noman, 2015).

The service sector is also not very developed, but it contributes the most to the GDP of the region: 37% to Sikkim’s GDP, 58% to West Bengal’s GDP and 49.33% to North Bangladesh’s GDP²⁹⁹. Navigation on the Teesta river was once an important economic activity, but due to dwindling Teesta flows, large parts of the river remain dry for many months each year, whereas excessive swelling of the river in the rainy season makes her a risky mode of travel. Together, both situations have reduced the scope for navigational activities on the Teesta.

Tourism is a prominent sub-sector driving the growth and income of the service sector in the Teesta basin, especially in the upper and middle reaches of the Teesta river. Sikkim is a major tourist hub; an average of 6 lakh domestic and foreign tourists (Department of Tourism and Civil Aviation, Govt. of Sikkim, 2014) visit the tiny state every year. In North Bengal, tourism flourishes in the Darjeeling Hills and Dooars region which also cater to a similar number of tourists on an annual basis (Statistics of Tourist Arrival in Gorkhaland Territorial Administration, n.d.). Melli, a town on the West Bengal-Sikkim border is a famous tourist spot for white water rafting on the Teesta river. Bangladesh as a whole also receives 5 to 6 lakhs of tourists each year, but most of them travel to the Sundarbans and beaches in the south and a negligible proportion trickles to the north. With its archaeological sites, museums, architecture and rural beauty, North Bangladesh has ample scope for increasing its tourism.

On both sides of the border, the natural beauty of the Teesta and her ecosystem are highly underrated. Apart from white water rafting at Melli, the Teesta’s potential for tourism, by and large, remains unutilised. This is also partly because of the river’s deteriorating conditions due to drying up, excessive sand mining and contamination. If sand mining is controlled, quality levels of Teesta’s waters improve, and adequate environmental flows are guaranteed throughout the year, the Teesta river can provide a major boost to tourism revenues on both sides of the border.

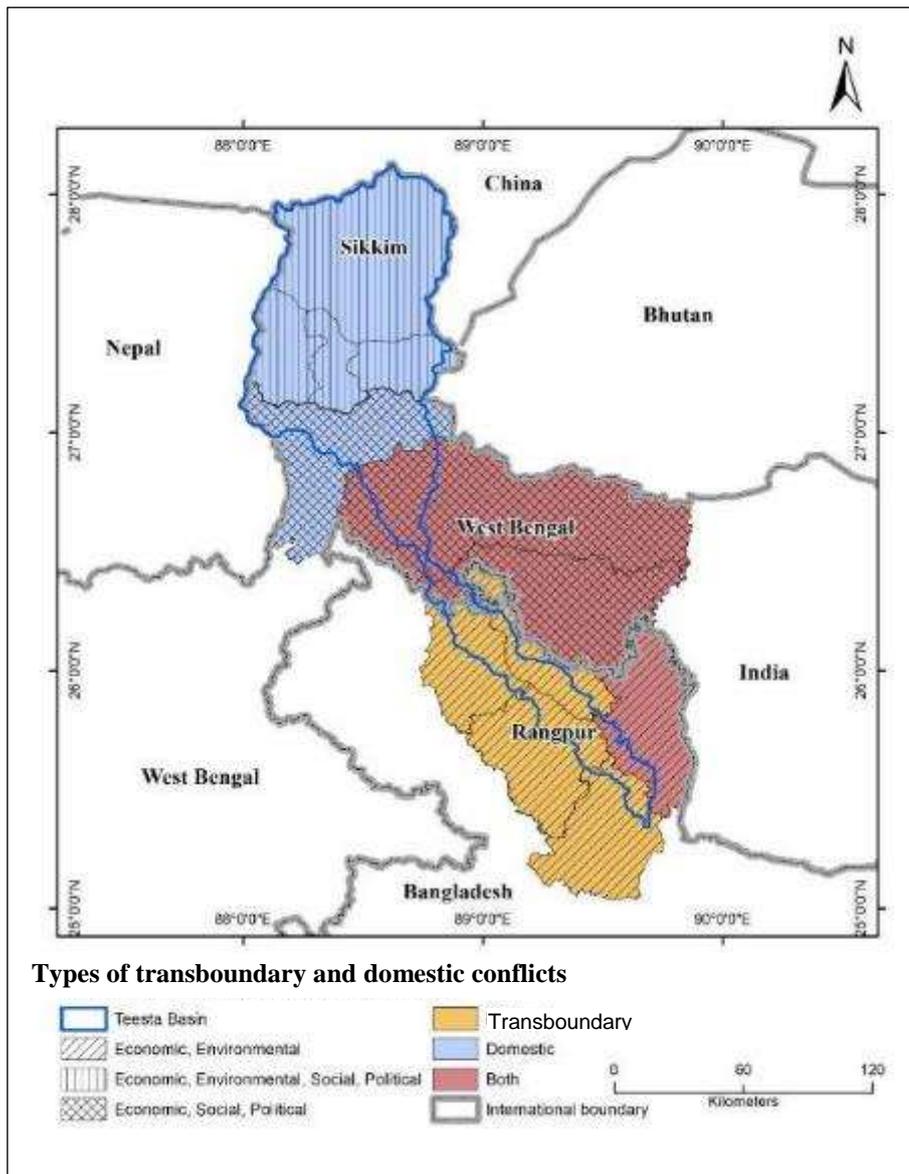
Figure 94: Sectoral Contribution to the Economy of the Teesta River Basin



B. CONFLICTS IN THE TEESTA BASIN

Figure 95: Transboundary and Domestic Conflicts in the Teesta River Basin

299 This is the national figure for Bangladesh. The service sector is largely concentrated in the Dhaka division and other divisions in southern Bangladesh, whereas it is very less developed in North Bangladesh. The contribution of the service sector in Rangpur division’s GDP is lesser than the national average of 49.33%.



B.1. Transboundary Conflict

B.1.1. Signing the Teesta Treaty (India, Bangladesh)

B.1.1.1. The Issue

The Teesta is a perennial, rain-and-snow-fed river characterised by extreme variability in her flows throughout the year. Over 90% of her flow occurs in the rainy season from June to September while the rest 10% occurs in the remaining eight months. As a lower riparian, Bangladesh is completely dependent on India, the upper riparian, for keeping minimum flows in the Teesta river. India has been unilaterally constructing a series of dams up north which have reduced the flows to as little as 14 m³/s during times of drought, greatly hurting the livelihoods of thousands of farmers, fishermen and boatmen downstream in Bangladesh. Conversely, during monsoon season, Indian dams on the Teesta release excess water, causing heavy floods and again disrupting thousands of livelihoods in in Bangladesh. The intensity of damage is particularly more acute in Bangladesh as the size of population and economy dependent on the Teesta in Bangladesh outstrips its counterpart upstream in India. Bangladesh demands a fair share of the Teesta waters in the lean season and minimum guaranteed flows throughout the year formalised in a treaty signed and ratified by the governments of both the countries. Negotiations on the Teesta have been going on for decades and a draft agreement has been prepared, however, the Teesta deal between New Delhi and Dhaka fell through in 2011, and no concrete progress has been made since.

B.1.1.1.1. History of the Teesta Dispute: From Partition to the Creation of Bangladesh

Up until the Partition in 1947, since the Teesta flowed as a single unit through the then princely state of Sikkim and the province of Bengal, both under British India, there was no question of transboundary governance and sharing. During Partition, the All India Muslim League was the first to hint at the looming dispute by asking for Jalpaiguri and Darjeeling districts to be incorporated in East Pakistan on the ground that they were the catchment areas of the Teesta. The rationale was that with the entire middle and lower Teesta basin in one country i.e. East Pakistan, they would be in a better position

to use the erstwhile and future hydropower projects. However, mainly due to their non-Muslim composition, Darjeeling and Jalpaiguri were handed over to India (Ranjan, 2017).

After Partition, Sikkim continued to be a protectorate of India right up to its merger with the latter as a state in 1975. During the 1950s and 1960s, Indian and East Pakistani officials began talks over damming and sharing the Teesta. At the same time, India and Pakistan were negotiating agreements on the Ganga and Indus rivers due to which the Teesta issue took a backseat. After signing the Indus Treaty in 1960, the two countries turned their focus to negotiations on the Ganga, and the Teesta issue jumped up the ladder. East Pakistan outlined a plan to build a barrage on their side of the Teesta which India opposed. Suggesting 'other rivers' for fulfilling India's irrigation and other needs, East Pakistan decided to go ahead with the plan (Islam M. F., 2016); however, it was only in 1990 that a barrage was completed on the Teesta in what was now Bangladesh.

B.1.1.1.2. The Indo-Bangladesh Joint Rivers Commission (JRC)

After the creation of Bangladesh in 1971, the two countries resumed talks over sharing the Ganga, Teesta and other 52 rivers shared by them. In 1972, India and Bangladesh established the Indo-Bangladesh Joint Rivers Commission (JRC) with the intention of "working together in harnessing the rivers common to both the countries for the benefit of the peoples of the two countries", but originally focused on the joint management of the Ganga river basin. As per Article 4 of the Statute of the JRC, the Commission has the following functions –

"(a) to maintain liaison between the participating countries in order to ensure the most effective joint efforts in maximising the benefits from common river systems to both the countries,

(b) to formulate flood control works and to recommend implementation of joint projects,

(c) to formulate detailed proposals on advance flood warnings, flood forecasting and cyclone warnings,

(d) to study flood control and irrigation projects so that the water resources of the region can be utilized on an equitable basis for the mutual benefit of the peoples of the two countries, and

(e) to formulate proposals for carrying out coordinated research on problem of flood control affecting both the countries."

– as well as any other functions their governments mutually agree upon and direct them to do.

However, the JRC could do little in its first 25 years of existence. This was partly because the Ganga Treaty i.e. its most significant task, was given exclusive attention till it was finally signed in 1996. The general meetings of the JRC took place once every two years up until 2010, those of the Standing Committee took place until 2005, and technical level meetings related to water sharing issues began only in 2009. Apart from these meetings, there have been occasional and irregular meetings for flood management, joint scientific studies, dam and site visits, and reaching out to other co-riparians such as Nepal, Bhutan and China (Joint Rivers Commission, Bangladesh). The scenario was not very different for the Teesta. Talks on the Teesta played second fiddle to the negotiations to the Ganga Treaty. After 12 long years in 1983, the governments of India and Bangladesh signed an ad-hoc agreement during the 25th meeting of the JRC to share the waters of the Teesta in the following manner: 39% of the total flow of the river for India, 36% for Bangladesh, and the remaining 25% unallocated, to be decided on the basis of scientific studies carried out in the future. For the next 14 years, no serious development took place regarding formalising the agreement; in the face of the Ganga negotiations, other common rivers were not given priority. It was only after the signing of the Ganga Treaty in 1996 that the Teesta river came into focus.

According to the JRC Bangladesh website, the first meeting of Joint Committee of Experts (JCE) on sharing the Teesta waters was held in August 1997. Since then, seven JCE meetings have been held. Their last meeting was in 2004, while the Joint Technical Group (JTG) on sharing the Teesta met for the first time in the same year. The JTG held four meetings in all; three in 2004 and the fourth and the last one in 2005, after which there was a lull of two years.

During this lull, Bangladesh and China held their first meeting on cooperation over water resources in Beijing in 2006. China is the upstream riparian of the Brahmaputra which is the biggest river of Bangladesh. The two countries signed a Memorandum of Understanding (MoU) to cooperate on various aspects of technology, design and research on the watercourses of the Brahmaputra. It could have been that this alliance alarmed India and spurred it into action; following this development, the Indo-Bangladesh JRC held two technical level meetings regarding the Teesta in 2007 and 2008. During the same time, in 2007, the Govt. of West Bengal (henceforth, GoWB) declared that it could concede at most 25% of the water available at Gajaldoba barrage for both, Bangladesh as well as the river ecosystem itself. Bangladesh vehemently opposed West Bengal's stand and since then, the dispute over equitable sharing of the Teesta intensified.

The Government of India (henceforth, GoI), not wanting to antagonise Dhaka and Kolkata, suggested modifying the ad-hoc agreement of 1983 and dividing the 25% between the two countries so that India and Bangladesh get 52% and 48% of the total flow of the Teesta respectively (Rudra, Sharing Water Across Indo-Bangladesh Border, 2017). In an attempt to pacify both the contenders, the GoI completely ignored the health, or rather, the very existence of the Teesta and the survival of her ecosystems. With 100% of the Teesta's waters being used by the two countries, there was no chance of the river and her ecosystems surviving and sustaining her 30-million-strong riparian population. It would also mean a severe setback to fishing, tourism and navigational activities in the river, creating a deep dent in the rural economy of the Teesta basin. Such a proposal was not only short-sighted and narrow-minded, but also self-destructive. Fortunately, it did not materialise. In 2010, the JRC conducted a field visit to the Teesta river and held its 37th meeting in Dhaka with the specific agenda of determining the sharing of Teesta waters and preparing a draft agreement accordingly. During this meeting, the Government of Bangladesh (henceforth, GoB) reiterated an arrangement it had proposed some years ago

specifically for the lean season. This arrangement which allocated 40% of the Teesta's flow to each country and the rest 20% was to be reserved as minimum flows continues to be featured in the draft agreement to this day.

B.1.1.1.3. Failure of the Teesta Negotiations

The then Prime Minister Manmohan Singh was slated to visit Bangladesh with West Bengal Chief Minister Mamata Banerjee in September 2011 and sign this deal with the Bangladeshi Prime Minister Sheikh Hasina, but at the last minute, Banerjee pulled out of the delegation, protesting against changes made in the agreement which she neither approved nor, allegedly, was she informed of. Apparently, Banerjee had agreed to share Teesta waters at a rate of 708 m³/s (against the prevailing 651 m³/s) with Bangladesh. However, the final agreement which was sent to her just before the Dhaka visit allocated a much higher proportion – at an average rate of 935 m³/s up to 1699 m³/s and apparently with no scientific justification, due to which she cancelled her participation (Sahgal & Dasgupta, 2011). As a result, the talks between New Delhi and Dhaka fell through and the agreement was not signed. As Banerjee's Trinamool Congress (TMC) was the single largest ally of the UPA-led coalition government at the centre at that time, the central government had to accept her decision.

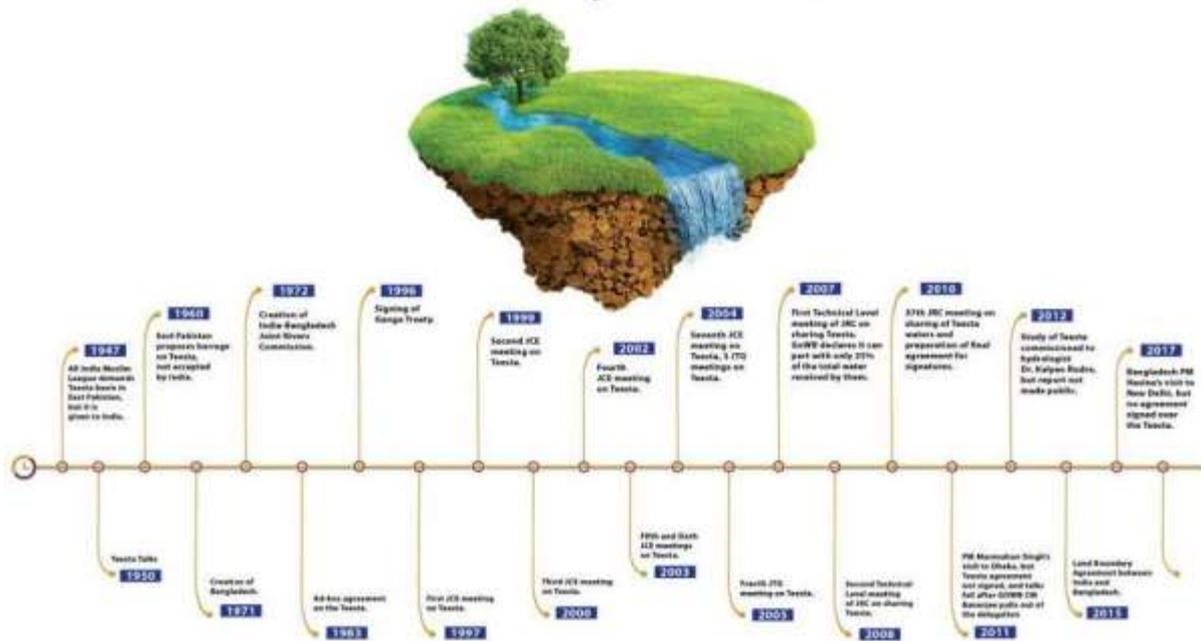
In the same year, the GoWB commissioned a study of the Teesta River under eminent hydrologist Kalyan Rudra who submitted his report in December 2012. This report was never made public and to this day, Rudra is “not authorised by the GoWB to speak on this issue”³⁰⁰. However, Rudra's views on the Teesta issue and his criticism of the entire TBP and the NHPC hydropower projects Teesta Low Dams III and IV, are evident in his paper “Taming the Teesta” (Rudra, 2003). “[S]iltation has been a major problem, with projected capacities decreasing at alarming rates, often before the entire project is completed,” he writes lamenting that “dams that were designed to moderate floods have created floods by releasing excess water at the peak of the monsoon.” Rudra's paper makes pertinent points regarding ecological fragility, economic liabilities, impact on wildlife and tourism, and social consequences of these projects.

In 2014, when the NDA government came into power at the centre, it was no longer dependent on allies to retain power, but getting the Teesta deal signed was still complicated due to political and ideological friction between the centre and the Banerjee-led GoWB. During Prime Minister Modi's historic visit to Dhaka to conclude the land boundary agreement in 2015, Prime Minister Hasina reminded him of “an immediate conclusion” on the Teesta deal. Banerjee had accompanied Modi on this visit, however, she maintained silence on this topic.

There was renewed hope for a Teesta agreement when Hasina visited India in 2017. Hasina and Modi signed 22 MoUs covering defense, education, space technology, nuclear energy, IT, cyber security, trade, R&D, judiciary, shipping, mass media and public health (MEA, GoI, 2017). Modi's support to the agreement and his initiative in breaching the topic increased hopes further, but the agreement continued to remain unsigned as Banerjee steadfastly maintained her opposition to the current nature of the agreement and offered “other river systems” to meet Bangladeshi needs, namely the Torsa, Sankosh and Raidak rivers, all three of which flow down to West Bengal from Bhutan (Ghosal, 2017). Predictably, this suggestion was met with little enthusiasm, and Hasina returned to Bangladesh without a Teesta deal where she was criticised vociferously by her main political rival, the Bangladesh Nationalist Party (BNP) led by Khaleda Zia for giving “unilaterally” while “issues crucial for Bangladesh [...] were not discussed in the visit.” Zia and BNP essentially accused Hasina of failing the people and signing MoUs which would “only increase India's military, political, and geopolitical influence on Bangladesh” and declared that the involvement of Banerjee in the Teesta treaty “undermined the sovereign status of Bangladesh” (Prothom Alo, 2017). Currently, while both GoI and GoB want to sign the agreement, it is the Banerjee-led GoWB which is standing in the way of the finalisation of the Teesta Treaty.

Figure 96: Timeline of the Teesta Dispute

³⁰⁰ As per telephone conversation with Dr. Rudra in April 2017.



B.1.1.2. Positions

B.1.1.2.1. The Government of India (GoI)

The GoI, previously led by the UPA and now the NDA, has shown willingness to sign the Teesta agreement. It is caught between two opposing sides, GoWB and GoB and is trying to balance the situation by offering more engagement, cooperation and aid to Bangladesh in various areas and negotiating with the GoWB simultaneously.

As per the Indian Constitution, water is a state subject, listed as Entry 17 in the State List.³⁰¹ However, entry 56 in the Union List gives the central government exclusive powers to deal with “[r]egulation and development of inter-State rivers and river valleys to the extent to which such regulation and development under the control of the Union is declared by Parliament by law to be expedient in the public interest.” Further, entries 10 and 14 in the Union List place powers regarding foreign affairs and signing of international treaties exclusively with the central government. Hence constitutionally, the central government does not need the consent of a state government while signing an international agreement over a transboundary water body.

Reality though is far different. The UPA was constrained by the fact that Banerjee’s party TMC was their biggest ally in their coalition government at the centre. While there is no such constraint to the NDA government, it is anxious to not aggravate the GoWB with which it already has significant ideological and political differences.

India looks towards Bangladesh as a trusted partner in South Asia, especially in the face of Pakistan and China. Cultural and historical ties with Bangladesh, particularly with Sheikh Hasina, her party Awami League and her government have led to healthy Indo-Bangladeshi relations. New Delhi views Dhaka as a partner in combating terrorism in South Asia, a connector between the North East and the rest of India, and a gateway to East Asia. In order to retain cooperation and friendship with Bangladesh, India cannot afford to ignore their demands, including that of a fair share of Teesta waters.

B.1.1.2.2. The Government of West Bengal (GoWB)

Despite strong cultural and historical ties with Bangladesh and their pro-Muslim appeasement policies, the Banerjee-led GoWB has loudly and clearly voiced opposition to the terms of the Teesta treaty. While Banerjee had consented earlier to a 70:30 arrangement with 70% retained by the Indian side (Das M. , 2015), she has refused to accept the 40:40:20 arrangement as mentioned in the current draft of the treaty. The argument of the GoWB is “to protect the interest of the farmers in the area”. Flows drop drastically in the lean season, partly due to dams upstream in Sikkim holding water in order to generate electricity at peak times (Basu, 2017), and parts of the river are reduced to a trickle. The Teesta is vital for irrigating 1.20 lakh ha of land in five districts of West Bengal – Cooch Behar, Jalpaiguri, South and North Dinajpur, and Darjeeling – which consist of some of the poorest areas of the state and are home to a burgeoning and highly profitable tea industry and the draft treaty in its current form will seriously harm agriculture, particularly the cultivation of Boro rice, in North Bengal (Ranjan, 2017).

However, there is another layer to their reasoning – giving more of the Teesta to Bangladesh can hurt Banerjee and her party TMC electorally. About 30% of the population in these districts (47% in North Dinajpur) is of tribal and minority groups (Das M. , 2015). Also, there is a considerable proportion of Bengali Hindus who have fled East Pakistan during the Partition and then Bangladesh during the Liberation war and settled in North Bengal. The region is also home to sizeable numbers of Marwaris, Nepalis and Gorkhas who have migrated and settled here for trade and employment. Mamata Banerjee and her party TMC are not politically strong in North Bengal which has traditionally been a Leftist stronghold.

301 Article 246 of the Indian Constitution allows the central and state governments of India to make laws on certain subjects which are divided into three lists: List I or the Union List, List II or the State List and List III or the Concurrent List.

In the 2017 municipal elections, the Gorkha Janmukti Morcha (GJM) was a clear winner among Nepalis and Gorkhas, while due to Banerjee's obvious minority appeasement policies, other communities are increasingly distancing themselves from her. Since Banerjee and TMC are looking to consolidate votes in North Bengal, they are in clear opposition of the treaty as it can significantly upset their political prospects in the region.

There are quite a few compelling reasons why the Modi-led GoI, despite constitutional backing and a clear majority for the Bhartiya Janata Party (BJP) at the centre, cannot bulldoze over West Bengal's opposition and sign the Teesta Treaty.

- i. **The Geopolitical Importance of the Chicken's Neck:** West Bengal is a border state and its districts of Jalpaiguri, Darjeeling and Cooch Behar are located in the Siliguri Corridor or more popularly, 'Chicken's Neck', a narrow strip of land connecting the north-eastern states of India with the rest of the country which is important and sensitive on multiple levels. First, it is home to a vital transboundary resource (the Teesta) and shares international borders with three countries, namely Nepal, Bangladesh and Bhutan, with China in proximity. Second, the railway network which passes through this corridor connects to military bases in the northeast and is essential to provide troops with supplies and reinforcements. Third, it is a highly sensitive and socially fragile region: it faces a high incidence of poverty and economic inequality, is home to some of the most backward districts of West Bengal, has seen the birth of the Naxal movement, and now experiences a significant influx of "outsiders" i.e. Nepalis and illegal Bangladeshi migrants. Fourth, the region is impacted by climate change and has been grappling with environmental disasters such as extreme floods and droughts, which directly affect the Teesta River (Oak, 2017).
- ii. **Friction between GoI and GoWB:** The Teesta issue notwithstanding, the current GoI and the GoWB do not see eye-to-eye on many important issues within the country. There is significant political and ideological friction between the two governments which has manifested itself time and again: Banerjee's stinging criticism of demonetisation of Rs. 500 and Rs. 1000 notes in November 2016 ("biggest disaster") and the Goods and Services Tax (GST) implemented in July 2017 ("great stunt") (PTI, 2017), and the row between her and then Defense Minister Manohar Parrikar over army drills at toll plazas in West Bengal in December 2016 are just two and recent incidences in a series of spats between the two governments. At the same time, West Bengal is an important state in terms of security and geopolitics, it shares international borders with Bhutan, Nepal and Bangladesh and is in the vicinity of China. In terms of economy, and it contributes 40% of the GDP of East and North-East India, and 78% and 82% of the national production of jute and tea respectively (PTI, 2016); strategically, it is located on the trans-regional economic and trade route under the 'Act East' policy of the GoI. For all these reasons, the central government is cautious about any increase in differences and wants to minimise the friction in their relationship.
- iii. **Progress of BJP, current ruling party at the centre:** BJP, the biggest political party in the NDA, has historically had a weak presence in West Bengal and has only recently started making inroads into the state. The policy of selective minority appeasement followed consistently by the Banerjee-led GoWB has drawn the ire of the majority sections of Bengali society, especially those who have fled East Pakistan in 1947 and Bangladesh in 1971. The situation is serious enough for the Kolkata High Court to issue three remonstrations over GoWB's actions "to pamper and appease the minority section of the public at the cost of the majority section without there being any plausible justification" (Merchant, 2017). Multiple bans and curtailments on Hindu festivals and rituals, stipends to Imams and Muezzins and repeated incidents of communal violence across the state, eight of which have taken place in just the last year (Talukdar, 2017), have coupled with economic woes and consequently lowered Banerjee's credibility as a balanced leader working in the interests of all sections of the society. Meanwhile, BJP has steadily cemented for itself the position of a viable option to the TMC; the popular vote for BJP in West Bengal has risen from 17.5% in the 2014 Lok Sabha elections to more than 30% in the 2017 West Bengal municipal elections (Mukerjee, 2017). In such a scenario, BJP is wary of taking unpopular decisions (like giving a bigger share of the Teesta to Bangladesh) that could possibly cause a dent in their progress.

B.1.1.2.3. The Government of Bangladesh (GoB)

The GoB has long maintained the stand that they have not been getting a fair share of the Teesta for years, especially during the lean season, and that the dual problem of consecutive droughts and floods in a year has been aggravated due to dams built unilaterally by India on the Teesta upstream. Bangladeshis are also critical of India's river inter-linking project, and even more so of the diversion of Teesta waters to the Mahananda River in the west. Through the 40:40:20 arrangement, GoB is looking to obtain guaranteed minimum flows during the lean season.

The Teesta is a major river flowing through the Rangpur division, formed in 2010 out of the northern eight districts of the Rajshahi division. Rangpur is the poorest division in Bangladesh. Its poverty headcount rate (HCR) is 42.3% and the extreme poverty HCR is 27.7% - both highest in the country (World Bank; World Food Programme: Bangladesh Bureau of Statistics, 2010). This means that 42.3% of the population of Rangpur division lives in poverty while 27.7% lives in extreme poverty. The Greater Rangpur region is historically known to be drought-prone and was among the worst hit regions during the Great Bengal Famine of 1942-1944 as well as Bangladesh's famine of 1974. The region is particularly vulnerable to seasonal hunger³⁰² which, combined with recurring droughts and floods, has induced large-scale climate change-linked migration and is significantly responsible for illegal cross-border migration from Bangladesh to India. In

³⁰² Seasonal hunger is the recurrence of poverty and food deprivation during a certain period such as the sowing season every agricultural year. In northern Bangladesh, this period falls between September and November.

addition, ecological vulnerability (particularly to frequent floods and river erosion), poor connectivity to urban areas, distance from markets and political neglect have contributed to the poverty and backwardness of the region.

However, at the same time, the Rangpur division is also known as the 'granary' of Bangladesh (Kumar, 2013). Maize, followed by rice, is grown extensively in the Greater Rangpur region. Other crops such as jute, chillies, potatoes and various vegetables are cultivated as well. While most of Bangladesh has a predominantly 'rice economy', the Rangpur division enjoys significant crop diversification (World Bank Group, 2016). Moreover, as contamination of groundwater due to arsenic is affecting agriculture in southern Bangladesh, the onus of maintaining food security is increasing on Rangpur. For a poor country like Bangladesh, food security is paramount, and hence, the waters of the Teesta are more crucial than ever.

While natural conditions and geographical distance from economic centres such as Dhaka and Chittagong are responsible for the backwardness of Rangpur division, years of political neglect, lack of public investment in infrastructure and education, and development of local industries, urban centres and markets are responsible too. The vacuum thus created has been exploited by anti-social elements such as smugglers (Strategic Foresight Group, 2013) and Islamist terrorist outfits such as the Harkat-ul-Jihad-al Islami Bangladesh (HuJI-B) and the Jagrata Muslim Janata Bangladesh (JMJB) to set up their bases and hide-out places (Terrorist and Extremist Groups - Bangladesh, n.d.).

In order to combat the lagging economy, seasonal deprivation and vulnerability, and extremism, the GoB believes that Teesta, the principal river of this region, must flow optimally throughout the year for them to harness her waters for economic development and social stability. Further, the unilateral exploitation of Teesta waters in India and the visible drop in Teesta's flow in Bangladesh have upset the local Bangladeshi people; it is now an emotional issue as well. Hasina's failure to clinch the Teesta deal during her visit to India in April 2017 has drawn sharp criticism from all levels of Bangladeshi society. In the upcoming national elections in Bangladesh in 2018, the Teesta issue promises to be significant in determining the extent of power that will be retained by the Awami League under Sheikh Hasina. Given its secular standing and steadfast friendship, it is in India's interest that the Awami League retains its position as the ruling party.

Purely on the basis of geographic location, Bangladesh is at India's mercy for regulating the flow in the Teesta to ensure adequate flows in the lean season and control of floods during monsoons. However, what lies underacknowledged, much to Dhaka's resentment, is the fact that India is also dependent on Bangladesh in multiple areas they have cooperated upon.

- i. **Connectivity to the North East:** India is connected to its seven north-eastern states solely by a narrow strip of land. Geographical isolation has partly been responsible for the detachment of the north-eastern states from the rest of the country in terms of social cohesion, popular culture and political discourse. The consequences of North East's isolation have been detrimental to India's social, political and economic interests and efforts to bring them into mainstream India have markedly increased in the past few years. Bangladesh, due to the virtue of its geographic location, is an important connector between India and its north-eastern states. Its ports are the North-East's best access points to sea routes and marine trade. Be it transporting electricity, goods, services or people from the North East to rest of India or vice versa, the fastest, safest and most efficient transit routes run through Bangladesh, particularly in the times of natural disasters and other emergencies. The GoB under Hasina has tried to address India's connectivity concerns by opening up numerous transit points all over the Indo-Bangladeshi border, issuing clearance for transport of Indian goods to and from the North East across Bangladeshi territory and allowing Indian ships to use the Chittagong port. India and Bangladesh will also be developing and upgrading the ports at Chittagong, Mongla and Payra together.
- ii. **Combating Islamist terrorism, illegal migration and other anti-social elements:** One of the biggest successes of the GoB under Hasina have been to crack down on Islamist terrorist outfits in Bangladesh. It has supported India's stand on terrorism and cooperated regularly in capturing and handing over a number of terrorists who have been destabilising India's North East and contributing to the spread of Islamist terror across both countries. The GoB has also provided regular intel to India over the movement of terrorist groups around and across the border. Similarly, it has actively cooperated with GoI to control rampant smuggling of drugs, timber, ivory and cattle across the border, as well as tried to curb illegal migration from Bangladesh to India through more stringent border controls and regular intel to GoI. Dhaka's efforts have contributed greatly in minimising threats, attacks and illegal activities, and increasing overall stability in the eastern region of India.
- iii. **Trusted partner in South Asia:** In a volatile and deeply distrusting South Asian neighbourhood, the GoB under Hasina is the one partner which has steadfastly supported India in various areas from diplomatic cornering of Pakistan to restoring and firmly protecting the secular fabric of its country time and again. Hasina has gone great lengths to strengthen bilateral relations with India and change the latter's image from an oppressor to a friend at the risk of antagonising BNP and the rising numbers of Islamists in the country (Talukdar, 2017). Bangladesh is also a strategic partner and gateway to India's 'Act East' policy. Through Bangladeshi ports, it can establish a cultural and economic route to East Asia and engage more actively with the region. In the face of the current Rohingya crisis and instability in Myanmar, another strategically placed neighbour, Bangladesh is the only dependable partner to take the 'Act East' policy further for now.
- iv. **Combating China's Influence in South Asia:** India realises that Bangladesh's friendship is vital if it has to check China's influence and strategic incursion in South Asia. While China is already making headway in Pakistan and Sri Lanka through the China-Pakistan Economic Corridor (CPEC) and the recent USD 1.1 billion deal over Sri Lanka's

Hambantota port (PTI, 2017), it has also begun on India's eastern front. In November 2016, China and Bangladesh signed deals worth USD 25 billion, and Bangladesh has been obtaining most of its military hardware from China, its latest purchase being two Chinese submarines (Bhaumik, 2017). Bangladesh and China have also been cooperating on the Brahmaputra since 2006 for augmenting cooperation on managing water resources. India has reasons to be alarmed as China and Bangladesh move closer to each other; the more China intrudes in South Asia, the more is regional stability at stake.

B.1.1.3. The Current Draft of the Teesta Agreement

While this whole dispute is centred around signing the Teesta agreement, the actual agreement and its contents have garnered little attention. A major reason for this can be that the draft of this agreement is hard to access; it is not available on the official websites of the water-related ministries of both the countries for public viewing and scrutiny. In a country like India where water data has been a sensitive issue and guarded closely by a rather paranoid government and bureaucracy, this does not come as a surprise. Earlier, a draft version of the agreement (Annexure IV) could be found on the website of 'Water Beyond Borders' for the year 2010, but recent verification (October 2017) shows that the draft is not available on that website anymore.

Annexure IV of the draft agreement (the only part of the agreement which was available) makes rather detailed provisions for allocating the water flow in the lean season between India and Bangladesh based on a formula mentioned in Annexure I and also keeps aside 20% flow as "share of river" i.e. for maintaining environmental flows during the lean season. Multiple sources have confirmed that the formula entails a share of 40% each to India and Bangladesh. Further, point ii) of Article II has a special provision for ensuring a minimum quantity of the Teesta to Bangladesh if the Teesta's flow falls below a certain level. The agreement also elaborates on the schedule of the sharing mechanism (Annexure II), a dispute resolution mechanism, pushes for structured data collection and sharing between the two riparians, and takes water quality requirements into account (Annexure III).

Assuming that the actual agreement would be the same or similar, it can be seen that the content of this deal is woefully inadequate in addressing the concerns and development of the entire basin. There are no provisions for disaster prevention, management and mitigation, tackling climate change, harnessing, sharing and conserving groundwater, maximising environmental flows and making them economically viable, river conservation and efficient water management measures, preservation and enhance of the cultural heritage (and consequently tourism) of the Teesta, protection of the basin's ecosystems, and overall human and environmental wellbeing of the basin. The Teesta is not a bucket of water from which mugs of water can be drawn and handed around in the hope of solving everyone's 'water problems'. She is a complex entity, connected to the environment, communities and economies through an intricate web of give and take. She percolates into the lives of her riparians through various layers, and not all of them are tangible and measurable. Simply dividing up her waters is therefore never a holistic solution to the issues in the basin.

The agreement, then, clearly needs to be about more than just minimum flows and 'fair' shares. While 20% minimum flows are a good start, ways have to be found to take this share to 30%. These environmental flows will serve fisheries in both countries, facilitate navigation, and boost tourism, thus creating sustainable employment and maintaining social and economic security in the basin. Both countries need to consider this advantage of adequate environmental flows and think beyond conventional large structural interventions.

It must be remembered that the GoI and GoB indeed managed to get the Ganga treaty signed, but after almost three decades of negotiations. Even then, the Treaty has not been deemed satisfactory on several grounds. For one, it does not provide for any joint development activities of the Ganga basin, beyond flood control, and even then, Bangladesh as well as the Indian state of Bihar face floods due to the Farakka barrage (which is the main point of contention between the two countries) as well as climate change. There are no provisions to tackle climate change and its impacts in the Ganga basin. Without joint development efforts, the river and her communities remain degraded and impoverished respectively. The Ganga Treaty also does not provide a 'minimum guarantee clause' to safeguard minimum flows in lean season, unlike its predecessor in 1977. The dispute resolution mechanism of the Ganga Treaty too is inadequate as it does not provide for an arbitration mechanism for the settlement of the dispute, unlike the Indo-Nepali Mahakali Treaty and the Indo-Pak Indus Waters Treaty. Moreover, since the JRC has focused completely and only on the Ganga, the rest of the rivers have been neglected and no more agreements have been signed yet.

The Indus Waters Treaty signed by India and Pakistan is frequently cited as among the most successful water treaties globally, and in South Asia. Having withstood three wars and nearly constant hostile relations between India and Pakistan, the IWT stands a strong chance of being considered as a 'model' treaty for further water cooperation in South Asia. However, despite its resilience, the IWT has its own limitations. The treaty excludes two riparians of the Indus basin, China and Afghanistan. It allocates three of the six rivers in the basin to Pakistan and the remaining three to India, and is not based on joint efforts towards cooperation and development of the Indus basin. It has a robust dispute resolution mechanism, but there are no provisions to tackle climate change, improve the basin's ecology and biodiversity, manage groundwater aquifers and boost local economy in a joint manner. In this sense, the IWT is limited to preventing conflicts and is not fully equipped to tackle issues of climate change and groundwater and establish holistic cooperation between the two riparian countries.

Thus, the experience with the Ganga Treaty of 1996 shows that simply having an agreement does not guarantee proper conservation and utilisation of the river, while the success of the Indus Waters Treaty has failed to bring about joint

conservation and holistic development of the Indus basin. In both cases, the details of the agreement make a huge difference.

B.2. Domestic Conflicts

B.2.1. India

B.2.1.1. Hydroelectric dams on the Teesta in Sikkim

B.2.1.1.1. The Issue

Sikkim was an independent Himalayan kingdom until 1975 when it merged with India as its 22nd state. The Himalayas run right through the state which is also home to the third-highest peak in the world, the Khangchendzonga. Sikkim is situated in the north-eastern part of India and shares international borders with Nepal, China and Bhutan. Due its geographical location and terrain, Sikkim has been relatively cut off from contact with the rest of India and seen little industrialisation. Since joining India, the predominantly rural economy of Sikkim has been reliant on funds and assistance from the central government in almost all developmental areas. The Teesta river, with its steep drop of more than 5000 m within a distance of 100 kms, is hence considered as a valuable resource from which hydroelectricity can be produced to power the economies of Sikkim and other power-deficit states for considerable revenue. As per the website of the Department of Energy and Power, Government of Sikkim (henceforth, GoS), Sikkim's free share of hydroelectricity is of 12% in the initial 15 years and 15% for two decades after them, while the rest of the power would be sold to states as far as Punjab, Haryana, Uttar Pradesh and Rajasthan. Sikkim's tourism industry, organic farming, horticulture as well as overall economy could benefit greatly from an increased and consistent supply of electricity. As a result, the GoS set on a dam-building spree and by 2011, had awarded 38 projects to roughly 20 private and public firms in India (Huber & Joshi, 2015). As of the year 2017, 16 of them have been cancelled while the rest are either commissioned or in various stages of construction (Table 1).

These hydropower dams have been designated as 'run-of-the-river' projects considered to be environment-friendly, and are supposed to make non-consumptive use of water. However, quite a few papers such as but not limited to Vaghlikar & Das (2010), Kohli (2011), Bhutia (2012) and Shah (2013) have shown that the real consequences of these dams are very different. Most of these 'run-of-the-river' projects are actually large dams with significant storage capacities so that water can be held back for daily peaking power generation, and with underground tunnels, some as long as 18 kms for diverting water. Even though this water is eventually returned to the original course of the river, it does not alter the fact that the river bed lies dry in patches where water has been diverted and stored, sometimes for 24 hours or longer. Travelling up and down the Teesta, it can be seen that she no longer flows consistently; at some places, she trickles while at some, she swells due to the irregular and unsynchronised holding and releasing of her waters by the dams. Further, blasting of tunnels has caused immediate and visible impacts in the surroundings. Landslides have become frequent causing degradation of land, property and domestic water supply; heaps of rocks and heavily eroded mountain sides are a common sight while travelling across the state. Environmental Impact Assessments (EIAs) have not taken cognizance of the severity of this fact, just as they have downplayed the risks and hazards of building so many hydropower dams in an area like the Eastern Himalayas which experience significant seismic activity.

Reasons behind cancelling the 16 dams mostly pertain to vicinity to the Khangchendzonga National Park and 'non-performance' of the companies who were assigned the project. The HEP at Rathangchu was cancelled for religious reasons. This was the result of the first anti-dam movement in Sikkim, led by environmentalists, Buddhist monks and other devout Buddhists under the banner of Concerned Citizens of Sikkim (CCS) who protested vehemently against the dam which threatened to destroy Rathangchu, a sacred river for the Buddhists, and the Khangchendzonga Biosphere Reserve nearby. There were numerous public protests which included monks from monasteries all over Sikkim, and the matter went to the Supreme Court. In 1997, the then newly elected Chief Minister of Sikkim, Pawan Chamling pulled back the project in the honour of "the sentiments, religion and culture of the people of Sikkim" (Huber & Joshi, 2015).

The movement picked up again with the Affected Citizens of Teesta (ACT) in 2004, a group of young Lepcha activists who took it to an unprecedented scale. The ACT began with protesting against the dams Teesta III (at Chungthang in North Sikkim) and Teesta IV (just south of Mangan, district headquarters of North Sikkim) and eventually included five other dams planned near Dzongu, a traditional 'reserve' of the Lepchas, namely Panan Hydro Electric Project (HEP), Ringpi HEP, Rukel HEP, Rangyong HEP, and Lingza HEP. A fiery protest by the ACT in the form of numerous street protests, petitions, cases in the National Green Tribunal (NGT) and a record of several hunger strikes stretching for 915 days led to the cancellation of projects at Ringpi, Rukel, Rangyong and Lingza, while as of 2017, Panan, Teesta III and Teesta IV are at various stages of construction against which the ACT and its associates, namely Sangha of Dzongu (SOD), Concerned Lepchas of Sikkim (CLOS), Citizens Forum of Sikkim (CFS) and the Sikkim Association for Environment continue to agitate.

Elsewhere in Sikkim, another 12 dams have been cancelled, but others continue to be constructed and operated. In 2011, the controversial "Prevention and Control of Disturbance of Public Order Bill" which banned processions, hunger strikes, and any other form of public agitation was tabled by the GoS and raised an uproar of such proportions that the bill had to be recalled (Huber & Joshi, 2013). However, resistance persists, and the tension between the government and civil society continues to simmer in Sikkim.

B.2.1.1.2. Positions

B.2.1.1.2.1. The Anti-Dam Activists

The activists and their supporters are rightly concerned about the deceptive labelling of the dams as ‘run-of-the-river’ projects and that a) 70% of the river was to flow from the tunnels constructed for diverting the water for electricity generation and b) about 150 tonnes of dynamite was used to construct 1 km of a tunnel; the sum total of dynamite blasted for the construction of tunnels of 30+ hydro-projects impacted the brittle Himalayan mountains to their core and increased landslides to the detriment of human lives, land and property (ACT, n.d.).

However, the fears and issues are much deeper. Due to Sikkim’s difficult terrain and isolated geography, Sikkimese society has evolved to be small and close-knitted, and is characterised by emphasis on ethnic and tribal identities. Dzongu, the hotbed of this conflict, has traditionally been a Lepcha bastion which was formalised in 1958 as a part of the erstwhile Sikkimese queen’s estate. When Sikkim became an Indian state in 1975, their identity, along with that of other Sikkimese communities was safeguarded through Article 371F of the Indian constitution. However, the hydropower projects brought with them an influx of migrant labour. Not only were the locals not given employment, but the outsiders came in such large numbers that they threatened to make the indigenous tribes, especially the Lepchas, a minority in their own state.

The ACT, its supporters feared erosion of local cultures and religion; they pointed at the friction between Buddhists and Sikhs over sites such as Gurudongmar Lake sacred to Buddhism as well as Sikhism and the Sikh attempts to rename the lake. Further, isolation had also kept them away from specific health conditions and diseases which were common in the rest of the country; the migrants mingled with the locals and brought with them these diseases, thus impacting public health in Sikkim. Also, after the stipulated time of their work at the hydropower project, they continued to stay in Sikkim and eventually earned voting rights. The local communities, especially the Lepchas who are already a small community were alarmed at this. Electoral politics being all about numbers and demography, they saw this as dilution of their political rights, and a threat to the protection which Article 371 accorded to their ethnic group and identity.

Accompanying these fears was the nature of implementation of project-related activities. The EIAs were fraught with significant errors, and many of them had completely ignored important components, such as seismic activity, which contributed to the ecological fragility of the region. Public hearings were manipulated; protestors were pressurized and threatened (Huber & Joshi, 2015), facts were suppressed, and approvals were forged (Mazoomdaar, 2017). There had also been numerous delays, errors, neglect in the case of resettlement and rehabilitation, and even a blatant portrayal of basic and mandatory facilities such as electricity, primary healthcare centres, roads, schools etc. as “advantageous individual gains” (Huber & Joshi, 2015).

At the initial stages, the activists, particularly ACT, were rather stubborn and aggressive in their approach, which put them at odds with both, the affected local communities as well as the state GoS. Two instances prove this point.

In the first, in 2007, the GoS set up a review committee to look into ACT’s demands. The committee’s recommendations would be submitted within a month of its formation and would be binding on the government in exchange for ACT calling off the hunger strike to sit down with the government and decide the composition of the committee. The ACT responded with a fresh set of numerous conditions. Negotiations collapsed, with the Chief Secretary of Sikkim accusing them of not being interested in solutions and that they were infiltrated with anti-Sikkim forces (Wangchuk, 2007). The ACT could have taken up the offer and played an important role in forming a balanced committee that would have put their grievances ‘on record’ and influenced its recommendations. It took a while for the negotiations to revive, but precious time had passed by then.

In the second instance just previous to the collapse of negotiations over the review committee, a delegation of dam-supporters from Dzongu issued a statement saying that they were not aligned with the hunger strikes led by ACT and CLOS, and their No-Objection Certificates still held good if they were granted better compensation rates for lost land and other safeguards in a timely and orderly manner. They refrained from commenting on the anti-dam activists and their hunger strikes and stuck to their stand, but the ACT responded rather harshly, which eventually led to two bitter, untrusting camps among the people of Dzongu. Around the same time, Lepchas from Darjeeling staged a protest against the projects in Dzongu by blocking National Highway 31A, the sole road connecting Sikkim to the rest of the country, thereby cutting Sikkim off India. The protest lasted for two hours and affected traffic mostly on the Sikkim side, irking many common Sikkimese people. The GoS also was displeased and considered it as an outside interference in state matters (Wangchuk, 2007).

More than a decade has passed since the protests were launched in Sikkim, and the anti-dam activists have seen victories as well as failures. Over the years, the protest has moved from opposing hydroelectric dams in principle to keeping Teesta’s tributaries free of hydropower projects, with each of the party making a few compromises in the process. However, the concerns of ACT and its supporting organisations persist.

B.2.1.1.2.2. Dam Supporters among Local Communities

The Sikkimese people have been sharply divided over the hydropower projects. Even the community in Dzongu has split into two groups, one of those who support ACT and its sister organisations in their anti-dam stance and a second of those who see the projects as an opportunity for development, livelihood and prosperity. While both groups share fears over outsider influence and domination on local culture, religion and politics, they differ significantly on ways to address the situation. Unlike the blanket opposition imposed by the anti-dam activists and their supporters, the pro-dam segment believes that a robust system of adequate checks and balances would resolve the issue. While ACT and other activists

carried out protests, the pro-dam group has repeatedly issued letters and declarations that they were not a part of the protest and were willing to cooperate with the administration and the power companies if their conditions were met. Instances of friction with ACT and its supporters put them further apart from each other and at one point, there was a total absence of trust and dialogue between both the camps (Wangchuk, 2007).

The pro-dam segment, especially of Dzongu, had compelling reasons for supporting the hydropower projects. Unlike the rest of the state which benefited from the tourism boom, Dzongu stayed untouched, with poor infrastructure and low economic activity. Its cardamom plantations were hit by a decline in productivity and market value. In such a situation, the land owners of Dzongu saw the hydropower projects as a chance to sell their lands at a rate many times higher than their market value – in August 2007, the GoS finalised the rate for land acquisition for the Panan project at Rs. 18 per sq. ft. for agricultural land and Rs. 16 per sq. ft. for barren land, when the market rate hovered around as low as Rs. 2 per sq. ft. The 9-fold jump was the highest rate that the state government had for any project anywhere in the state, and it was accompanied with another 30% of the amount as a compensation. This was too much for the Lepchas in Dzongu to ignore.

Further, opposition to these projects meant opposition to the state government, which had unique repercussions in Sikkim. Sikkim's 'success story' of a flourishing tourism sector, organic farming, and fairly developed infrastructure even in some of its remotest areas masks the fact that almost 20% of the Sikkimese population lives below poverty line, and even though it has one of the highest per capita incomes in the North East, much of this income is generated from public employment (18.5% in Sikkim compared to the national average of 6.3%). This is just one of the many indicators emphasising the dependency of the local population on the government instead of other private economic activities for generating income (Chettri, 2013).

Further, it also overshadows the overwhelming dependency of the local communities on the state administration for the provision of many goods and services, employment opportunities, and subsidies, the distribution of which varies along ethnic lines. The GoS has complete control over this distribution which is often influenced by short-term political interests. Due to such high level of dependency on the government, the locals automatically face restrictions on expressing dissent; control on distribution of basic facilities and resources enables the state to silence any opposing voices and coerce the locals into conforming with its agenda (Chettri, 2013). Naturally, many locals were unable to voice any opposition towards the projects even if they wanted to for the fear of being stripped off government benefits and left alone to fend for themselves. The monetary and employment benefits (at least as projected initially) of the projects were thus an obvious choice for many.

B.2.1.1.2.3. Government of Sikkim (GoS)

Since its amalgamation with India 42 years ago, Sikkim has seen only two full-term Chief Ministers, Nar Bahadur Bhandari (1979-1994) and Pawan K. Chamling (1994-present), with no robust opposition to either. Coupled with the government's stronghold on basic necessities and resources, and the fact that open dissent is not a traditional aspect of the Sikkimese society, the resultant nature of democracy in Sikkim is quasi-feudal, with little space for sustained and systematic disagreement and criticism of the state within civil society.

This is the primary reason why the strength and tenacity of the Lepcha movement against dams took everyone, including the state, by surprise. The GoS initially ignored the protests, but as they grew in volume and number, it had no option but to respond. The GoS tried working out all sorts of solutions with the anti-dam activists, from offering to set up a review committee to look into the demands of the ACT, to restricting the flow of outside labour in Dzongu, to cancelling about 16 projects up until now. Talks collapsed from time to time, but each time they resumed, the GoS seemed to work towards a solution that would safeguard everyone's interests. However, hydropower project continued to be built in Sikkim and problems pointed out by activists and local communities continued to hamper the economic, ecological and cultural interests of the region.

The GoS maintained a careful balance of coercion, persuasion and incentivisation in order to advance its agenda. Depoliticizing of dams (shifting the responsibility of the projects to private, non-governmental actors), promoting selected facts and 'there-is-no-alternative' (TINA) narratives (Huber & Joshi, 2015), pressurizing protestors through threats and public criticism, and more subtle means such as financing local festivals and celebrations were some of the tactics used by both GoS and private hydropower companies to round up approval and curb dissent. The systematically built dependence of locals on government machinery for basic necessities, employment and subsidies contributed to the use of *saam-daam-dand-bhed*³⁰³ by the establishment and the private sector.

However, the dam building spree in Sikkim has been slowing down. From 27 hydropower projects allotted to various public and private companies in 2007, the number has come down to 16 in 2015, with many projects being stalled or abandoned due to financial reasons. The hydropower projects on the Teesta in Sikkim are at various stages of construction and experience inordinate delays, governance and clearance issues and huge cost overruns. For instance, the original cost of the Teesta III project has almost doubled from Rs. 5702 crores to Rs. 11382 crores by the year 2015, while the original completion deadline for the Teesta IV project was 2011-2012, which was then shifted to 2016-17 (Datta, 2015); as of November 2017, the project is yet to get environmental clearance and major works have not started (Energy and Power Department, GoS, 2017). Further, the risk of increased landslides due to intensive tunnelling and

303 An ancient Indian saying which outlines four ways of getting a task done. Saam – through requests, pitches, advice; Daam – through monetary incentives; Dand – through punishment; Bhed – through 'divide and rule' policy.

seismic activity (Sikkim falls in seismic zone IV; zone V has the highest risk) have also added considerably to the costs of completing these hydropower projects.

In the face of widespread, aggressive and persistent opposition, high ecological risks, and mounting financial problems, the Chamling-led GoS went to great lengths to consolidate hydropower projects in Sikkim for reasons, many of which received the nod of the GoI as well. Elaborated below, they sum up the geopolitical and economic importance of hydropower projects for Sikkim.

- i. **Economic independence:** The most significant driving force behind the hydropower project building spree in Sikkim is economic independence from central aids, funds and development packages. After annexation into India in 1975, Article 371F of the Constitution was created specially to preserve certain laws and social, political and economic rights of the indigenous communities of Sikkim. Additionally, it also granted Sikkim the status of a 'special' state which enables it to this day to receive a special share of grants and funds (apart from those included in the National Planned Expenditure) from the central government plus a separate contribution by the central government amounting to 90% of the total costs of Centrally Sponsored Schemes in the state. Sikkim's small, largely agrarian and poor economy is heavily dependent on these funds, and is able to secure them only as long as it is a 'special' state. In an attempt to reduce this vulnerability, the GoS views hydropower as a financially lucrative option. As per the contracts signed over the projects, an average of 12% of the power generated is allocated to Sikkim, while the rest of it is sold to other states in North India. Given the direct correlation between availability of electricity and economic growth, the GoS hopes to stir up Sikkimese economy and bring more prosperity to the state through, in the words of Chamling, its own 'white gold' (Huber & Joshi, 2015).
- ii. **Cautious and cordial relations between GoI and GoS:** Since Sikkim is a crucial border state surrounded by three countries – Nepal, Bhutan and China – it is unlikely that it will ever lose the status of 'special' state. Sikkim plays the very important role of providing a buffer between China and the very vulnerable Chicken's Neck. China particularly has an active presence at the border. The latest standoff between Indian and Chinese troops at Doklam in Sikkim in July 2017 led to the Chinese state-controlled media calling on Beijing to "reconsider its stance over the Sikkim issue" and push for a 'pro-independence movement' in Sikkim (Patranobis, 2017). While this rhetoric gained traction in neither of the establishments, such a possibility is very real and cannot be taken lightly. The geopolitical vulnerability and significance of Sikkim has led to successive central governments carefully maintaining cordial relations with the state and not interfering in its peculiar ethnicity-driven politics and quasi-feudal democracy. However, even though GoI has continued to allot funds generously to Sikkim, it sees an opportunity to meet the needs of a power-hungry India in Sikkim's untapped hydropower potential which is more than 5000 MW and up to 8000 MW at peak times (Department of Information and Technology, GoS, 2016), and has thus encouraged the proliferation of hydropower projects in the state.
- iii. **The 'clean' image of hydropower:** Hydropower development is an attractive option to energize Sikkimese economy because of its 'clean' image which fits perfectly with Sikkim's reputation for eco-friendly policies. Sikkim, with its untouched verdant beauty, almost non-existent industry (and pollution), and fully organic farms is famously known as the 'green state' in a country otherwise reeling under the harmful effects of industrial pollution and fertiliser-soaked agricultural lands. A host of policies and eco-friendly initiatives in Sikkim, ranging from afforestation to state-wide bans on plastic bags have drawn appreciation and numerous awards for the state, including the 'Sustainable Development Leadership Award' for CM Chamling at the World Sustainable Development Summit in 2016 (ANI, 2016). Being "the cheapest green power available to mankind today" (Huber & Joshi, 2015), hydropower only enhances the image of the state and its government.

B.2.1.2. The Struggle for Gorkhaland

B.2.1.2.1. The Issue

Gorkhaland is a separate state demanded by the Gorkha community which resides in the extreme north of West Bengal. Its proposed area consists of Darjeeling district, surrounding Darjeeling hills, parts of Siliguri subdivision and parts of the Dooars region, all in north Bengal.

The aspiration and struggle for Gorkhaland is almost a century old, when the region was under British control. Historically, Gorkhaland has not been an independent state; the region was passed around among the regional powers of Sikkim, the Gorkhas, Bhutan and the British. In the early 20th century, when the Darjeeling hills were an administrative part of British Bengal, the Nepali-speaking Gorkhas began to dominate the region, while indigenous tribes from Sikkim settled down as minorities. What further propagated the influx of communities in the region was the tea sector; the British brought with them cheap labour from Nepal, eastern India and even China, while Marwadis and Bengalis flocked to the tea estates to take up salaried and clerical positions. The Gorkhas and other local tribes found themselves increasingly at the bottom of the flourishing tea ladder, which, along with practically no affinity with Marwadi and Bengali cultures, united them in their rejection of their artificial integration with Bengal. This culminated into the demand for a separate administrative unit for Darjeeling district in 1907, and then one for Darjeeling and Jalpaiguri districts in 1929 (Banerjee & Stöber, 2013).

Figure 97: Proposed Map of Gorkhaland.



Picture Credit: The Darjeeling Chronicle – via Facebook

The All India Gorkha League was founded in 1943 with the aim to separate the Darjeeling hills from West Bengal. During the time of India's independence, a public meeting was held in Darjeeling to voice local aspirations for autonomy. The District Committee of the Communist Party of India (CPI) even issued a memorandum pitching for the creation of a 'Gorkhistan' out of Darjeeling Hills, southern Sikkim and Nepal. However, CPI's West Bengal faction opposed the idea vehemently and rooted for the Darjeeling hills to remain a part of the newly created state of West Bengal, a position upheld henceforth by every government of the state, irrespective of the ruling party (Benedikter, 2009). The nationwide exercise of linguistically organising Indian states evaded Darjeeling hills in the 1950s. Nepali, the language spoken by about two-thirds of the population in the Darjeeling hills was simply not considered as an official language until 1961 by the GoWB and in 1992 by GoI (Mitra, 2017). The Gorkha National Liberation Front (GNLF) was formed by Subhash Ghising in 1979 and a long, tumultuous struggle for Gorkhaland was launched. The struggle continued throughout the 1980s, with the GNLF approaching the Prime Minister of India demanding a separate state and the recognition of Nepali language under the 8th schedule of the Constitution. The struggle began to turn violent and at its peak in 1986-88, nearly 1200 people succumbed to the political violence.

The then GoWB finally yielded to a compromise – the 'Darjeeling Gorkha Hill Council' (DGHC) was formed in 1988 under Subhash Ghising's chairmanship. Under the DGHC, territorial autonomy was granted to the sub-divisions of Darjeeling, Kalimpong and Kurseong, and a few villages from the Siliguri sub-division as well. However, without legislative powers, the DGHC quickly descended into inefficiency, financial problems and non-democratic functioning. For years, the DGHC did not meet, no economic planning was undertaken, and accountability was severely compromised. In short, the DGHC had wasted the opportunity.

In 2007, Ghising was toppled from his position as the Chairman of DGHC and was succeeded by Bimal Gurung of Gorkha Janmukti Morcha (GJM) who launched a fresh struggle for Gorkhaland. Under Gurung, a bill for creating the Gorkhaland Territorial Administration (GTA) was passed in 2011. The GTA replaced DGHC and had more administrative, financial and executive powers than the DGHC, however, they were still not vested with legislative powers. GJM proposed to include 398 mouzas³⁰⁴ from Siliguri and Dooars in the GTA and expand its territory but was furiously opposed by the Bengalis who had increasingly come to view the Gorkhas as 'outsiders' and migrants from Nepal rather than the indigenous Nepali-speaking population of the region.

Just before the elections for GTA, the Justice Shyamal Sen Commission recommended the inclusion of only 5 mouzas to the existing GTA territory, which angered the GJM and led them to boycott the elections (Nagchoudhary, 2017). However, they came around and after quite a few political upheavals, captured all the seats of the GTA. The Gorkha community continues to lend support to GJM and Gurung as is evident in the May 2017 municipal elections in which GJM retained three of the four municipalities in the Darjeeling Hills.

In June 2017, a controversial decision by the GoWB to make Bengali compulsory in all schools of West Bengal sparked protests in the Nepali-speaking GTA region which saw the move as an act of aggression against their language and culture. The protests which began peacefully quickly spiralled out of control and widespread occurrences of violence were reported. Police and paramilitary forces had to be deployed, which further led to skirmishes between them and the protestors. The protests began with the agenda of opposing the imposition of Bengali language, but the demand for Gorkhaland soon took over, with the GJM firmly stating that "the only thing [they] want now is Gorkhaland" (Special Correspondent, 2017).

The protests collided with peak tourist season of the region, and the tourism sector took a hit not only in the GTA region but also neighbouring Sikkim, the sole road to which passed through GTA territory (Giri P. , 2017), (Chowdhury, 2017).

³⁰⁴ A small administrative unit, akin to a village.

By the time the GJM called off the agitation in September 2017, 104 days had passed, 11 lives and significant public and personal property had been lost (Express News Service, 2017), and the GJM had split with one faction resuming control of the GTA. While the protests have died down, the region is still simmering with dissent among both the Gorkhas and the Bengali populations. Recognizing this, the Kolkata High Court has issued a stay order on the central government's decision to pull paramilitary forces out of the Darjeeling hills (Chatterjee, 2017).

B.2.1.2.2. Positions

B.2.1.2.2.1. The Gorkhas

Unlike the local communities in Sikkim who were divided over the hydropower projects, there is an overwhelming consensus among the Gorkha community over a separate Gorkhaland. While the demand for Gorkhaland is primarily territorial, over years, it has accumulated layers of economic status, language, culture, ethnicity and political clout. The Gorkhas differ from the Bengalis in ethnicity and physical appearance; their distinctly separate languages and cultures have co-existed for more than a century but not blended in. With the tea plantations, economic differences also took root; Bengalis took up all the clerical and bureaucratic i.e. 'white collar' positions while many Gorkhas, along with other tribal communities from Nepal, Sikkim and East India were brought to the tea estates as labourers. Hence, it was only a matter of time that the Gorkhas and other Nepali-speaking communities frowned upon the merger of the Darjeeling hills with Bengal, which they deemed as artificial.

The dissent among Gorkhas increased with the delay in recognising Nepali as an official language; for years, it was not recognised as a second language even at the district level in Darjeeling. The Bengalis dominated economically and culturally, and after independence, they took over politically and bureaucratically as well. The Gorkhas began to feel increasingly trapped – they had neither financial control, nor political clout, nor cultural influence in a state with which they were merged purely in an administrative sense. The only solution, they surmised, was a separate state of Gorkhaland; in the words of Roshan Giri, secretary-general of the GJM, “[o]nly a State in India can provide us with the necessary legal framework for developing our ethnic and linguistic identity” (Giri R. , 2009).

It must be noted that while the Gorkhas have clamoured persistently for a separate state, the idea of seceding from India and forming a separate country is not on their cards. Firstly, the Gorkhas are a patriotic community; the Gorkha regiment is one of the most valiant regiments of the Indian Army. Secondly, they recognise the comparative benefit of staying with India over forming an independent state in the face of complex geopolitical and economic realities of the proposed Gorkhaland. Within India, the Gorkhas are confident of stabilising and progressing as a successful state for various reasons. Economically, the proposed area under Gorkhaland would be home to several tea estates, forests and national parks, and the upper reaches of the Teesta. With these resources, tea, timber, tourism and hydropower will be able to flourish, bringing significant revenue to the state. Politically, there are considerable chances that Gorkhaland will qualify as a 'special' state. Its location in the Chicken's Neck, shared international borders with Nepal and Bhutan, and proximity to China will bring focus and funds from the central government. As a gateway to the north-east, Gorkhaland also stands to benefit from the 'Act East' policy. Socially and culturally, a separate state would enable the Gorkhas to preserve and enhance their language and culture more proactively. However, there are other factors which are not conducive for the creation of Gorkhaland.

- i. **Too small for statehood or too large for social dominance:** The current area under the GTA is about 3300 km² with a population of about 12 lakhs, and has three seats in West Bengal's legislative assembly. With not even a full Lok Sabha seat in its kitty, the GTA-administered area is too small to merit statehood. However, with Siliguri and Dooars, the area of proposed Gorkhaland almost doubles to 6500 km² and its population expands to 32 lakhs which translates into 20-25 assembly seats, and one, or possibly two Lok Sabha seats. However, the population of Gorkhas in Siliguri, and Dooars is not in majority; these areas are dominated by Bengalis and Adivasi tribes. Essentially, if the total population of the newly proposed area is considered, the Gorkhas will not emerge as the dominant community. In fact, they will end up being a minority in their own state and gain neither political clout nor cultural mainstreaming which they have been seeking through Gorkhaland. In other words, a larger Gorkhaland would defeat the very purpose of Gorkhaland.
- ii. **Risk of a new state in the Chicken's Neck:** A separate Gorkhaland's location in the Chicken's Neck would possibly mean the 'special' status, but it could also mean a challenge to the new, inexperienced administration. The region is sensitive on multiple levels – political, strategic, military, economic, social – and any weakness or folly in this region can have serious ramifications in terms of security. While military and security are the domains of the central government, daily administration, law and order and internal peace are under state administration. Whether a new, inexperienced state government with a record such as that of its predecessor DGHC can successfully carry out these duties in unique and highly sensitive situations is a serious question.

B.2.1.2.2.2. The Bengalis

The Bengalis, both within and outside the Darjeeling hills oppose the creation of Gorkhaland. They argue that the area now proposed to be Gorkhaland has been as much a home to them as to the Gorkhas. While they accept the GTA, they are against the inclusion of areas from Siliguri and Dooars in the proposed state on the grounds of Justice Shyamal Sen Commission's verdict and that these areas are not predominantly Gorkha, but home to a mixture of Bengalis and Adivasi tribes. Rather, the Bengalis have started viewing the Gorkhas increasingly as 'outsiders'; the open border policy with Nepal has led to a huge influx of Nepali migrants to the region. These migrants share common language and culture with

the Gorkhas and hence in the eyes of the Bengalis, the Nepali-speaking communities are ‘taking over’ not only the Darjeeling hills, but also areas of Siliguri and Dooars which have traditionally been a Bengali and Adivasi stronghold.

For many Bengalis, Darjeeling is traditionally a part of their state. It features in their literature as a place of beauty and recreation, and has an exceptional sentimental value attached to it. For Bengalis, the Darjeeling hills contribute to the unique image of West Bengal – the only Indian state with both, the Himalayas in the North and the sea in the south – which is similar to India itself in a miniature form. They are ready to make concessions to the Gorkhas (the GoWB publicly apologized to them for imposing Bengali language in all schools of the state) but they are also resolute in keeping West Bengal unified. It cannot be forgotten that the Bengalis have seen partition twice, first in 1947 and second in 1971. Many Bengalis have fled East Pakistan and Bangladesh before settling down in Darjeeling, the surrounding hills, Dooars and Siliguri. For them and even for West Bengal as a whole, the idea of a third partition is simply unacceptable. Banerjee’s poignant words sum up the collective feelings of the Bengali community: “Bengal cannot suffer the pain of yet another partition”.

B.2.1.2.2.3. The GoWB and GoI

The GoWB has unequivocally opposed the creation of Gorkhaland from the very beginning. Barring the one memorandum issued by CPI in 1947, neither the Left nor Banerjee’s TMC have indicated any support for the creation of Gorkhaland. The fact that even the slightest whiff of support to Gorkhaland would severely impair their popularity within the Bengali community – the largest in West Bengal – is a strong political reason for the parties to oppose the Gorkha movement. However, there are other reasons, especially from the point of view of a ruling party, as well.

- i. **Economic importance of Darjeeling hills to West Bengal:** The Darjeeling hills are economically important for West Bengal as they have flourishing sectors of tourism and tea. In 2014 alone, more than 6 lakh tourists visited the areas under the GTA. In the same year, the areas of Darjeeling and Dooars produced over 187 million kgs of tea, which amounts to about 60% of the tea production of West Bengal (Tea Statistics, n.d.). Darjeeling and Jalpaiguri districts have the highest per capita incomes in West Bengal (Planning Commission, GoI, 2010) and tea, a financially lucrative cash crop, is an important contributor. If Gorkhaland becomes a separate state, West Bengal will lose substantial parts of two of its more prosperous districts and see steep reduction in its revenues.
- ii. **Control over Teesta’s flow to West Bengal:** If Gorkhaland is formed, it will be the upstream neighbour to West Bengal and will control Teesta’s waters before they reach the Bengal plains. The GJM is fully aware of this; amidst the strikes, rallies and violence of 2017, GJM chief Bimal Gurung warned that he would halt ongoing hydel projects, Teesta Lower Dam III and IV on the river as a “non-cooperation movement against the West Bengal government”. That the statement did not materialise into reality is another story, but the fact remains that an independent Gorkhaland, with or without the graces of the central government, can certainly use the dams to halt flow of the Teesta downstream to West Bengal. If Gorkhaland is created, West Bengal will lose two hydropower projects worth 292 MW to the new state. Currently, the Teesta Barrage project in North Bengal produces only 20 MW of electricity, and based on its slow and dismal progress, it looks unlikely that it will meet its original target of generating 67.5 MW of electricity. Hence North Bengal is relying on the Teesta Lower Dams III and IV for fulfilling its power needs. With Gorkhaland in the picture, West Bengal will have no option but to buy power from the new state, thus stretching its finances.
- iii. **Weakening of GoWB’s position in the Teesta issue:** the Gajaldoba Barrage built on the Teesta river is located in the Dooars region, downstream of the Teesta Lower Dams III and IV. Since all three dams are currently located in West Bengal, the GoWB holds a key position in controlling the flow of the Teesta to Bangladesh, and in the whole transboundary dispute. Even if GoWB retains the Gajaldoba barrage, losing Teesta Lower Dams III and IV to Gorkhaland would reduce GoWB’s control over the flow of the Teesta and weaken its position in the Teesta transboundary issue.

Given these reasons, it is clear that no government (and no party aiming to form government) in West Bengal would support the creation of Gorkhaland.

National political parties have historically shown little interest in the matter. The BJP had initially sided with the Gorkhas; in 2009, it contested and won the Loksabha seat from Darjeeling, with its candidate Jaswant Singh voicing active support for Gorkhaland. However, over the years, BJP has carefully retraced its position. It is currently trying to pave its way into West Bengal and fears that vocal support to Gorkhaland would seriously hamper its progress in the rest of the state. The state’s BJP cell too has openly stated that even though they empathise with the agitators and stand for their development, they do not support the creation of Gorkhaland for now. However, one cannot rule out the possibility of a BJP-led GoI pushing for the creation of Gorkhaland sometime in the future. The strategic location of Gorkhaland regarding the Teesta sharing issue as well as the current government’s demonstrated capability to take bold and swift decisions (demonetisation, GST etc.) has raised the possibility (and hopes) of a separate Gorkhaland. If and when such a decision is taken, it would be heavily dependent on the status of the Teesta issue, India-Bangladesh relations, political climate in Bangladesh and the political and economic situation of West Bengal, to name a few.

B.2.2. Bangladesh

B.2.2.1. Domestic Conflicts in the Teesta Basin – A Possibility for the Future?

As far as one can see, there are no major domestic conflicts in the Teesta Basin in Bangladesh. Unlike Sikkim and West Bengal who face turmoil, the overall situation in Rangpur is that of relative stability and peace. In fact, Rangpur division is one of the more peaceful areas of Bangladesh. It is among areas least affected by political violence, militant activities, rebellions and insurgencies, and *hartal* (strike) violence with considerably less casualties than many other areas of Bangladesh (Suykens & Islam, 2015). Rangpur has been a shelter for Islamist militant outfits such as Harkat-ul-Jihad-al-Islami Bangladesh (HuJI-B) and the Jagrata Muslim Janata Bangladesh (JMJB), but the division has by and large stayed out of the ambit of their attacks which have been concentrated in areas in and around power centres like Dhaka and Chittagong. Security-wise, its distance from urban epicentres like Dhaka and Chittagong has benefitted Rangpur.

Multiple sources and field visits convey that Rangpur's principal problem is the reduction in the flow of the Teesta. It is true that there are more than a dozen other rivers flowing through Rangpur including the mighty Brahmaputra, however, except for Teesta and the Brahmaputra, many of these rivers are too small to support a significant size of population and agriculture throughout the year. Also, the Brahmaputra flows in the far eastern part of the division while the Teesta is closer to the central part. To the west of the Teesta, there is no major river running through Rangpur. Teesta river is the only major source of water for most of the division. Hence, even if the Teesta basin in Bangladesh covers only 2004 km² area inhabited by 9.5 million people, more than 21 million people in the country are dependent directly or indirectly on the river for livelihood.

Further, the fact that Rangpur is far away from economic centres and markets such as Dhaka and Chittagong, has led to its decades-long neglect. It was only in 2010 that the region was separated from Rajshahi division and focused upon for development. Effectively, Rangpur has been prioritised for only seven years now and has a long way to go before it sheds off the tag of a backward division. The GoB has been taking efforts along with many NGOs to boost agricultural production, public health, literacy and resilience to natural disasters. In all these areas, water availability and management are key to achieving progress and hence, the administration has set its sights on the Teesta which is the fourth largest river in the country and the largest river in Rangpur division after the Brahmaputra.

For anyone familiar with the Teesta conflict, it is no news that India's actions upstream of the Teesta are hurting Bangladesh, the downstream riparian. However, domestic issues of the Teesta basin in Bangladesh are not covered as extensively by Bangladeshi media, academia and policymakers. A recent public outburst in Ulipur town of Kurigram district, Rangpur division provides a glimpse into some local issues in the Teesta basin of Bangladesh.

B.2.2.1.1. 'Save the Buri Teesta' movement

A local movement to 'Save the Buri Teesta' a 30-km-long distributary³⁰⁵ of the Teesta was launched in Ulipur upazila of Kurigram district of Rangpur Division in February 2017. The Buri Teesta emerged as a distributary of the Teesta river at Arjun village of Ulipur upazila and joined the Brahmaputra river at Kachkol area under Chilmari upazila. Its flow was controlled by two regulators (sluice gates) by the Bangladesh Water Development Board (BWDB) at Arjun and Kachkol. However, due to heavy floods in 1988, the sluice gate at Arjun collapsed. Since then, BWDB blocked the flow of Buri Teesta and it started silting rapidly. In the process, all agricultural land in its vicinity became unusable in the dry season. Along with agriculture, local navigation (including recreational activities such as annual boat races) and fisheries were severely hit. Slowly, the Buri Teesta fell to neglect – even a simple bridge could not be constructed over the small river due to petty local politics, lack of funds, and obstruction from locals, most of whom were poorly compensated for their land at the site of construction (Asaduzzaman, 2012). The Buri Teesta is almost dead now and its dry bed has been grabbed illegally, mostly by rich and powerful locals, and turned into agricultural fields for regular cultivation. Some have also created and sold plots in the river bed for commercial uses.

The 'Save the Buri Teesta' movement has four clear demands – a) digging at source-point of the Buri Teesta in order to rejuvenate the flow, b) reconstruction of the sluice gate at Arjun, c) immediate eviction of illegal land grabbers to restore the course of the river, and d) immediate dredging of the river bed. In March 2017, more than 5000 people of Ulipur came out on the streets to form a 2-km-long human chain urging authorities to rejuvenate the Buri Teesta river (Daily Star Correspondent, 2017). The very next month, a procession of around 4,000 people carrying water bottles and pitchers went to the Khepar Bridge over the Buri Teesta. They poured water in the river, in a symbolic move to recreate the flow of water and urged authorities again to prevent the river from dying. The mayor of Ulipur municipality supported the movement, insisting that normal flow of the Teesta and Buri Teesta were essential for the local environment (Staff Correspondent, 2017). In May 2017, the movement went to Dhaka. The Ulipur Samity at Dhaka formed a human chain yet again in front of the National Press Club in which natives from Ulipur and Kurigram staying in Dhaka and leading environmentalists of the country participated in large numbers. Directly addressing the Prime Minister, the organisers and participants reiterated their four demands in front of a large crowd. (Staff Correspondent, 2017).

The movement has received the attention of the concerned authorities. The Executive Engineer of BWDB Kurigram has agreed to build a new sluice gate at Arjun in the next fiscal year stating, "if the local lawmaker assists me, the project may be approved quickly" (Wahed, 2017). The Upazila Nirbahi Officer (UNO) of Ulipur took up the issue with the Assistant Commissioner of Kurigram district. It was also discussed by Kurigram's District River Protection Committee under the National River Protection Commission. All eyes are now on the coming fiscal year when works on the Buri Teesta will begin.

B.2.2.2. The Teesta Narrative and Conflicts

³⁰⁵ A distributary is a branch of a river that does not return to the main stream after leaving it.

That unilateral actions by India upstream on the Teesta have severely affected her flow downstream and rendered Bangladesh's Teesta Barrage Project partially useless is an undisputed fact. However, the popular narrative in Bangladesh portraying Indian actions as the singular problem and a bilateral treaty on the Teesta as the singular solution does not take cognizance of the shortcomings in water infrastructure, management and conservation practices in the country.

Multiple studies conducted by both Bangladeshi as well as non-Bangladeshi researchers confirm the definite deterioration of the Teesta and the reduction in her flow over the past few decades, especially after the Gajaldoba barrage started operating. However, the availability of Teesta's water, or in general of transboundary rivers flowing into Bangladesh, became a grave issue of national political proportions only in the last 20-25 years. This was due to not only decreasing flows and other climate change impacts, but also political/developmental changes in upstream India. In 2001, the Central Electricity Authority of India identified the Brahmaputra basin as "India's powerhouse" and singled out two states, Arunachal Pradesh and Sikkim, as most ideally suited for hydropower production. Within these new findings, the GoI saw the fulfilment of its twin goals of fulfilling the needs of power-hungry central and western states of India, and bringing the North East into mainstream economic growth.

Accordingly, plans for 168 hydropower projects with a total installed capacity of 63328 MW were drawn up for the north-eastern states, more than half of which were to be in Arunachal Pradesh and Sikkim alone. The Ministry of Power, GoI, also launched the '50,000 MW Hydro Initiative' in 2003 as part of GoI's "Mission 2012: Power for All". Incidentally, Sikkim and Arunachal Pradesh were also the upper riparians for Teesta and Brahmaputra, two major rivers of Bangladesh. Bangladesh was rightly alarmed at the intensive damming activity which India embarked upon without consulting its co-riparians. With high uncertainty of impacts, very little information available due to GoI's opaque dealings, and high stakes for the vulnerable downstream communities, Indian hydropower projects in particular and joint water management in general became key points of Bangladeshi hydropolitics (Kolås, et al., 2013). While civil society groups arranged local protests of aggrieved and vulnerable communities, spearheading the agitation at the national front was the BNP.

To this day, the contestations and protests continue. India's hydropower projects in the North East and the lack of a water sharing agreement, especially on the Teesta, are discussed intensively among the political circles, academia and civil society in Bangladesh. However, apart from highlighting India's actions and the need for an agreement, very little is put forth. Few papers talk about local solutions such as rainwater harvesting in the Teesta basin, or a critical and pragmatic look at the current draft of the Teesta agreement without hurrying to get it signed – such an approach is clearly not mainstreamed in the current political and even academic discourse over the Teesta. The focus instead, of Bangladeshi political class and at least a portion of civil society and intelligentsia is to get an agreement signed and obtain "a fair share of Teesta waters" from India, once and for all. This is particularly crucial for the Hasina government; it will finally silence her critics, especially the BNP, who have been alleging that her government has 'sold over' to India. A deal over the Teesta will also go a considerable length in consolidating the Awami League's position in northern Bangladesh, more so if the agreement is signed before Bangladesh's national elections in late 2018/early 2019.

The media too has clamoured vigorously for the agreement with little incursion into its details. An analysis of media coverage around the Teesta agreement from 2010 to 2012 conducted by the International Union for Conservation of Nature (IUCN) points out that when the Teesta deal fell through in 2011, the media in both countries resorted to "a blame game" and indulged in "a fair amount of partisan and unattributed reportage". The report highlighted the fact that the "least detailed aspects of the proposed Teesta agreement in the media during this period were: the rationale on either side of the border for the water-sharing agreement, the contours of the agreement, and the strategies being explored, if any, for pushing for the agreement to take place in the near future" (Bhushan & Ahmed, 2014); looking at media coverage of the Teesta since then, it can be seen that little has changed.

It would be prudent to remember here the Ganga Treaty which despite being signed and implemented, has failed to address issues of the Ganga River basin on both sides of the border. Pushing for an agreement and a share of the river deemed as 'fair' by narrowly defined parameters would work in nobody's interest; better to have no agreement instead of a detrimental one. However, geopolitical realities and political equations on both sides of the border have now made the Teesta agreement (in whichever form) imperative. Given the importance of the Hasina-led GoB for India, the Teesta agreement is bound to be signed sooner than later. However, if all the efforts are focused solely on getting a signed agreement and a fixed quantity of water from India without proper infrastructure, technology, distribution systems and management practices in place, it is highly likely that domestic conflicts over the Teesta will occur in Bangladesh after the agreement is signed. In order to prevent this from happening, Bangladesh needs to have a framework already in place to store, manage and distribute the waters efficiently, equitably and sustainably. Both countries need to ensure that issues such as climate change, river and groundwater conservation and sustainable development are adequately addressed in the agreement itself. As the downstream riparian state with the development and stability of its poorest region at stake, Bangladesh needs to realise the urgency and act proactively.

A. LOCAL COMMUNITIES OF THE TEESTA

Teesta's riparian communities are largely rural and agricultural, characterised by low level of economic activity (a small service sector and an almost non-existent industrial sector), poverty, low level of human resource development, weak access to markets, and an overall low standard of living. They are highly dependent on the Teesta river for survival and livelihoods, and many of their cultural and religious practices involve her in various capacities. Within an area of little more than 12000 km², the Teesta basin holds extraordinary cultural diversity; almost all major religions are represented, and various languages, ethnicities, tribes, and two nationalities can be found staying together. However, always clubbed

together as one monolithic group, the different interests, aspirations and concerns of the local communities are rarely taken into serious consideration. Through activism and a more vocal civil society on both sides of the border, it is now possible for the local communities to ensure that their fears and needs are heard. As gathered first-hand and through secondary sources, the primary issues of the local stakeholders are as follows.

- i. **High apprehension about dams and other built structures on the Teesta:** Right from North Sikkim to Kurigram, locals are highly sceptical and even fearful of the big dams and barrages built across the Teesta and their effects on the river's health and ecology. The anti-dam movement is the strongest in Sikkim, partly because most of the dams on the Teesta are concentrated there and partly because the impacts on the state's fragile ecology have been immediate and severe, but communities downstream are critical of the Gajaldoba and Dalia barrages as well. Those who supported the construction of the dams in Sikkim as well as those who see economic opportunity in the Gajaldoba and Dalia barrages are nevertheless anxious about impacts of the structures on the surrounding environment, their society, and the health of the river.

In Sikkim, there are concerns regarding safeguarding of indigenous cultures and the religious value of the Teesta, disaster mitigation and management, and obtaining the electricity supply as promised by power companies and the state government. In North Bengal, the locals worry over dams in the Darjeeling hills and Sikkim, the devastating floods caused due to their unsynchronised release of water especially in the monsoons, overall environmental degradation, and the effects of a rapidly deteriorating Teesta on their farming and fishing activities. The Bangladeshis are most upset over the Gajaldoba barrage and the resultant irregular flows of the Teesta, leading to droughts in the lean season and floods in the rainy season, year after year. The Dalia barrage, now almost defunct due to Gajaldoba upstream, is unable to meet irrigation and other water needs of the Bangladeshis, causing severe stress to their livelihoods. Project affected people across the basin are concerned about adequate and timely land compensation and employment opportunities.

- ii. **Climate change and disasters:** Local communities in the Teesta basin are experiencing climate change first-hand. Rising temperatures, greater snow melt, season shifts, erratic monsoon patterns and increase in severity of natural disasters are a current reality in the Teesta basin. Further, the effects of climate change have been aggravated by unchecked dam building in the region. The largely agrarian nature of the local population makes it extremely vulnerable to climate change and combined with a lack of latest knowledge, technology and resources, the socio-economic and environmental risks for Teesta's local communities are high. While many tribal and riverine communities have been picking up the signs from their surroundings – through observing river flow, behaviour of surrounding wildlife and climate patterns – they find it challenging to access regular, reliable and easily understandable data on what is happening to their land, water and climate. This inaccessibility obstructs farmers, fishermen and other people whose livelihoods are vulnerable to the vagaries of nature from taking timely and informed decisions to prevent or minimise their losses and arrange for substitute income.
- iii. **Migration and social upheavals:** the cases of Sikkim and Gorkhaland shed light on the sensitive nature of social and cultural diversity in the region. With two partitions, an annexation, and the birth of an eventually violent socio-economic movement (the Naxalite movement), the Teesta basin carries high social risks. Its geopolitically sensitive location makes it even more vulnerable to external interference or worse, provocation. Its economic backwardness and uneven development lead to considerable rural to urban migration, as well as an influx of migrants from Nepal and Bangladesh into Gangtok and Darjeeling-Jalpaiguri areas (which are the most developed areas of the region). There is vocal discomfort and even outrage about migrants from Nepal and Bangladesh.

Opposition to Nepali migrants is largely socio-economic, as legally, India shares an open border with Nepal. However, there is no such arrangement with Bangladesh, and a large number of migrants are illegal. In 2004, the estimated numbers of Bangladeshi illegal immigrants to West Bengal and all of India were 12 million and 5.7 million respectively (Das P. , 2016). As of 2017, the total number of Bangladeshi illegal immigrants in the country is said to be 20 million (Tripathi, 2017). This number has radically altered population dynamics in West Bengal and the North-East, leading to communal fears in the region and drawing ire at a national level. While local riparians in the Teesta basin recognise that many of these migrants, legal and illegal are fleeing, among other things, environmental and economic crises, they feel that this influx is an infringement on their lands, resources, opportunities and rights. Many North Bengalis have vouched for giving Bangladesh a fair share of the Teesta with the hopes that this might improve the agricultural situation in North Bangladesh and curb illegal immigration.

- iv. **Weak representation of local concerns and interests:** local communities across the basin feel that their actual concerns and interests find little space in bilateral negotiations and mainstream media. Many civil society organisations and activists have raised awareness about various local issues in the Teesta basin especially on the Indian side, but at the negotiation table as well as in the existing draft of the Teesta agreement, these issues are not addressed. A stakeholder survey conducted by The Asia Foundation in 2013 in the Teesta basin indicated that there was "little propensity to conduct public consultations on issues that directly affect the local people", with about 78% of the respondents never being invited to share their views before the start of a development project (Prasai & Surie, 2013). Since the survey sample was not large enough to be statistically significant, the results could be debated. However, first hand field research for this project echoed these results across the entire length of the river. For stakeholders to be heard, there has to be a platform, and only civil society initiatives can create it.

Another survey by Prasai & Surie (2013) indicated that 33% of Indian residents and 43% of Bangladeshi residents resorted to media outlets for making their voices heard, while almost similar proportions also took their concerns to local politicians. In the case of media, Bangladeshi stakeholders have fared better than their Indian counterparts. This is because the Teesta issue resonates with a larger base in Bangladesh than in India due to its geographical compactness and relative homogeneity as compared to India's vast size and variety of issues which compete for national attention. With local politicians and government officials, there hasn't been much success as negotiations have been restricted to the highest levels of the political ladder. Not only the local communities but also other important actors such as hydropower companies, prominent activists and NGOs in the Teesta Basin, and even the Chief Ministers of West Bengal and Sikkim and the Divisional Commissioner of Rangpur have been excluded from these negotiations.

The common man on both sides of the border is undoubtedly influenced by the political and media narrative over the Teesta. Fuelling his discontent is the visibly declining and deteriorating flow of the Teesta, leading her to a slow and painful death, year after year. It is natural that local riparian communities of the Teesta are emotional about her waters and her possible extinction. However, instead of letting their political representatives and the media take disadvantage of it, they need to move beyond emotions and look at the Teesta as a strategic, economic, ecological resource that needs urgent care and fortification. It is unfortunate that the bilateral negotiations do not give as much importance to socio-cultural and economic impacts of the Teesta issue on local communities as they do to geopolitical, technological, financial and security aspects. However, these four factors have a direct impact on Teesta's local communities, and must be kept in view in order to devise solutions and policies which can be pragmatic, feasible and more than an academic exercise.

B. GROUNDWATER

One of the most neglected aspects of the Teesta basin is groundwater. Not only no aquifer mapping has been done at a basin-wide scale but also there is no mention of groundwater and the regulation of its use in the existing draft of the agreement. The upper reaches of the Teesta i.e. Sikkim state is home to what is known as a 'mountain aquifer' while northern part of West Bengal and northwestern Bangladesh have alluvium aquifers which are a part of the extensive alluvium aquifer of the Indo-Gangetic plain. Accessing water from mountain aquifers is relatively more challenging than that from alluvium aquifers. They are variable and complex, and their recharge depends largely upon the relationship between slope and the underlying geology. Alluvium aquifers are vast and shallow reserves of groundwater and more easily accessible, but their recharge rate is slow.

Groundwater is used in many places in the middle and lower reaches of the Teesta basin. In the area from Sevoke to Jalpaiguri, dug wells are the main source of drinking water. Sinking tube wells is difficult in this region due to presence of pebbles and boulders hence they are lesser in number. The water table in this region is shallow with small seasonal fluctuations which makes it an almost perennial source of water. However, arsenic³⁰⁶ has been traced in the groundwater, especially in areas very close to the course of the Teesta (Bhattacharyya & Mukherjee, 2008).

Groundwater is extensively used on the Bangladeshi side of the Teesta basin, partly due to decrease in surface water, and partly because groundwater is abundantly available at a shallow level. However, between 1981 and 2011, it has been exploited to unsustainable levels and the decline in groundwater table has been found to be between -2.3 m to -11.5 m. The use of tubewells has proliferated in the region chiefly due to the rapid and widespread expansion of boro rice cultivation which consumes 78.7% of the abstracted water. Together, boro rice cultivation, resultant exploitation of existing groundwater, depletion of surface water, reduction of wetland areas and below average rainfall are major impediments to sustainability of groundwater in the region. Further, a joint study by Ahmed et al., (2004) has found moderate to severe traces of arsenic in about 60-80% of tested wells in the region.

As the volume of surface water in the Teesta and her tributaries decreases due to natural or anthropogenic factors, groundwater will become more and more crucial for fulfilling domestic and agricultural needs. However, there is no shared policy on how the groundwater of the Teesta basin will be used, conserved and improved qualitatively. It is evident that uncontrolled abstraction of groundwater is going to deplete the aquifers. Contamination of groundwater can also make it a scarce resource. If the alluvium aquifers deplete, recharging them, especially the deeper ones, is a slow process, sometimes taking hundreds of years. Surface water depletion is immediately visible and obvious and hence, an easily identified cause for conflict. In the case of groundwater, it is not so; groundwater depletion is relatively slower, inconspicuous, out of human sight, and hence out of human mind. This makes groundwater a potential and serious cause of conflict. While the Teesta basin has a good amount of groundwater, it is only a matter of time that it turns into a scarce or qualitatively unusable resource; the process has already started. Taking cognizance of this silent factor in negotiations, policies and the agreement while there is still time is of paramount importance.

C. CLIMATE CHANGE IN THE TEESTA BASIN

The Teesta basin is an ecologically diverse region, stretching from the Tibetan plateau to the tropical humid plains of Bengal. The basin has an extremely fragile ecology which is sensitive and vulnerable to climate change. It is also prone to earthquakes, droughts and floods, the intensity of which have been aggravated by large dams upstream of the river.

Average temperatures across the Himalayas and on the Tibetan plateau have been rising at rates higher than global average for about half a century now. Temperatures in the Himalayas rose at a rate of 1°C per decade from the 1970s to the 1990s (against mid-latitudinal northern hemisphere average of 0.6°C). As a result of this warming of the Himalayas,

³⁰⁶ A harmful mineral which in its inorganic form can cause cancer of skin, lungs and bladder.

snow-covers and glaciers are melting at an alarming rate, swelling Himalayan rivers and causing huge floods. Many of these receding glaciers end up creating glacial lakes. Water accumulates rapidly as snow and ice melt faster, and sudden discharge of large volumes of water and debris from these lakes causes glacial lake outburst floods (GLOFs), which cause huge destruction in the valleys downstream (Vagholikar & Das, 2010).

All these phenomena are observed in the Teesta basin as the Teesta arises from a glacier and is a perennial snow-fed river. Rising average temperatures are observed throughout the basin, and so are the changes in rainfall. Rainfall pattern in the Teesta basin has become erratic, more intense over a smaller number of 'wet' days with longer dry spells, and will continue to be more so. Such intense rainfall over a short period of time is leading to a high rate of soil erosion and landslides in the upper reaches of the Teesta, and increasing the number and intensity of floods and droughts across the basin. If this scenario continues at the current pace, in the next few decades, it is projected that the melting glaciers will at first swell the rivers with increased meltwater, but then, as the glaciers will continue to shrink, so will the volume of meltwater, and the glaciers will disappear altogether. The environmental ramifications of such an event would definitely be disastrous, but the social, economic and political consequences could be destabilising and catastrophic beyond imagination.

What is worrying is that despite a mammoth amount of research and clear evidence, climate change and its effects find no place in the bilateral negotiations and the existing draft of the Teesta agreement. It is a clearly visible ticking time bomb and yet, large dams continue to be built and the signs continue to be neglected or at best, be 'fixed' by temporary measures. Governments at state and central level might have different agendas, but they are unanimous in their dismissive attitude towards the profound effects of climate change sweeping across the basin.

D. ROLE OF DOMESTIC POLITICS IN TEESTA TRANSBOUNDARY DISPUTE

It is evident that the Teesta dispute is not restricted to the central governments of India and Bangladesh. While GoWB is directly involved in the bilateral issue, India's interests in Sikkim and Bangladesh's interests in Rangpur play an indirect role in the tussle over the Teesta. It is impossible to study this dispute by formally separating domestic politics and bilateral relations between India and Bangladesh; the two are entangled in complex ways with each affecting the other.

Despite failure of the Teesta talks in 2011, it is evident that bilateral relations between India and Bangladesh have been largely smooth. Some friction was definitely created in 2011 but it was temporary, and relations were back on track on many fronts, including the Land Boundary Agreement as well as various agreements in defense, transport, electricity, education, maritime safety etc., being signed over the next few years. Looking back, India's failure to sign the Teesta agreement looks like a speedbump in the otherwise smooth journey of India-Bangladesh ties. Moreover, the central governments of both countries have time and again shown willingness to sign the agreement, as both recognise the importance of the issue for the health of their relationship, which in turn is important for South Asia's stability and security.

Particularly, Bangladesh finds in India a natural ally – culturally, historically, economically and geographically. A secular democracy like itself, India is a trusted partner for Bangladesh in economic development, capacity building, trade, defense, research and development and combating climate change. India too sees a friend in Bangladesh, and especially in the secular Awami League government lead by Sheikh Hasina. Bangladesh is also a strategic partner connecting India to its north-eastern states, fighting terrorism in South Asia, and pursuing its 'Act East' policy. Owing to proximity and geographical similarities, India and Bangladesh experience natural disasters and climate change in similar ways. Both countries are dependent on each other for growth and stability.

It is due to GoWB's opposition that India has not signed the treaty; hence the driver behind the fundamental Teesta dispute is a domestic player. Even though GoI has constitutional powers to override the position of GoWB, geopolitical and domestic realities dictate otherwise. Much to the chagrin of Bangladesh, these factors thwarted the signing of the Teesta agreement. While relations became frosty for a while after the pull out, India more or less got away without signing the treaty, at least in the short term for the following reasons.

- i. India is the upstream riparian, as well as more powerful economically, politically and militarily.
- ii. India's location as well as strength increased its stalling capacity. Bangladesh too tried to stall transit deals which would give connectivity to India's north-eastern states with the rest of the country through Bangladeshi territory. However, Bangladesh could not stall for long.
- iii. Bangladesh has a bigger win-set³⁰⁷. Despite the Teesta negotiations falling apart, GoB braved domestic pressure and cooperated with India over many other issues. Many agreements and deals were signed between 2011 and this day, including almost two dozen deals in April 2017 alone. Due to the size and flexibility of Bangladesh's win-set, India found it relatively easy to 'make it up' to Bangladesh by offering aid and cooperation in other less contested areas and ensure at least satisfactory if not excellent ties.
- iv. In India, there were differences between the positions of centre and state, whereas in Bangladesh, the position over the Teesta deal was largely homogenous. The GoI was able to successfully use the reason of domestic pressure and friction for not signing the agreement: it satisfied GoWB without antagonising Bangladesh into defection from negotiations and deteriorating bilateral relations.

³⁰⁷ A win-set is an array of all possible outcomes that are acceptable to the negotiating party. I have borrowed this concept and related logic from the 'two-level game theory' as elaborated by Robert Putnam in his paper "Diplomacy and Domestic Politics: the logic of two-level games" published in 1988.

However, there is no doubt that an agreement over Teesta's waters is very much in India's interest and India needs the Teesta treaty to secure its friendship and partnership with Bangladesh for a stable and secure South Asia. For this to happen, both India and Bangladesh need to rework their strategies in realising the Teesta agreement. In the case of India, it needs to acknowledge the role of domestic players in the issue not only verbally, but through action. To start with, at least the two state governments need to be roped in. GoI needs to bring West Bengal, the main contender, aboard and include Sikkim as well. The tactic of offering more and more cooperation and aid in various areas to Bangladesh i.e. maximising its win-set will not work after a while; it will certainly be tested in the national elections of Bangladesh in 2018/2019. GoI will have no option but to prioritise signing the Teesta agreement by winning West Bengal's support and aligning the win-sets of Sikkim and West Bengal with its own.

It is an unfortunate fact that as the downstream riparian, the onus of getting the Teesta agreement signed lies on Bangladesh. Lowi (1993) argues that upstream states, due to geographical advantage, do not need to bother with downstream requirements and are in a position to act as they please, especially if they are a powerful regional hydro hegemon (like India and China). However, this is not entirely true in the case of India and Bangladesh as Bangladesh is important for India in many ways which have been mentioned earlier in the paper. As the downstream and non-hegemonic riparian of the Teesta, it is up to Bangladesh to strengthen its bargaining power, and through innovative options and solutions, incentivise India to get the deal through. Increasing bonhomie with China and positioning itself as a crucial partner in combating terrorism in north-eastern India has benefitted Bangladesh, but it needs to consolidate its indispensability further to push India into delivering what it wants.

Beyond the governments who are players at the domestic and international/bilateral level, there is a third level of civil society, environmentalists, academia, technocracy, corporates and activists. Currently, these actors are excluded from the negotiations. However, this does not mean that they do not wield power. Warner & Zawahri (2012) note that these non-state actors "can enter the game and influence the outcome even under conditions of power asymmetry among the riparian states" by using "their specialised knowledge, networks, and 'soft power' to challenge the authority of powerful states and alter the power equation". An example is cancellation of multiple hydropower projects owing to pressure from anti-dam activists and local communities. While non-state actors from both sides have not played a major role in the bilateral Teesta dispute as of now, they hold potential to influence and shape its proceedings. Their presence is of prime importance for the health of the Teesta and her ecosystems, and efficient use and just allocation of her resources on both sides of the border. In the Indian context at least, non-state actors provide heterogeneity in interests and positions at the domestic level. This heterogeneity opens doors for Bangladesh to find supporters on the other side of the negotiating table.

E. CONCLUSIONS AND RECOMMENDATIONS

In the complex web of conflicts in the Teesta basin, the most ignored entity is the river. Heavily dammed, mined for sand, drying in wide patches, deteriorating in quality and reeling under the impacts of climate change, the Teesta nevertheless retains traces of her once pristine beauty. Frequently subject to landslides in its upper reaches and severe droughts and floods in its lower reaches, the Teesta manages to support a population of 30 million people in her basin. She has been directly responsible for their survival and livelihoods features prominently in their cultural, recreational and spiritual lives.

The importance of Teesta to India and Bangladesh is profound. For India, she is the only major river draining two of its geopolitically important state – Sikkim and West Bengal. The Teesta also flows through the Chicken's Neck and separates the North East from the rest of the country. For Bangladesh, Teesta is the principal river in its dry, drought-prone north and north-west region which is also the poorest region in the country. Away from urban centres and markets like Dhaka and Chittagong, Rangpur division's economic growth and development relies heavily on the Teesta river. Both countries naturally want to reap maximum benefits of the Teesta though at current rates of consumption, the total volume of the river, even if used up completely, is insufficient to meet their needs. This scarcity combined with India's upstream location and hegemony is the driving force behind Bangladesh's insistence that a fair sharing arrangement over the Teesta be worked out at the earliest.

On the surface, the failure of Teesta talks in 2011 and the overall lethargy in their progression indicate a gap in Indo-Bangladeshi relations. However, apart from temporary setbacks, the bilateral ties between India and Bangladesh have sailed well and expanded into areas such as education, maritime cooperation, IT, transport and defense. Moreover, the Indian government has repeatedly voiced its consent to signing the Teesta agreement. The bilateral dispute then, is not really just bilateral; the opposition by the Banerjee-led GoWB to the terms of the current draft of the Teesta agreement is the single biggest hurdle to the fruition of Teesta negotiations. While the Indian Constitution grants the central government powers to override GoWB's opinion in this matter, geopolitical realities state that the GoI bringing GoWB onboard before signing the Teesta agreement is in the interest of the country's security, economy and political stability. For Banerjee and her government, retaining maximum of the Teesta's waters for North Bengal is important for gaining political clout in the traditionally Leftist stronghold and assuaging the discontent in the region, especially within the Gorkha community.

The current Bangladeshi government too is anxious to compensate for years of neglect of Rangpur division by securing the Teesta waters for its population, as well as provide an answer to the nationwide criticism of their failure to get the Teesta deal before the country goes to national elections in late 2018/early 2019. In this entire scenario, there is no weightage given to the river's conservation and sustainable use and development, the economic importance of her

resources for sectors like tourism, fisheries and navigation, equitability in access to and allocation of her resources among the local communities in the basin, and her resilience to various impacts of climate change.

Thus, through numerous examples throughout the paper, it has been established time and again **that the Teesta dispute between India and Bangladesh is neither a bilateral dispute between the two countries, nor is it about the Teesta river**. The term 'Indo-Bangladeshi conflict over the Teesta river' has proven to be a misnomer. The political players in the dispute have clear political, economic and security interests; it is the local communities and activists on both sides of the border who have prioritised the Teesta on their agenda. Since the river is directly connected to their social, economic and cultural wellbeing, it is understandable that the local communities strive to restore and maintain her quality and quantity.

However, it must be noted that the river is neither the exclusive nor the topmost priority of the local communities; their struggle for the Teesta is enmeshed with numerous struggles to preserve their cultural, ethnic and religious identities which have regularly overtaken the cause of saving and conserving the river. This has also resulted in difference of opinion and deep divisions within them, unlike political and economic players (such as the hydropower companies) who enjoy a relatively larger support base within their own groups. The vulnerability of local communities to environmental and social phenomena such as climate change, demographic transformations, globalisation and privatisation, and regional political dynamics is responsible for their recurring emphasis on cultural and political identity and economic fortification, sometimes at the cost of the river. The activists and NGOs who support and further their cause understand this and hence their stand too is a hybrid of the issues of the river and other socio-economic concerns of the local communities of the Teesta basin.

A conflict which has intricate layers of economics, domestic politics and regional geopolitics needs solutions that consider these layers as inseparable and legitimate aspects of the problem as well as recognise the personal interests behind each party's position and actions. Such solutions are pragmatic and able to satisfy personal interests, but in the hope that once these personal interests are satisfied to at least a certain extent, the players will acknowledge the bigger picture and collaborate to work towards a greater, nobler goal of saving and flourishing the river, her ecosystems and her people. While we cannot assume that the parties will develop such an integrated, environmental approach after their interests are met, we can certainly incentivise certain actions and policies which would lead to the betterment of the Teesta.

For India, the priority is to sign the Teesta agreement and retain the Hasina-led GoB and its friendship without antagonising the people of West Bengal. The following actions could yield results.

- i. **Involving Sikkim:** Throughout the unravelling of the Teesta issue, the state of Sikkim has been a mute spectator. Despite being the uppermost riparian with thirty-odd dams holding a substantial amount of Teesta's water, Sikkim has never been included in the discourse over sharing the Teesta, neither at domestic level nor at national level. Whether it is the state's location as the uppermost riparian, the fact that it has almost no stakes in the sharing issue, its 'special' status, or the geopolitical importance of its location that has left Sikkim 'untouched' throughout the dispute, Sikkim must no longer be kept away from the negotiating table, especially now that it shares vulnerability to climate change along with the other two regions. The main argument of the GoWB is that the volume of Teesta waters that flows into West Bengal is not enough to fulfil its needs with Bangladesh's demand to spare. Lack of synchronisation of water releases by Sikkim's dams affects the flow of the Teesta to Gajaldoba and eventually to Bangladesh. Hence it is natural, rather imperative, that Sikkim be a part of the discourse on bilateral sharing of the Teesta.
- ii. **A domestic agreement on the Teesta:** The GoI should also work towards a domestic agreement over the release of Teesta waters between Sikkim and West Bengal. In order to get the Teesta agreement signed (and not stall it) soon and especially before Bangladesh goes to national elections, it is important that all the domestic players are aligned with the GoI when it goes to the negotiation table. The domestic agreement can determine the timing, quantity and quality of flow of the Teesta up to Gajaldoba in such a manner that a maximum of North Bengal's water needs is fulfilled and flash floods downstream in southern Sikkim and North Bengal are prevented by synchronising water releases from the dams upstream. The agreement can (and should) also include quality control measures, and joint actions to increase their resilience towards climate change, protecting Teesta's ecosystems, and developing Teesta's economy in an integrated manner. Such an arrangement and its efficient and timely execution would go a long way in blunting GoWB's opposition to the bilateral Teesta agreement between India and Bangladesh.
- iii. **Water use efficiency and conservation plan for the Teesta basin in North Bengal:** It has been established that the volume of the Teesta is no longer sufficient to fulfil the demands of India and Bangladesh. The dwindling supply of her waters, be it due to dams upstream or climate change, calls for extensive demand management through serious upgradation in water use efficiency and water conservation efforts, especially in North Bengal. Since water is a state subject as per the Indian Constitution, planning and implementing efficiency and conservation measures is primarily the responsibility of the GoWB. By expanding its activities into disaster management, groundwater management and sustainable crop patterns, it can develop a blueprint for efficient water management in North Bengal. Through sustained, systematic implementation and proper awareness, the GoWB can fashion this responsibility into an opportunity to a) develop and consolidate a voter base in North Bengal, especially in the rural areas and b) cooperate with GoI on the Teesta agreement without fearing opposition from local communities and its adverse political consequences.

On the other hand, the West Bengal unit of BJP can also spearhead water use efficiency and conservation efforts in the Teesta basin in order to pave its way into North Bengal. In North Bengal which has traditionally been a Leftist stronghold, such a move would make BJP look more centrist than right wing, and not only enable the central BJP-majority government to take the unpopular decision of giving more of the Teesta to Bangladesh, but also improve the chances of BJP performing well in the West Bengal state elections in 2021. Further, such efforts would also gain traction among local communities, environmentalists, environmental NGOs and activists who are more likely to lend actual on-ground support to the GoI in conserving Teesta waters for West Bengal as well as sharing them equitably with Bangladesh. However, while the political opportunities are enormous, the risk of water use efficiency and conservation turning into a mere tool for political gains and thus being treated with a shallow, farcical approach is very real. Care should be taken that this does not happen.

- iv. **Other sources of power in Sikkim:** Sikkim's dams, though environmentally harmful and socio-culturally disruptive, are a crucial source of revenue for the state, and of power for states as far as Punjab, Haryana and Rajasthan. Hence, for economic and energy reasons at least, complete dam removal is not a practical option. However, there are two other options which GoS and GoI can explore in Sikkim. The first is constructing many micro and mini hydel projects in place of some of the dams, especially those which hold large storage capacity. Studies exploring dams that could be replaced with smaller, non-storage dams should be carried out. Also, in order to prevent micro and mini hydel projects from creating the same adverse social, cultural, economic and environmental impacts which large hydropower projects do, care needs to be taken that these projects are backed by inclusive planning, active participation of local stakeholders and strict adherence to environmental regulations.

The second option is using solar energy. The steep drop in solar energy prices and a record low of Rs. 2.44/kWh in 2016-17 (Das, Gambhir, Sarode, & Dikshit, 2017) has made solar energy an attractive, clean and cost-efficient option for fulfilling the power needs of a sunshine-abundant India. It is true that Sikkim does not have the large, flat spaces which are required to install solar panels in order to generate solar energy on a large scale. However, it can definitely explore investing in rooftop photovoltaic (PV) systems for its houses and buildings. Further, large scale solar energy production is very much possible in Punjab, Rajasthan and Haryana and must be encouraged to reduce dependence on hydropower.

With solar energy and micro and mini dams, Sikkim will truly be able to maintain the image of being an 'eco-friendly' state. This will certainly have an impact on Sikkim's revenues in the short run, but by investing in and upgrading its tourism, service and organic farming sectors, Sikkim can generate substantial revenues (even if not as much as the current hydropower projects) and definitely provide wider employment options to its local population than the hydropower projects could. These moves will go a long way in pacifying the discontented Lepchas and other local communities, as well as curb the environmental degradation in the region. It must also be noted that given Sikkim's strategic location and the current geopolitical realities in the Himalayas, it is highly unlikely that Sikkim's 'special' status and consequent benefits will be taken away. Hence Sikkim (and India) should consider the economic, social, environmental, cultural, inter-state and international impacts of its dams and take serious efforts to reduce their numbers and impacts in the Teesta basin.

- v. **Greater (incremental) autonomy for Gorkhaland Territorial Administration (GTA):** The short-term benefits of establishing a separate state of Gorkhaland for both the Gorkhas and the GoI cannot offset long term liabilities and challenges. For the Gorkhas, the current size of the GTA is too small to merit statehood, whereas expanding it to include areas of the Dooars and Siliguri subdivision will reduce them to minority status in their own state, defeating the purpose of Gorkhaland. For the central government, a fledgling state in the vulnerable Chicken's Neck would drain its financial and security resources. Also, there are other ways in which the current GoI can coax or pressurize West Bengal such as increasing its win-set through more funds, resources and other benefits, improving performance in the state during Loksabha elections of 2019, and possibly a regime change in West Bengal in 2021 are some ways in which West Bengal can be brought aboard the Teesta treaty.

In such a scenario, a separate Gorkhaland is neither desirable nor necessary. Instead, more autonomy to the existing GTA in areas of legislation, economy and socio-cultural aspects along with a robust system of checks and balances for greater efficiency and accountability would work in all parties' interests. The Gorkhas would benefit by gaining more control without losing their majority or stability, West Bengal would be able to keep its state intact and access Teesta Lower Dams III and IV, and the GoI would be able to gain more support in Darjeeling for the Teesta treaty as well as the Loksabha elections of 2019. With GoWB onboard, the option of declaring Gorkhaland as a Union Territory can also be explored.

Bangladesh's priority number one is getting the Teesta agreement signed, and particularly for Hasina's government, before the upcoming national elections. While the time frame is too short for all of the following actions are likely to be carried out effectively, the GoB needs to think and proceed along their lines.

- i. **Restricting its win set:** By signing various agreements and cooperating in a host of other fields with India, Bangladesh is effectively allowing India to get away without signing the Teesta agreement. The GoB should recognise areas in which it has the upper hand and try to strike a bargain which would entail India prioritising the Teesta river and the release of its waters to Bangladesh. India recognises the importance of the Awami League-led government for the strength of its bilateral ties with Bangladesh; this factor can be leveraged to start discussions on Teesta afresh and get a better, more comprehensive and fairer deal not only for Bangladesh but also for the local riparian communities across the basin. Bangladesh being the downstream riparian has more

incentive and need (in the short term) than India to ensure a holistic agreement over the Teesta. It must therefore take a pragmatic look at the consequences of foregoing certain cooperative or friendly moves in exchange for the Teesta agreement and choose the terms of its bargain accordingly.

- ii. **Basin-wide approach:** The Teesta is a tributary of the Brahmaputra and the Teesta basin, strategically located the wider Ganga-Brahmaputra-Meghna (GBM) basin. 83% of Bangladeshi territory lies in the GBM basin whereas about a third of Indian territory lies in the GBM basin - its management therefore is key to Bangladesh's overall growth, development and stability in greater proportion than it is in the case of India. Hence, Bangladesh cannot afford to look at it from a myopic point of view.

Even though the Teesta basin is shared only by India and Bangladesh, other countries in the South Asian neighbourhood such as Nepal and Bhutan are upstream riparians to quite a few rivers of the GBM basin. Nepal lies completely in the Ganga basin of which Bangladesh too is a part, while rivers such as Jaldhaka, Torsa and Raidak flow through Bhutan as well as Bangladesh with India being the middle riparian. Bangladesh should look beyond India and work on developing water resources with these countries at a basin level, as it already is with China. The process has already begun; under Bangladesh JRC, there have been five expert level meetings with Nepal since 2000 while a Bangladesh-India-Bhutan group for sub-regional cooperation has met once in 2013. This initiative needs to be sustained and expanded, with or without India, with a basin-wide outlook and corresponding aims to bring about all-round development in the region. Increasing cooperation between Bangladesh, Nepal and Bhutan will motivate India to step up and contribute more substantially to joint efforts on water resources management and development in the GBM basin.

- iii. **Preventing possible future domestic conflicts:** Unlike India, the Teesta basin in Bangladesh is not fraught with conflicts between different domestic constituents. However, the potential for conflicts to erupt after a stipulated share of the Teesta waters starts arriving from India very much exists and can materialise into reality very rapidly if adequate measures for equitable and efficient allocation are not taken swiftly. Besides negotiating for the agreement, Bangladesh should focus on investing in appropriate water infrastructure and cheap and effective technologies. It should also devise and diffuse best practices in water management and governance and put in place a comprehensive framework of robust water laws, rules and regulations to efficient utilisation and equitable allocation of the Teesta waters to the last drop. In the long run, these steps can play an important role in mitigating and preventing water conflicts in Bangladesh's Teesta basin.
- iv. **A far-sighted, more comprehensive Teesta agreement:** The Teesta agreement in its current form is but a narrow, reductionist and state-centric approach towards sharing the Teesta's waters. In the long run, both India and Bangladesh are likely to suffer from such half-baked water cooperation, but in the short run, the stakes for Bangladesh are higher. Before renewing its efforts for signing the Teesta agreement, Bangladeshi water experts and policymakers should take a long, hard look at the content of the current draft of the Teesta agreement and invest time and efforts in making it holistic and truly representative of the interests of the river and her stakeholders. It is true that this will push the signing further into the future, but it is better to have a delayed deal which is beneficial than to have a bad deal finalised hastily. Ideally, the geopolitical consequences of the delay should push both riparians to rework the Teesta agreement speedily and strategically and give it more vision and comprehensiveness. However, given that India is less affected in the short term, it is up to Bangladesh to initiate and propel the process.

Together, India and Bangladesh should also revise the Terms of Reference (ToR) of the Indo-Bangladesh Joint Rivers Commission. Apart from meeting regularly over the joint monitoring of the flows of the Ganga at Farakka, the JRC is carrying out other functions in a rather half-hearted and inconsistent manner. Both countries need to revamp the JRC and convert it into a River Basin Organisation (RBO) operating at the transboundary level, with more powers, more autonomy and a wider scope that includes preserving, protecting and enhancing hydrogeological properties the river, agriculture, fisheries, animal husbandry, water supply and sanitation, groundwater aquifer management, pollution control, sand mining, water for industrial use, water for tourism etc. in the basin. A strong dispute resolution mechanism, and allocation of water and financial resources within the area to obtain optimal results are fundamental. However, other functions such as establishing stakeholder fora and partnerships, and enabling regular interactions between them and relevant government departments are important as well, and need to be incorporated in the main functions of the RBO. Initially, the RBO can begin functioning on a single transboundary river basin such as the Teesta and gradually, it can be expanded to include rest of the 54 transboundary rivers shared by India and Bangladesh as well. While each river basin has its unique characteristics, an overarching, cumulative and integrated agreement and an equally holistic and effective RBO can be aimed for transboundary water security and cooperation between the two countries.

The civil society is most and directly affected by the Teesta dispute and the least heard among all parties. Whatever be its ultimate intention, civil society is the one party closest to placing the actual river and her environment high up on its agenda. In order to safeguard the river and ultimately its own survival, civil society needs to regroup and take the following actions.

- i. **Clamour for a better agreement:** Local communities, activists and NGOs across the basin need to prioritise a better Teesta agreement, drawn on the lines of environmental sustainability, resilience to climate change, economic efficiency and equitable allocation of Teesta's waters. Through community outreach programs, NGOs and activists can spread awareness about the contents of the current draft of the agreement and sensitise local communities towards factors such as climate change, environmental flows, groundwater management, disaster mitigation,

- heritage preservation, and protection of Teesta's flora and fauna which have been omitted from the draft. This sensitisation has to be accompanied by political awareness drives which relay domestic and international political equations, regional geopolitical realities, various narratives of the issue on both sides of the border, and the economics of the Teesta dispute to the local communities in an easy-to-understand manner. The objective is to develop a well-informed consensus in order to negotiate longer and better, and a combination of environmental and political knowledge would empower the communities with a realistic and greater grasp of the situation and further contribute to their struggle. With this multifaceted understanding, the local communities would be in a better position to understand the motives and agendas of their political representatives and bureaucracy and demand a better agreement followed by accountability from them.
- ii. **A more assertive role of the epistemic community**³⁰⁸: The epistemic community too has a huge role to play in this regard. While many studies have been conducted on the environmental, economic, social and scientific aspects of the Teesta basin, its geopolitical dimensions and entanglement of bilateral and domestic politics is rarely focused upon. Deeper and more sophisticated analysis of the geopolitics of the Teesta basin is the need of the hour. The epistemic community needs to probe further into these dimensions of the Teesta dispute and work twofold: on one hand, empower the civil society with their findings and analyses and on the other, advise the negotiating parties at both domestic and bilateral level to implement solutions that would make everyone better off.
 - iii. **Stronger track II diplomacy**: The nature of Teesta negotiations is state-centric and in dire need of more consistent and robust Track II initiatives to solve the Teesta issue, which can be taken up after sufficient progress is achieved in the two areas as mentioned above. Initiatives such as the India Bangladesh Roundtable on Blue Peace in the Eastern Himalayas – convened in Mumbai by Strategic Foresight Group, a Mumbai-based think tank, and attended by 25 senior diplomats, Members of Parliament, former ministers and experts from India and Bangladesh (Strategic Foresight Group, 2013) – should multiply and be publicised extensively in mainstream media. This will play a crucial role in disseminating vital facts and figures about the issues in the basin across both countries and provide narratives which are relatively less politicised and biased to locals in the Teesta basin and the Indian and Bangladeshi population at large.
 - iv. **Push for water conservation measures**: Recognising that decentralised water management and localised solutions are not as lucrative for governments as large-scale irrigation and hydropower projects are, NGOs, activists and the epistemic community should spearhead the spread of water conservation and efficiency practices which can be directly accessible to and implementable by local communities. Rainwater harvesting, farm ponds, rooftop solar PV and water-efficient cropping patterns are some solutions which can be implemented at an individual and community level with NGOs providing technical know-how and access to basic materials. Water security is a crucial aspect of social and economic stability, and access to such easily applicable solutions will go a long way in improving and conserving the river and inculcate both resilience and confidence in the local communities. With their basic risks and vulnerabilities addressed, the communities will then be in a better position to demand overall conservation and development of the Teesta basin.

BIBLIOGRAPHY

- ACT. (n.d.). *Affected Citizens of Teesta (ACT) - Issues of Concern*. Retrieved from Affected Citizens of Teesta - ACT: <http://www.actsikkim.com/concerns.html>
- Ahmed, K. M., Bhattacharya, P., Hasan, M. A., Akhter, S. H., Alam, S. M., Bhuyian, M. H., . . . Sracek, O. (2004). Arsenic enrichment in groundwater of the alluvial aquifers in Bangladesh: an overview. *Applied Geochemistry*, 19(2), 181-200. Retrieved from https://s3.amazonaws.com/academia.edu.documents/43465379/Arsenic_enrichment_in_groundwater_of_the20160307-21850-61j6l.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1509188039&Signature=Vh96lbJvuvlT1QHktN35R0JfSI8%3D&response-content-disposition=inline%3
- ANI. (2016, October 6). *Sikkim CM Chamling honoured with 'Sustainable Development Leadership Award'*. Retrieved from Business Standard: http://www.business-standard.com/article/news-ani/sikkim-cm-chamling-honoured-with-sustainable-development-leadership-award-116100600489_1.html
- Asaduzzaman, E. (2012, September 5). *Work of Khoksha bridge on Buri Teesta stalled halfway*. Retrieved from The Daily Star: <http://www.thedailystar.net/news-detail-248470>
- Asian Development Bank. (2016). *Employment and the Labor Market in Bangladesh: Overview of Trends and Challenges*. ADB Briefs No. 62. Retrieved from <https://www.adb.org/sites/default/files/publication/190595/employment-labor-market-ban.pdf>
- Banerjee, B. K., & Stöber, G. (2013). Gorkhaland Movement in India: A Case of Indigeneity and/or a Struggle over Space? *1 Geographien*, pp. 5-8. Retrieved from [http://www.sai.uni-heidelberg.de/geo/pdfs/Lennartz\(ed\)_2013_GeographienSuedasiens1.pdf#page=8](http://www.sai.uni-heidelberg.de/geo/pdfs/Lennartz(ed)_2013_GeographienSuedasiens1.pdf#page=8)
- Basu, J. (2017, June 20). *Why does the Teesta river run dry in non-monsoon months? Because it has more dams than it needs*. Retrieved from Scroll.in: <https://scroll.in/article/841068/why-does-the-teesta-river-run-dry-in-non-monsoon-months-because-it-has-more-dams-than-it-needs>
- Benedikter, T. (2009). Gorkhaland: autonomy is no longer the issue. In M. Authors, *Solving Ethnic Conflict through Self-Government: A Short Guide to Autonomy in South Asia and Europe* (pp. 104-111). Retrieved from https://s3.amazonaws.com/academia.edu.documents/39330371/Solving_Ethnic_Conflict_-_Autonomy_in_Europe_and_South_Asia.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1508766765&Signature=%2Br7csaVQdBGp945%2B2Y96xgvgBeU%3D&response-content-disposition=inlin
- Bhattacharyya, A. (1974). *Historical geography of ancient and early medieval Bengal*. (B. N. Mukherjee, Ed.) University of Calcutta. Retrieved from <http://hdl.handle.net/10603/168494>

308 It is a transnational network of knowledge-based experts who help decision-makers to define the problems they face, identify various policy solutions and assess the policy outcomes. (Wikipedia)

- Bhattacharyya, D., & Mukherjee, P. (2008, July 15). Contamination of shallow aquifers by arsenic in upper reaches of Tista river at Siliguri–Jalpaiguri area of West Bengal, India. *Environmental Geology*, 57(7), 1687–1692. Retrieved from https://s3.amazonaws.com/academia.edu.documents/43351001/Contamination_of_shallow_aquifers_by_ars20160304-3353-1wlcphn.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1509185568&Signature=TJ4MhPl8vEwCqbx2SruH67BSHf4%3D&response-content-disposition=inline%3D
- Bhaumik, S. (2017, March 1). *Keener on Arms from China, Bangladesh Dithers on Defense Pact with India*. Retrieved from South China Morning Post: http://www.scmp.com/week-asia/geopolitics/article/2075152/keener-arms-china-bangladesh-dithers-defence-pact-india?lipi=urn%3Ali%3Apage%3Ad_flagship3_pulse_read%3BY6FaX3e5QPqJdhXzSyysjQ%3D%3D
- Bhushan, B., & Ahmed, J. (2014). *An Analytical Review of Media Reports: Context of Trans-boundary Aspects of the Teesta River*. International Union for Conservation of Nature, Ecosystems for Life: A Bangladesh-India Initiative. Retrieved from http://cmsdata.iucn.org/downloads/media_analysis_report_final.pdf
- Bhutia, D. T. (2012). *Independent People's Tribunal on Dams, Environment and Displacement*. (D. T. Bhutia, Ed.) Human Rights Law Network. Retrieved from <http://hrln.org/hrln/publications/books/930-independent-peoples-tribunal-on-dams-environment-and-displacement.html>
- Braided Rivers*. (n.d.). Retrieved from University of Oregon: <http://pages.uoregon.edu/millerm/braided.html>
- Chatterjee, G. (2017, October 18). *Gorkhaland protests: Centre's decision to pull troops from Darjeeling was a betrayal of people of Bengal, it must make amends*. Retrieved from Firstpost: <http://www.firstpost.com/politics/gorkhaland-protests-centres-decision-to-pull-troops-from-darjeeling-was-a-betrayal-of-people-of-bengal-it-must-make-amends-4156937.html>
- Chettri, M. (2013). *Ethnic politics in the Nepali public sphere: three cases from the eastern*. PhD Thesis, University of London, SOAS. Retrieved from <http://eprints.soas.ac.uk/18060>
- Chowdhury, S. (2017, June 20). *Darjeeling violence: As protests continue, hotels in Sikkim start losing bookings*. Retrieved from The Indian Express: <http://indianexpress.com/article/india/gorkhaland-gjm-darjeeling-violence-as-protests-continue-hotels-in-sikkim-start-losing-bookings-4712349/>
- Daily Star Correspondent. (2017, March 14). *'Save Buri Teesta, save Ulipur'*. Retrieved from The Daily Star: <http://www.thedailystar.net/country/save-buri-teesta-save-ulipur-1375603>
- Das, M. (2015, June 13). *Teesta accord: West Bengal CM Mamata Banerjee may be eyeing bigger compensation*. Retrieved from The Economic Times: <http://economictimes.indiatimes.com/news/politics-and-nation/teesta-accord-west-bengal-cm-mamata-banerjee-may-be-eyeing-bigger-compensation/articleshow/47650472.cms>
- Das, N., Gambhir, A., Sarode, J., & Dikshit, S. (2017, September). *India's Journey towards 175 GW Renewables by 2022 - A July 2017 Update*. Retrieved from Prayas (Energy Group): <http://www.prayasgroup.org/peg/publications/item/356-india-s-journey-towards-175-gw-renewables-by-2022-version-2-0.html>
- Das, P. (2016, December). *Illegal Migration from Bangladesh: Deportation, Border Fences and Work Permits*. *IDS Monograph Series*(56), p. 120. Retrieved from <https://idsa.in/system/files/monograph/monograph56.pdf>
- Datta, S. (2015, January 3). *Rs 38,420 crore: Little Sikkim's Huge Growth Gamble*. Retrieved from IndiaSpend: <http://www.indiaspend.com/cover-story/rs-38420-crore-little-sikkims-huge-growth-gamble-96374>
- Department of Information and Technology, GoS. (2016, March). *Energy And Power Department*. Retrieved from Official Website of Government of Sikkim : <https://www.sikkim.gov.in/portal/portal/StatePortal/Department/EnergyAndPowerDepartment>
- Department of Tourism and Civil Aviation, Govt. of Sikkim. (2014). *Annual Report 2013-14*.
- Dhamai, B. M. (2014). An Overview of Indigenous Peoples in Bangladesh. In M. S. Chowdhury (Ed.), *Survival under Threat: Human Rights Situation of Indigenous Peoples in Bangladesh* (pp. 10-26). Retrieved from <http://kapaeeng.org/wp-content/uploads/2016/08/HR-Situation-of-ips-in-Bangladesh.pdf#page=11>
- Energy and Power Department, GoS. (2017). *Status/Progress of HEPs Allotted to IPPs*. Retrieved from Energy and Power Department, Government of Sikkim: <http://www.powerdepartmentsikkim.com/HEPLatestStatus.aspx>
- Express News Service. (2017, September 27). *Rajnath Singh appeals, GJM calls off Darjeeling strike after 104 days*. Retrieved from The Indian Express: <http://indianexpress.com/article/india/rajnath-singh-appeals-gjm-calls-off-darjeeling-strike-after-104-days-4862899/>
- Ghosal, A. (2017, April 9). *Why focus just on Teesta? Didi moots plan with 3 other rivers*. Retrieved from The Indian Express: <http://indianexpress.com/article/india/why-focus-just-on-teesta-didi-moots-plan-with-3-other-rivers-mamata-banerjee-india-bangladesh-4605722/>
- Giri, P. (2017, June 18). *Darjeeling unrest: Holiday turns into nightmare for tourists*. Retrieved from Hindustan Times: <http://www.hindustantimes.com/india-news/darjeeling-unrest-holiday-turns-into-nightmare-for-tourists/story-ewUD5NVikL8Sugdn15WCHP.html>
- Giri, R. (2009, April). "Gorkhaland needs a separate state in India". (T. Benedikter, Interviewer) Darjeeling. Government of Sikkim. (2011). *Sikkim Action Plan on Climate Change (2012-2030) Draft Copy*. Retrieved from <http://www.moef.nic.in/sites/default/files/sapcc/Sikkim.pdf>
- Huber, A., & Joshi, D. (2013). *Hydropower in Sikkim: Coercion and Emergent Socio-environmental Justice*. In M. Authors, *Water Conflicts in North East India: A Compendium of Case Studies* (pp. 102-110). Retrieved from https://www.academia.edu/30541542/Hydropower_in_Sikkim_Coercion_and_Emergent_Socio-environmental_Justice
- Huber, A., & Joshi, D. (2015). *Hydropower, Anti-Politics, and the Opening of New Political Spaces in the Eastern Himalayas*. *World Development*, 76, 13-25. Retrieved from https://www.academia.edu/21171734/Hydropower_Anti-Politics_and_the_Opening_of_New_Political_Spaces_in_the_Eastern_Himalayas
- Islam, M. F. (2016). Identification of the Problem. In M. F. Islam, *Water Use and Poverty Reduction* (pp. 1-12). Retrieved from <https://books.google.co.in/books?id=IHpBDAAAQBAJ&pg=PA2&dq=east+pakistan+bangladesh+teesta&hl=en&sa=X&ved=0ahUKEwi62t3usZvXAhVLOI8KHTUhC50Q6AEIjzAA#v=onepage&q=east%20pakistan%20teesta&f=false>
- Islam, M. F. (2016). The Teesta River and Its Basin Area. In *Water Use and Poverty Reduction. New Frontiers in Regional Science: Asian Perspectives* (Vol. 8, pp. 13-43). Retrieved from <http://www.springer.com/in/book/9784431551713>
- Islam, N., & Noman, A. (2015, November -). *Estimated Regional Disparity for Northern Bangladesh*. *IOSR Journal Of Humanities And Social Science*, 20(11), 59-63. Retrieved from <http://www.iosrjournals.org/iosr-jhss/papers/Vol20-issue11/Version-1/0201115963.pdf>
- Joint Rivers Commission, Bangladesh. (n.d.). *List of Meetings Held Under JRC After Signing of the Ganges Treaty in December 1996*. Retrieved from Joint Rivers Commission, Bangladesh, Ministry of Water Resources, Government of Bangladesh: <http://www.jrc.gov.bd/>

<http://jrbc.gov.bd/bangla/images/LOM.pdf>

- Kohli, K. (2011, December). Inducing vulnerabilities in a fragile landscape. *Economic and Political Weekly*, 46(51), 19-22. Retrieved from http://www.indiawaterportal.org/sites/indiawaterportal.org/files/Inducing_vulnerabilities_fragile_landscape_Kanchi_Kohli_EPW_0.pdf
- Kolås, Å., Barkved, L., Hoelscher, K., Miklian, J., Edelen, K., Jahan, F., . . . Holen, S. (2013). *Water Scarcity in Bangladesh: Transboundary Rivers, Conflict and Cooperation*. Technical Report. Retrieved from <https://reliefweb.int/report/bangladesh/water-scarcity-bangladesh-transboundary-rivers-conflict-and-cooperation>
- Kumar, A. (2013, May). Impact of West Bengal Politics on India–Bangladesh Relations. *Strategic Analysis*, 37(3), 338-352. Retrieved from <http://discuss.forumias.com/uploads/FileUpload/f0/ec042b195bba3d0079e4db25b966e1.pdf>
- Lowi, M. R. (1993). Bridging the Divide: Transboundary Resource Disputes and The Case of West Bank Water. *International Security*, 18(1), 113-138. Retrieved from http://www.jstor.org/stable/2539034?seq=1#page_scan_tab_contents
- Mazoomdaar, J. (2017, July 15). *Teesta project: Panchayats in Sikkim accuse govt of forging their approval*. Retrieved from The Indian Express: <http://indianexpress.com/article/india/teesta-project-panchayats-in-sikkim-accuse-govt-of-forging-their-approval/>
- MEA, GoI. (2017, April 8). *List of Agreements/MoUs exchanged during the State Visit of Prime Minister of Bangladesh to India (April 07-10, 2017)*. Retrieved from Ministry of External Affairs, Govt. of India: <http://www.mea.gov.in/bilateral-documents.htm?dtl/28360/List+of+AgreementsMoUs+exchanged+during+the+State+Visit+of+Prime+Minister+of+Bangladesh+to+India+April+07+10+2017>
- Merchant, M. (2017, July 13). *Basirhat riots: Mamata Banerjee can end up helping BJP in Bengal*. Retrieved from DailyO: <http://www.dailyo.in/politics/mamata-banerjee-west-bengal-tmc-bjp-basirhat/story/1/18344.html>
- Mitra, A. (2017, June 15). *Tracing the history of Gorkhaland movement: Another crisis triggered by language*. Retrieved from The Indian Express: <http://indianexpress.com/article/research/mamata-banerjee-darjeeling-violence-tracing-the-history-of-gorkhaland-movement-another-crisis-triggered-by-language/>
- Mondal, M. S., & Islam, M. S. (2017, March). Chronological trends in maximum and minimum water flows of the Teesta River, Bangladesh, and its implications. *Jambá: Journal of Disaster Risk Studies*, 9(1). Retrieved from <http://www.jamba.org.za/index.php/jamba/article/view/373/630>
- Mukerjee, S. (2017, Aug 24). *Narendra Modi should thank Mamata Banerjee, her pro-Muslim agenda fuels BJP's rise in West Bengal*. Retrieved from Firstpost: <http://www.firstpost.com/politics/narendra-modi-should-thank-mamata-banerjee-her-pro-muslim-agenda-fuels-bjps-rise-in-west-bengal-3970265.html>
- Nagchoudhary, S. (2017, June 19). *Five Reasons Why A Separate State of Gorkhaland is Not A Reality*. Retrieved from The Quint: <https://www.thequint.com/voices/opinion/why-there-is-no-separate-state-of-gorkhaland>
- Oak, G. (2017, July 31). *Gorkhaland: Troubles on the Teesta*. Retrieved from The Diplomat: <https://thediplomat.com/2017/08/gorkhaland-troubles-on-the-teesta/>
- Patranobis, S. (2017, July 6). *Chinese media calls for Sikkim's 'independence', scrapping of 'unfair' Bhutan treaties*. Retrieved from Hindustan Times: <http://www.hindustantimes.com/india-news/chinese-media-calls-for-sikkim-s-independence-and-fueling-anti-india-feelings/story-h4jmY82X7MuDSaj3qzDBNL.html>
- Planning Commission of India. (2014). *State-wise Gross State Domestic Product by Industry of Origin (at 2004-05 Prices)*. Retrieved from http://planningcommission.gov.in/data/datatable/0814/table_66.pdf
- Planning Commission, GoI. (2010). *West Bengal Development Report*. Retrieved from http://planningcommission.nic.in/plans/stateplan/sdr/sdr_wb1909.pdf
- Prasai, S., & Surie, M. D. (2013). *Political Economy Analysis of the Teesta River Basin*. The Asia Foundation. Retrieved from <https://asiafoundation.org/resources/pdfs/TheAsiaFoundation.PoliticalEconomyAnalysisoftheTeestaRiverBasin.March20131.pdf>
- Prothom Alo. (2017, April 12). *Hasina makes Bangladesh a part of India's military plan: Khaleda*. Retrieved from Prothom Alo: <http://en.prothom-alo.com/bangladesh/news/145113/Hasina-makes-Bangladesh-a-part-of-India%E2%80%99s-military>
- PTI. (2016, January 24). *Eastern states led by West Bengal can be a \$3 trillion economy by 2035: Report*. Retrieved from The Economic Times: <http://economictimes.indiatimes.com/news/economy/indicators/eastern-states-led-by-west-bengal-can-be-a-3-trillion-economy-by-2035-report/articleshow/50706111.cms>
- PTI. (2017, October 5). *Demonetisation the biggest disaster, GST a great stunt: Mamata Banerjee*. Retrieved from The Economic Times: <http://economictimes.indiatimes.com/news/politics-and-nation/demonetisation-the-biggest-disaster-gst-a-great-stunt-mamata-banerjee/articleshow/60959257.cms>
- PTI. (2017, April 9). *Hasina 'selling' Bangladesh to India to stay in power: Khaleda Zia*. Retrieved from Deccan Chronicle: <http://www.deccanchronicle.com/world/neighbours/090417/hasina-selling-bangladesh-to-india-to-stay-in-power-opposition.html>
- PTI. (2017, July 29). *Sri Lanka, China sign \$1.1 billion Hambantota port deal*. Retrieved from The Hindu: <http://www.thehindu.com/news/international/sri-lanka-china-sign-11-bn-hambantota-port-deal/article19385932.ece>
- Ranjan, A. (2017, April). *The Teesta Muddle: Can India and Bangladesh Find a Way Out? ISAS Insights(397)*. Retrieved from <https://www.isas.nus.edu.sg/ISAS%20Reports/ISAS%20Insights%20No.%20397%20-%20The%20Teesta%20Muddle%20-%20Can%20India%20and%20Bangladesh%20find%20a%20way%20out.pdf>
- Rudra, K. (2003). *Taming the Teesta*. *Ecologist Asia*, 11(1), 80-83. Retrieved from http://www.actsikkim.com/docs/Rudra_Taming_the_Teesta.pdf
- Rudra, K. (2017). *Sharing Water Across Indo-Bangladesh Border*. In S. Bandyopadhyay, A. Torre, P. Casaca, & T. Dentinho, *Regional Cooperation in South Asia* (pp. 189-207). Retrieved from https://link.springer.com/chapter/10.1007/978-3-319-56747-1_11
- Sahgal, P., & Dasgupta, P. (2011, September 10). *CM Pours Cold Water Over PM*. Retrieved from India Today: <http://indiatoday.intoday.in/story/teesta-water-sharing-talks-put-off-mamata-banerjee-manmohan/1/150681.html>
- Shah, M. (2013, January). *Water: Towards a Paradigm Shift in the Twelfth Plan*. *Economic and Political Weekly*, 48(3), 40-52. Retrieved from http://www.indiawaterportal.org/sites/indiawaterportal.org/files/water-_towards_a_paradigm_shift_in_the_twelfth_plan_dr_mihir_shah_planning_commission.pdf
- Special Correspondent. (2017, June 27). *GJM supporters intensify protests*. Retrieved from The Hindu: <http://www.thehindu.com/news/national/other-states/gjm-supporters-intensify-protests/article19155883.ece>
- Staff Correspondent. (2017, 6 May). *Evict land grabbers to save Buri Teesta*. Retrieved from Daily Sun: <http://www.daily-sun.com/printversion/details/224430/%E2%80%98Evict-land-grabbers-to-save-Buri-Teesta%E2%80%99>
- Staff Correspondent. (2017, April 12). *'Revive flow of Buri Teesta'*. Retrieved from The Daily Star:

- <http://www.thedailystar.net/country/revive-flow-buri-teesta-1389898>
Statistics of Tourist Arrival in Gorkhaland Territorial Administration. (n.d.). Retrieved from Department of Tourism, Gorkhaland Territorial Administration: <http://tourismdarjeeling.com/department/statistics/>
- Strategic Foresight Group. (2013). *Rivers of Peace - Restructuring India Bangladesh Relations*. Retrieved from Strategic Foresight Group: http://www.strategicforesight.com/publication_pdf/22345riversofpeace-website.pdf
- Strategic Foresight Group. (2013). *Rivers of Peace: Restructuring India-Bangladesh Relations*. Retrieved from Strategic Foresight Group: http://www.strategicforesight.com/publication_pdf/22345riversofpeace-website.pdf
- Suykens, B., & Islam, A. (2015). *The Distribution of Political Violence in Bangladesh (2002-2013)*. Conflict Research Group. Retrieved from <http://www.psw.ugent.be/crg/Publications/The%20Distribution%20of%20Political%20Violence%20in%20Bangladesh.pdf>
- Talukdar, S. (2017, July 14). *Basirhat communal riots: Damaged liberal narrative won't help West Bengal, it'll push state towards a darker doom*. Retrieved from Firstpost: <http://www.firstpost.com/india/basirhat-communal-riots-damaged-liberal-narrative-wont-help-west-bengal-ittill-push-state-towards-a-darker-doom-3813675.html>
- Talukdar, S. (2017, April 10). *Teesta River deal: India cannot afford to let Sheikh Hasina fail and see the rise of another Pakistan in the east*. Retrieved from Firstpost: <http://www.firstpost.com/world/teesta-deal-india-cannot-afford-to-let-sheikh-hasina-fail-and-see-the-rise-of-another-pakistan-in-the-east-3377442.html>
- Tea Statistics*. (n.d.). Retrieved from India Brand Equity Foundation, Department of Commerce, Ministry of Commerce and Industry, Government of India: <https://www.teacoffeespiceofindia.com/>
- Terrorist and Extremist Groups - Bangladesh*. (n.d.). Retrieved from South Asia Terrorism Portal: <http://www.satp.org/>
- Tripathi, R. (2017, August 12). *Illegal migrants more vulnerable to be recruited by terrorist organisations: MHA*. Retrieved from The Indian Express: <http://indianexpress.com/article/india/illegal-migrants-more-vulnerable-to-be-recruited-by-terrorist-organisation-mha-4792962/>
- Vagholikar, N., & Das, P. J. (2010). *Damming Northeast India*. Kalpavriksh, Aaranyak, ActionAid India.
- Wahed, A. (2017, April 3). *Buri Teesta river dying*. Retrieved from The Daily Star: <http://www.thedailystar.net/country/buri-teesta-river-dying-1385293>
- Wangchuk, P. (2007). Lepchas and their Hydel Protest. *Bulletin of Tibetology*, 43(1-2), 33-57. Retrieved from http://www.siblac.org/doc/Wangchuk_Lepcha_Hydel_Protest.pdf
- Warner, J., & Zawahri, N. (2012, June 6). Hegemony and asymmetry: multiple-chessboard games on transboundary rivers. *International Environmental Agreements: Politics, Law and Economics*, 12(3), 215-229. Retrieved from <https://link.springer.com/article/10.1007/s10784-012-9177-y>
- World Bank Group. (2016). *Dynamics of Rural Growth in Bangladesh : Sustaining Poverty Reduction*. Retrieved from World Bank: <https://openknowledge.worldbank.org/handle/10986/24369>
- World Bank; World Food Programme; Bangladesh Bureau of Statistics. (2010). *Poverty Maps of Bangladesh 2010*. Retrieved from World Bank: <https://openknowledge.worldbank.org/bitstream/handle/10986/20425/904870WP0WB0Po00Box385319B00PUBLIC0.pdf?sequence=1&isAllowed=y>

1641 SPATIAL E-GOVERNANCE FOR CONSERVATION OF WATER BODIES AND THEIR CATCHMENTS IN SETTLEMENTS OF INDIA

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ABSTRACT

Water is a prime natural resource, a basic need and a precious asset. Technically it is considered a renewable resource because it can be used over and over again and it has a rain cycle. But the sustainability of this renewable resource is already questionable. The New Urban Agenda, Habitat III, held at Quito Ecuador 2016 recognizes that the inhabitants of developing countries are vulnerable to extreme impacts of climate change and other natural and human-made hazards, extreme weather events, including heat waves, flooding, water scarcity, droughts, and water and air pollution. In the context to these impacts status of water bodies and their catchments which are cushions to the settlements in India needs attention. The country has well developed National Water Policy, State Policies, River Action Plans, Conservation Plans, institutional framework, allocated funds in place since decades but we still don't find methods for successful rejuvenation of water resources. On the other hand development has negatively impacted water bodies.

One such case is the Ganga river flowing through the city of Varanasi (3,676,841 Population) within the Ganga Basin which covers 11 states in India. This city known as the oldest living cities in world with its huge Tourism potential is a land of challenges and opportunities coupled with its complex socioeconomic cultural, environmental and institutional aspects. It is associated with deteriorated Ganga rejuvenation and other pressing urban issues. The stakeholders to the water management challenges include government, private players, civil society and communities. To foster transformation there is a need to build synergy across scales by devolving functions and empowering stakeholders. For immediate contextual solutions or actions, there is immense potential with communities which needs to be tapped. Active community participation can enable revival of water bodies irrespective of their population hierarchies. However the use will be dependent upon the scale of water body and the population it can serve. This capacity building would strengthen communities and make communities resilient to uncertainties. Communities can revitalize traditional methods of water conservation (formalized local solutions) and therefore conserve and monitor local natural resources. Along with the increased autonomy, communities need to be a part of interactive spatial planning. Spatial e- governance can therefore act as platform for people to interact with the government.

This paper will explore mechanism of participation that can be applied for Protection and Conservation of Water Bodies and their catchment for Indian Settlements.

Key words: Spatial E- Governance, Water Bodies, Conservation, Community Participation

1 INTRODUCTION

Water as one of the most essential natural resource, is greatly threatened by human activities. Its consumption and pollution can be associated with specific activities, such as irrigation, bathing, washing, cleaning, cooling and processing. Total water consumption and pollution are generally regarded as the sum of a multitude of independent water demanding and polluting activities.

Some studies reports that there will be a severe lack of drinking water in next 2 decades and this effect can already be seen today but with less severity. Although there is the same amount of water on the earth today as there was when the earth was formed, only 3% of this water is usable and this figure is decreasing with time as more and more water becomes contaminated or polluted.

A 2006 United Nations report stated that "there is enough water for everyone", but that access to it is hampered by mismanagement and corruption, UNESCO (2006) Water, a shared responsibility. Therefore planning and management of water resources needs to be governed. The UN World Water Development Report (WWDR, 2003) from the World Water Assessment Program indicates that, in the next 20 years, the quantity of water available to everyone is predicted to decrease by 30 percent. Also 40 percent of the world's inhabitants currently have insufficient fresh water for minimal hygiene and more than 2.2 million people died in 2000 drought, globally.

The New Urban Agenda, Habitat III, held at Quito Ecuador 2016 recognizes that the inhabitants of developing countries are vulnerable to extreme impacts of climate change and other natural and human-made hazards, extreme weather events, including heat waves, flooding, water scarcity, droughts, and water and air pollution. The forum therefore commits itself to protect, conserve, restore and promote the ecosystems, water, natural habitats, biodiversity, minimize their environmental impact and change to sustainable consumption and production patterns in developing counties.

The developing India in South Asia has about 16 per cent of the world's population as compared to only 4 per cent of its water resources. With the present population of over 1,000 million, the per capita water availability is around 1.170 cu m/person/year. Severe water shortages have led to a growing number of conflicts between users in the agricultural and industrial sectors, as also the domestic sector. Water consumption of 135litres per capita per day (CPHEEO norms) is an unattainable ideal number for many Indian cities. With less than 1,500 cum of per capita renewal water resources per year, India is already classified as a water scarce country.

Also the lack of water availability or accessibility and poor management practices have manifested in poor sanitation facilities, which is among the biggest environmental and social challenges India faces today. In the next fifty years, India is projected to face the challenge of feeding a population of 1.6 billion people with a higher level of welfare than at present. The current view of the Indian government on food security is to hold on to the goal of food self-sufficiency but agriculture is the main consumer of water which will further increase the pressure on the renewable water resources. In order to reduce the pressure on renewable water resources, the Indian government has created National Water Development Agency (NWDA) to study and implement the concept of river interlinking as the solution for water scarcity in the drier regions. This concept means that water abundant regions will provide water to water scarce regions through the connection of rivers. The [Agency](#) had identified 30 links (16 under peninsular component and 14 under Himalayan component). Whether the interlinking of rivers will provide enough water to solve the observed and future water deficiency in the country with contextualized solution is still unclear.

The only long term option for reducing the national water scarcity and remaining food self sufficient is to increase the water productivity in India. The largest opportunity for this increase lies in East India, where there is an abundance of water and a large increase in water productivity seems possible. (The Water Footprint of India, April 2007).

2 PLANNING FOR WATER SECURED COMMUNITIES

The river basins of India are classified into Water Resource Information System of India (WRIS), Central Water Commission (CWC), National Commission for Integrated Water Resources Development Plan (NCIWRDP), Department of Agriculture and Cooperation, (AISLUS) and Central Ground Water Board (CGWB) Basin. This classification suggests different major river basins and delineates many other sub basins boundaries which are for different purpose of surveys and methodological analysis. Therefore even the National Water policy India (2012) recommends that the solutions for water resources must be given at basin or sub basin level. One of salient features of policy is that water sharing / distribution amongst the states should be guided by a national perspective with due regard to water resources availability and needs within the river basin. This means that all developmental projects in a basin should be formulated within the framework of an overall plan for a basin/sub-basin followed by integrated and multidisciplinary approach to river basin planning, catchment management, ecological aspects, rehabilitation of affected communities and establishment of an appropriate organization at the river basin level for ensuring optimum and balanced development of the water resources of a river basin.

Despite of River board Act 1956, no such effective river basin authority has been established in the country though number of basin organizations has been created for limited purposes such as speedy implementation of master plans for specific purposes. Therefore for basin-wide solution, sustainable contextual solutions must be strengthened.

Keeping in mind the sustainability challenges for Indian cities with respect to water sector, a demand focussed alternative approach, preventing urban water pollution, promoting recycling reuse as well as conservation of local resources is significantly required to ensure universal access in case of uncertainty. This can reduce per capita water resources to release the stress on city services and therefore basin. Further how we use, manage, waste or pollute water can determine the sustainability of communities.

Figure 1: Planning for Water Secured Communities

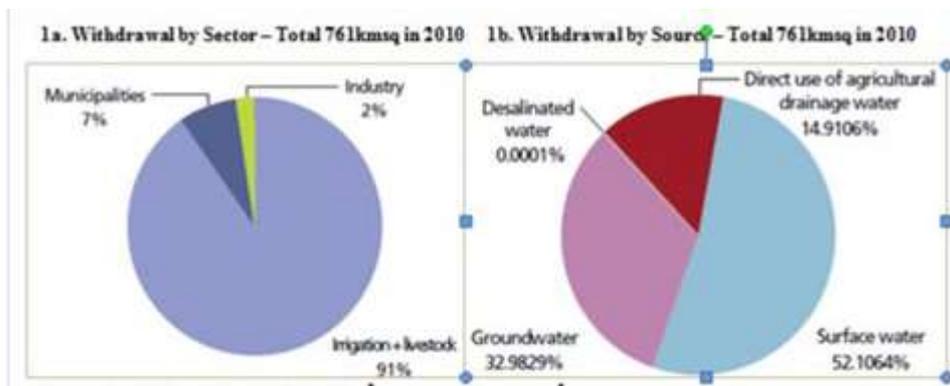
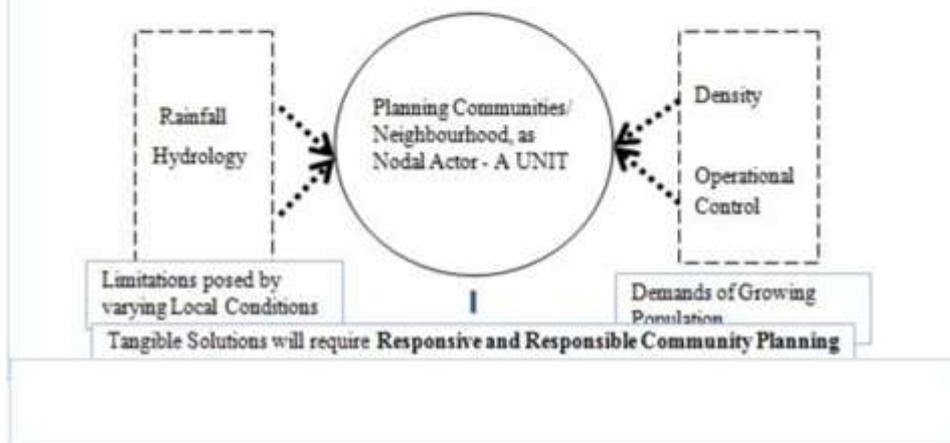


Figure 2: Factors Impacting Communities



Communities with Indigenous knowledge + Conservation of Water Bodies + O & M, Spatial E Governance (supported by SDI) = Continued Water Availability

Source: Author’s Understanding of Literature

For the success of efforts taken to keep up to the sustainability challenges an important opportunity is to build up synergy between all the stakeholders to the adverse effects. These include communities, government, private players and civil societies (representative of communities). Empowering stakeholders and devolving power or functions among stakeholders especially to the communities of a context through mechanism of community participation would enable effectiveness in water body conservation.

3 CHANGING STATUS OF WATER BODIES IN INDIA

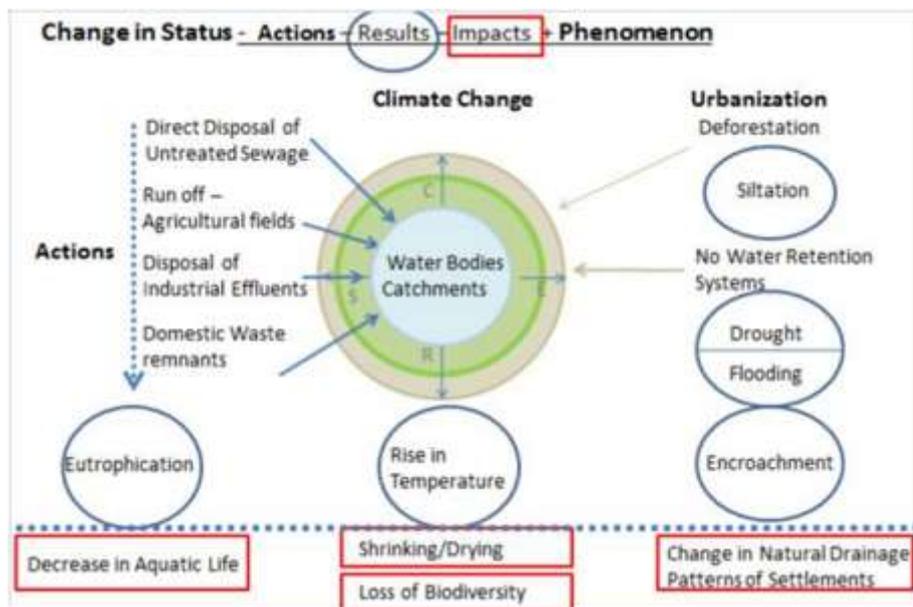
Historically water bodies were the centre of socio-cultural, recreational and economic activities. People used them as important gathering space, for rituals, fishing, boating etc. Over few decades with increased water pollution, people started moving away from river fronts or water bodies. They started residing in areas with high ground water table and have been exploiting ground water reserves. This movement marked the beginning of visible ignorance of man towards water bodies & the rivers, or water bodies gradually became the back of the city.

A very well-known reason for this high level of water pollution is the careless untreated direct disposal or leakage of sewage coming from populated areas into the water body. The tertiary treated water or the grey water achieved cannot be used for drinking purposes.

Therefore the naturally existing water body even when accessible is equivalent to non-existing feature for the people and is slowly becoming a dumping ground or a Nallah carrying waste. The phenomenon of Climate change (high temperatures) and urbanization over decades have added to the stress on water bodies leading to shrinking and drying up. Many Indian cities have faced haphazard unplanned development; consequently many water bodies were lost due to encroachment to accommodate uncontrolled spread of development.

As water is part of larger ecological system, shrinking of a water body also means loss of biodiversity. They remediate pollution, cool their surroundings creating a micro climate and acts as a cushion against adverse effects of climate change and heat waves. Water bodies can serve as emergency sources for water and recreational areas. These are very well connected to other sectors like urban health (reduce vector and water borne diseases), economy & finance (reduce costs of managing floods and scarcity) and ecology & environment of a city.

Figure 2: Changing Status of Water Bodies



Source: Author’s Understanding of Literature

To conserve local water resources there can be 4 revival mechanisms. Firstly there could be **technological interventions** (technologies for water quality management, develop water budgets starting from smallest scale, developing bioremediation & ecological engineering technologies). Secondly, **policy interventions** (developing water conservation policies at city level) or devolving conservation & management of water bodies to local communities. Third mechanism can be as simple as **making information** like water balance, water budget, city water status **available to city dwellers** and allowing them **access to easy statistical and monitoring data to ensure their engagement in the process**. Lastly and importantly is the **economic and financial mechanisms which will assess value of ecological services** (allocating budget for water body restoration and conservation projects & developing livelihood activities to support conservation & management).

For immediate contextual solutions enabling reduction in local water scarcity for all types of uses in India, there is immense potential with communities which needs to be tapped. Active community participation can enable revival of water bodies irrespective of their population hierarchies but all sizes of water bodies cannot be conserved.

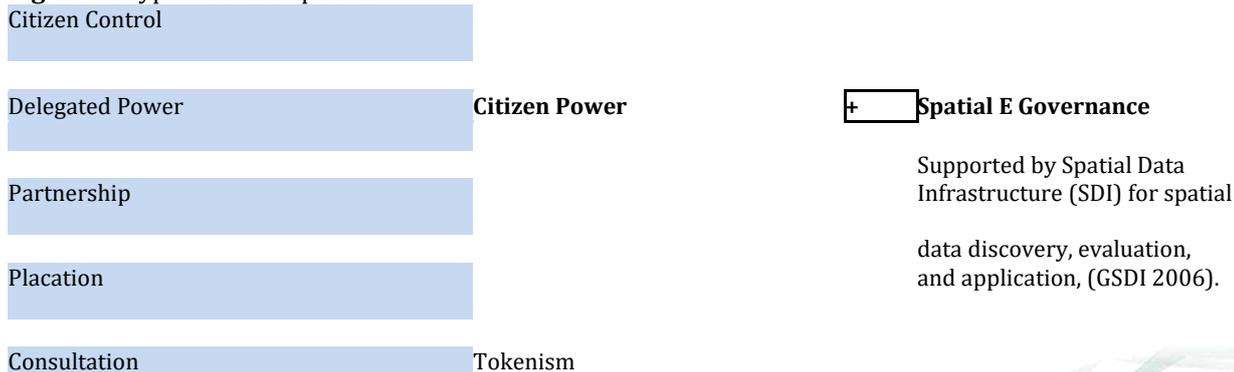
4 COMMUNITY PARTICIPATION AND SPATIAL E- GOVERNANCE

Communities can revitalize traditional methods of water conservation (formalised local solutions) and therefore conserve and monitor local natural resources. However the use will be dependent upon the scale of water body and the population it can serve. This capacity building would strengthen communities and make them resilient to conflicts during scarcity. Water being a common need for all dwellers, will foster community development as all will share common interests and goal. Therefore conservation of water bodies can play vital role in community development as it will involve active inclusion and equity in sharing.

On the other hand Community participation which enables bottom up approach in governance needs to be practiced with spatial e- governance for faster and effective interaction between the two stakeholders, communities and the government. Successful engagement with communities can improve quality of policy being developed, efficient service delivery, opportunity for government to check its reputation among citizens and close collaboration will lead to early notification of issues enabling proactive solutions.

The 6 “C” of successful community engagement includes – capability, commitment, contribution, continuity, collaboration and conscience (Brown and Isaacs, 74). Also the categorisation of various types of people involvement is important in realizing participation in true sense.

Figure 3: Types of Participation



Informing

Therapy

Manipulation

Non-Participation

Source: Eight rungs on the ladder of Citizen Participation, Sherry R Arnstein,

The nature of interaction and level of participation for interactive spatial planning between stakeholders is another set of research. The idea is to improve socio – technical network by educating and make stakeholders aware on the use of spatial data for e-governance apart from collaboration, cooperation and coordination. This is must to address the implementation challenges and realise the development goals.

5 LAYERS IN VARANASI, GANGA BASIN

The city of Varanasi within the Ganga Basin lies in the northern Indian state of Uttar Pradesh. It is a Class II city with a total population of municipal area as 1,201,815 (as of 2011) and total population with Urban Agglomeration is 1,435,113. The total Inflow of Tourists in the year 2013 was 52, 51,413; in which domestic tourists inflow is 95% of the total. Month-wise statistics of tourist shows that the peak season for tourist inflow is between October to March, as all the important fairs and festivals occur within these months. 'Education and research' is the first priority by International Tourists, and 'pilgrimage/spiritual tour' is the main attraction for maximum percentage of domestic tourists.

This heritage city is an example of a traditional human settlement, mix land-use, river edge representative of a culture, of another form of human interaction with the environment associated with its many tangible and intangible aspects. The intangible heritage includes the natural landscapes, and the cultural heritage in form of musicians, dancers and writers. Indian National Trust for Art and Heritage (INTACH) enlists 1700 heritage structures at Varanasi and Master Plan 2011 has identified 5 heritage zones namely

- *The Ganga River and the Riverfront Heritage Zone*
- *Durgakund-Sankatmochan Area*
- *Kamachcha-Bhelupura Area*
- *Kabir Math (Lahartara) Area*
- *Sarnath*

The Ganga and it's Ghats receives maximum attention followed by Vishwanath and Sarnath Temple from both international and foreign tourists. (Rana, Pravin S, 2011). The city has 5 major pilgrimage mandalas; Caurasikroshi Yatra, Antargraha yatra, Avimukta yatra, Nagarpradakshina yatra and Panchkroshi yatra. It takes 5-6 days to complete the yatra passing by 5 halts or villages namely Kardmeshwar, Bhimchandi, Rameshwar, Shivpuri and Kapildhara. This yatra starts and ends at Manikarnika Ghat at river Ganga. This leads to an opportunity to develop these circuits along with tourist infrastructure in order to increase the frequency and duration of stay of tourists at Varanasi which has been stagnant since past few years.

Table 1: Five Zones of Varanasi

City Zones	Density /Landuse	Activities
The Core City (Ghats Area)	High Density in heart of the city	Tourism, other economic and Religious activities.
The Trans Varuna Zone (upper Varuna)	Less Dense outer area of city	Sarnath as tourist attraction.
The South Varuna Zone (central area of the city)	Second highest density of population	Unplanned residential area.
The South Assi Zone	Planned Density	Banaras Hindu University area as attraction.
The Trans Ganga Zone (area outside the municipal boundary but including in the planning boundary.) Ram nagar	Under construction, poor connectivity with core city, lacks all basic services and infrastructure.	

Source: Studio Work, MUP, SPA Delhi



Active Ghats at Varanasi

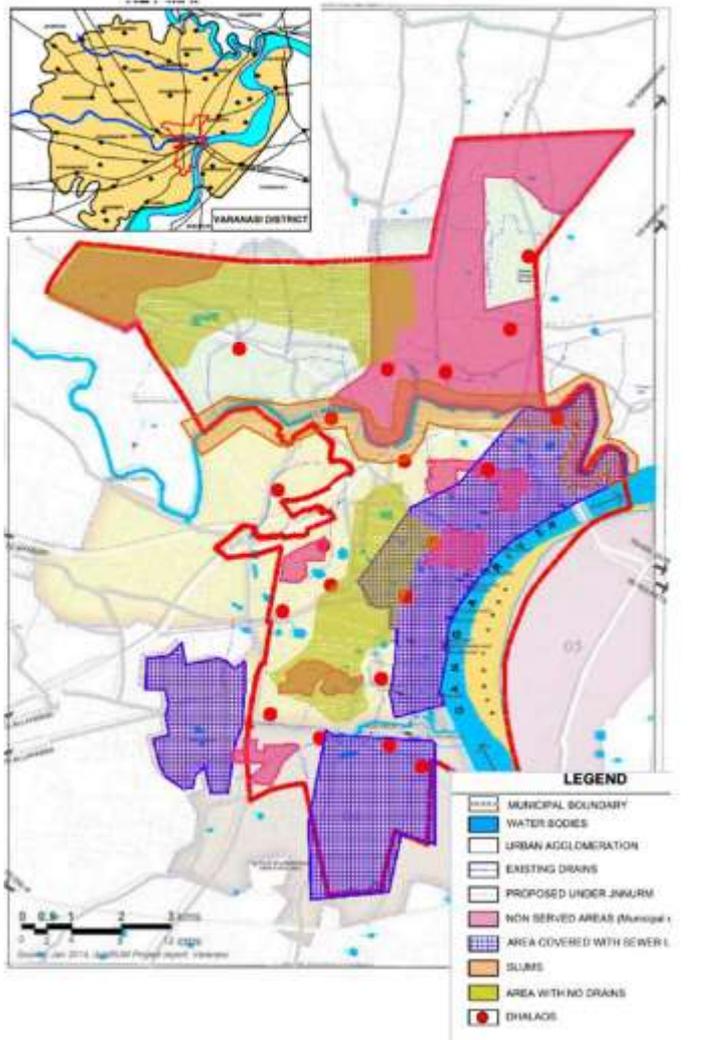
a. Infrastructure Status

Water supply system for Varanasi is as old as 125 years .It was introduced in year 1892 and was designed for the population of 2 lakhs with a treatment plant of 33mld constructed at Bhelupur. At present, the Jal Nigam, which is the supply agency, supplies 170lcpd but the users receive only 70-80lcpd. The 100 years old distribution system accounts for 20% water losses. The lifeline of the town is River Ganga, which takes care of approximately 45% of the water supplied of the town.50% of the water supplied is met out of 112 deep tube wells operated by Jal Sansthan and remaining 5% is supplied by publicly and privately owned 1559 hand pumps.

The raw water extracted from Ganga River at Bhadeni gets treated at two water treatment plants at Bhelupur water works. Capacities of the Water Treatment Plants (WTP) are 60MLD (1954) and 250mld (1994).

Only 30% of the total area is provided with underground *sewer network* with total length of about 400km due to which most of the sewage is disposed in the river Ganga without any treatment. The Trunk sewer 750mm to 2400mm is hundred years old and stretches to 7.4km. There are 2 main and 5 intermittent Pumping Stations (PS) for entire the city. The three Sewerage Treatment Plants (STPs) in Varanasi viz. Dinapur, Bhagwanpur and Diesel Locomotive Works (DLW) STP holds a capacity of 80mld, 9.8mld and 12mld respectively.

Map 1: Issue Mapping, Physical Infrastructure



Source: Studio Work, MUP, SPA Delhi

Solid waste generated in the city is 600 MT at the rate of 0.46 Kg per capita per day. A total of 2100 workers are associated with waste management where 4200 are required and therefore door to door collection is not being practised and waste is thrown on streets (collected by safai karamchari's).

The drains in the city are inefficient and instead of storm water it carries waste from slums and septic tank to Varuna. River. The low lying areas of Ghats experience water logging and associated issues.

The quality of water and the sustainability of the surface water resource is under threat due to pollution, the main reasons for which are discharge of untreated sewage, Solid waste dumping, encroachment of catchment areas and religious activities particularly in case of River Ganga.

Assi Nala contributes 10 MLD of untreated sewage into River Ganga. The Varuna receives sewage from 22 municipal drains located on both side of the river in addition to agricultural run-off at some selected points.

b. Governance

With different agencies like Nagarpalika, State Government agencies at power, influencing parts of city it becomes difficult to comprehend sector wise accountability of agencies in order to understand functioning of the city.

The major issue in institutional setup is that of overlapping roles of different agencies and the gaps and deficiencies in existing system which needs to be build upon via capacity building measures. For sustainable Ganga rejuvenation and Ghat improvement formal and informal sector (26%) needs to participate as one community and work towards sustainable heritage tourism and water body conservation through platform of spatial e governance. This will lead to cleaning of Ghat areas and reduce some percentage of pollutant into the city and consequently into the Ganga.

CONCLUSION

The revival of water bodies is imperative in the dynamic urban scenario of Indian cities and there are many tangible and intangible factors impacting communities and their actions leading to deterioration of water bodies. At urban planning level the five zones of Varanasi have their own set of infrastructure issues ranging from old piped systems, 20% transmission losses, no community taps in public area or slums, ground water exploitation leading to depletion of resources, contaminated water supply and lack of system in new zone. These issues are followed by activities on ghats,

sewage being drained into river as 70% areas are not covered and STP's are either over loaded, directly discharging into river or inefficient.

The strategy is to intercept drains carrying waste of septic tank and toilets, installation of new lines and equipments, reuse of treated water all aiming to achieve service level benchmarks for infrastructure up gradation.

The environmental issues identified are Water Pollution, Poor Air Quality, Risk of Disasters and High Noise levels. Therefore Policies and strategies have been suggested to minimize the issues and to work towards sustaining the environment of Varanasi. Most of the proposals given are sector wise for each zone as each contextual problem is adding to wider catchment and basin issues.

The reasons for the lack of success in Ganga Rejuvenation are the absence of long-term planning, poor co-ordination and failure to sustain existing infrastructure for water and sewage treatment. For wider economic and environmental benefits community participation, access to easy information, education, and spatial e governance clubbed with Public private partnership models for Ghats developments, tourism enhancement, utilization of external aid and global expertise would be an effective tool. This approach may lead to sustainable Ganga Rejuvenation in Varanasi.

REFERENCES

- Advisory on Conservation and Restoration of Water Bodies in Urban Areas 2013, CPHEEO, Ministry of Urban Development Government of India <http://moud.gov.in>
- Annual Report 2006-07, Conservation of Water Bodies , Ministry of Environment and Forestry, MOEF,
- Aruna Ramani 2009, Impact of Water Use Optimization on the Built Form of Residential Neighbourhoods, Doctoral Thesis ,SPA Delhi
- Conservation of Water Bodies in Delhi, 2008, Natural Heritage Division, INTACH
- GOI
- <https://books.google.co.in/books?id=J0VBDwAAQBAJ&printsec=frontcover#v=onepage&q&f=false>
- India Habitat III National Report 2016, Ministry of Housing and Poverty Alleviation, GOI
- Jo Howard and Joanna Wheeler 2015, What Community development and citizen participation should contribute to the new global framework for sustainable development. (www.cdj.oxfordjournals.org)
- National Water Policy 2012, Ministry of Water Resource (wrmin.nic.in)
- Pradeep Narayan, Sowmyaa Bharadwaj, Gayathri Sarangan and Vineetha 2015, Community Development Journal oxford university press (www.cdj.oxfordjournals.org)
- Pramod K. Singh, 2009, Spatial Data Infrastructure in India, Status Governance, Challenges and Strategies for effective functioning, Institute of rural Management, India.
- Studio Work,2013-15, Sustainable Development of Heritage City, Varanasi, Masters of Urban Planning, Unpublished, SPA Delhi
- Water Policy Delhi 2017, Indian National Trust for Art and Heritage (<http://naturalheritage.intach.org/delhi-water-policy-2/>)
- Yola Georgiadou, Orlando Rodriguez-Pabón, and Kate Trinko Lance, 2006, Spatial Data Infrastructure (SDI) and E-governance: A Quest For Appropriate Evaluation Approaches.

1154 EVALUATION OF WATER MANAGEMENT IN COASTAL REGIONS OF BANGLADESH

ABSTRACT

The geographic location, low-lying topography makes water management of southwest Bangladesh as a matter of great importance. Six major land cover/land use types were delineated using satellite data such as forest land, agricultural land, fallow land, water bodies, settlement and gher areas. During 1980-1990 decade, the study area had witnessed substantial increase in forest land, agriculture land and water body, but decreased in settlement and fallow land. LU/LC changes were of highest amount in forest land from 3496.6 km² to 4366.94 km², with a net addition of 870 km² and lowest amount in settlement from 2616.9 km² to 1208.81 km², with a net decrease of 1408.09 km² and fallow lands showed a net decrease of 315.34 km². The share of agricultural land was 14.13% of the total area, which increased up to 19.21%. The water body was increased from a share of 12.21% to 13.86% and gher area faced a slight increment in the total share from 3.48% to 3.6%. At that decade, initial benefits of CEP might be responsible for the escalation of agricultural lands and coastal afforestation started with the objective of protecting the coast from cyclones and foreshore that increased the forest lands. But weak structure and wrong design of the embankment projects caused water logging between this decade that was the reason behind the reduction of fallow lands and also created scarcity of drinking water and extensive salinity and because of these sufferings people had been shifted to another place. During 1990-2000, forest land shrank from 36.26% to 35.06% of the total area while agricultural lands reduced from 19.21% to 18.54%. But fallow lands showed a net decrease of 691.86 km² at that time. On the other hand settlement area was largely broadened from 1208.81 km² to 2027.7 km². Water body and gher area had also increased in area (by 104.12 km² and 5.36 km² respectively). At that time, rivers and canals lost their natural flow because of the poor maintenance of embankments or water management projects that triggered sedimentation which had blocked these rivers and canals and caused upstream drainage congestion of flooding with saline water. This situation was responsible for the reduction of agricultural and fallow lands and also for the escalation of gher areas and water body. With the introduction of commercial shrimp farming in polder areas settlement area had increased and in contrast forest land had decreased. During 2000-2015, major decline with respect to area coverage in the study area was observed in agricultural class (by 573.7 km²) whereas the area of gher was increased (by 801.29 km²). Fallow land shrank from 11.26% to 8.1% of the total area while water body increased from 14.69% to 17.18%. Settlement has decreased in area (by 141.2 km²). In the meantime forestland has increased from 35.06% to 35.35% of the total area.

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SS02.1. Smart Cities Initiatives for the 21st Century: Myth or Reality

1240 PEAK-HOUR SPREADING IN PARIS REGION? THE MYTH OF FLEXIBLE WORKING HOURS

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ABSTRACT

To reduce congestion during the morning rush hour, the solutions typically advanced are based on technical considerations: it is company schedules which dictate that workers all commute at the same time. One solution proposed by traffic engineers and policymakers is therefore to promote flexible work schedules. Against this background, the article challenges the assumption that introducing flexible work schedules will automatically have the effect of phasing passenger flows around morning peak periods. Drawing on an international literature review and data from the last national household travel survey in the Paris region (ENTD 08), it reveals new findings that are apparently paradoxical. Far from leading to staggered workplace arrival times, flexible working hours would instead seem to be associated with an increase in the concentration of journeys within the morning rush hour.

INTRODUCTION

The standard and symbolic representation of rush hour coincides with what we know about the history of the wage economy and the development of cities during the Industrial Revolution. It was the factory sirens, the time clock at the entrance, surveillance by the bosses and more globally the standardisation of work that determined the simultaneity of working hours (Godard, 2007). Necessary as it was to the proper operation of production systems (Lefebvre, 1968), the collective and uniform imposition of standardised working hours generated rush-hour congestion (Thompson, 1969).

Today, with the rise of the service economy and the “dematerialisation” of production activities in the big urban centres (du Tertre, 2005; Castells 1999), an ever-increasing proportion of the working population is able to access working hours that are no longer subject to the explicit diktat of the employer. The term for this situation is *flexible working hours*. For example in Île-de-France, a region particularly subject to problems of public transport congestion (Koning, 2011), the percentage of working people who set their own working hours is rising steadily, increasing from 24% in 1994 to 30% in 2008 (ENTD 1994 and 2008).³⁰⁹ According to the transport economic literature (Small, 1982; Vickrey, 1969), when individuals experience delays and discomfort associated with rush-hour travel, they try to avoid them by changing their working hours, provided that their contracts allow it. The increase in the proportion of employees able to choose their work schedules should lead to a reduction in rush-hour commuting and contribute to an improvement in travel conditions.

This postulate is reinforced by a theoretical premiss that underpins our shared vision of life in big cities in the late 20th and early 21st century. Whether we describe these urban lifestyles as *postmodern* (Harvey, 1990), *postindustrial* (Godard, 2007) or *hypermodern* (Ascher, 2000; Urry, 2000), the terms overlap to form a relatively unified definition of the ways in which people organise their time, by contrast with the practices observed in the “industrial period” (understood as the period extending to the end of the 1970s). The image of everyday life today as flexible, individualised and desynchronised is contrasted with the collective and temporal rules that previously structured day-to-day living patterns in the city and more broadly in society as a whole (Rosa, 2015; Dubet, 2009; Baumann, 2000). In this view, present-day ways of life in the big cities of the West are a photographic negative of the old ways.

The cause of travel spikes during the industrial period, on the one hand, and the factors driving their mitigation during the post-industrial period, on the other, provide a before and after image of the impact of the organisation of work on the rush-hour phenomenon: in one, the standardised working hours set by employers were the cause of the excessive synchronisation of commuting times; in the other, the end of employer-imposed working times are seen as contributing to the desynchronisation of morning travel.

On the basis of this “belief-image” (Laplantine, 1989), the non-governmental organisations (AFD 2016; OECD, 2010) which set and promote transport policy now emphasise flexibility in working hours as a way to reduce rush-hour congestion. However, these recommendations are only very rarely challenged and their real impact assessed (Shen et al., 2013). Time is still experienced as an abstract and obscure datum that is only very rarely submitted to evaluation in public policies (Coulombel, El-Mahrsi, Munch, 2017).

Indeed, a review of the academic literature reveals a certain vagueness on the issue. There is no discipline that fully takes on board the question of flexible working times and their effects on rush hours (Munch, 2017). Whether in transport research or sociology, there have been no studies that have looked directly at the effects of flexible working hours on the distribution of employees’ workplace arrival times. There is research in the transport field that focuses on rush-hour congestion but only partially tackles the factors that determine working hours. In the sociology of work, there are a few studies in France that draw on Time-Use Surveys to explore the issue of flexibility in working hours, but without ever connecting it with the problem of the rush hour.

³⁰⁹ ENT D for Enquête Nationale Transports et Déplacements (National Transport and Travel Survey).

Given this compartmentalisation and these uncertainties, the goal here is to explore the relation between flexible working hours and the distribution of workplace arrival times: do people who can choose their own working times in reality defer their time of arrival at work more than employees who are still subject to standard working times set by their employers?

In contrast with the common perception, we show that the flexibilisation of working times does not have the effect of distributing passenger flows on either side of rush-hour periods. To the contrary, we reveal findings that suggest that flexible working hours produce effects that run entirely counter to those anticipated.

We thus advance an argument that is apparently paradoxical: far from leading to more staggered workplace arrival times, flexible working hours are in fact associated with greater concentration of these arrival times.

In this way, the article makes a twofold contribution. First, from an operational perspective, it issues a warning against the current direction of certain public transport policies. Second, it contributes to theoretical debates in the social sciences. In fact, by opposition to most social science theories, we show that flexibility in working hours is not associated with the desynchronisation of working times (7/7, 24/24) but rather with their temporal synchronisation and concentration. In the era of pliable schedules, our research therefore qualifies the notion of a growing and general desynchronisation of day-to-day activities (Rosa, 2015; Mallet, 2012).

In methodological terms, we will focus on the morning rush hour because commuter concentration is often more intense in the morning than in the evening (Thorauge, 2015; Fosgerau & Kalrström, 2010) and the inconveniences (discomfort, delay...) associated with it are therefore intrinsically more objectionable. It is primarily for this reason that the potential impact of flexibility in working hours is particularly interesting to study at this time of day.

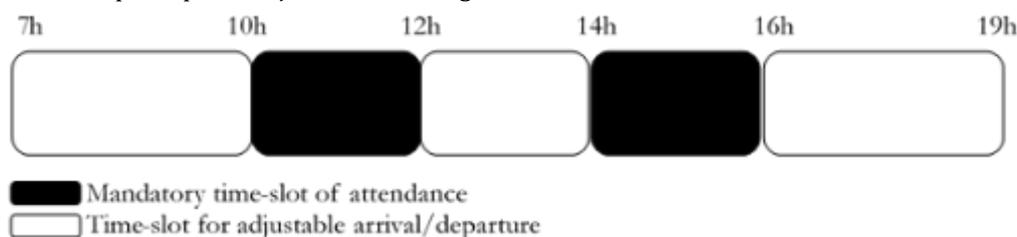
First of all, we will see that in the late 1960s, flexible working hours were precisely conceived as a managerial policy that would enable employees to avoid rush hours. Then, on the basis of an analysis of the scientific literature, we will compare the anticipated effects of flexibility with the effects actually observed on the spread of workplace arrival times. This analysis will reveal conclusions that are markedly less categorical than the predictions of managerial policies. Finally, drawing on the 2008 National Transport and Travel Survey, we will show that the greater the flexibility that employees in the Paris region enjoy in choosing their working hours, the more concentrated are the times at which they actually arrive at work.

1. FLEXIBLE WORKING TIMES CONCEIVED AS A WAY TO SPREAD TRAFFIC FLOWS

1.1 Genesis and conception of flexible working hours

Before looking at the genesis of *flexible working hours*, we first need to define the term itself. There are two levels of definition. First, flexible working hours are defined by opposition to *fixed working hours*: *flexible working hours* are working times that are not officially set by the employer. Second, they can then be broken down into two different degrees of freedom: *free scheduling* and *adjustable scheduling*. In the “freest” scenario, freelancers or autonomous employees are at liberty to arrange their working hours on a daily and/or weekly basis. In the case of employees, we speak of “annualised hours” or “fixed-salary employment contracts”, which nevertheless have to comply with the law on working hours as calculated over the year (35 hours per week, i.e. 1607 hours per year) and on weekly rest times. With a lesser degree of freedom, *adjustable scheduling* refers to the employee’s ability to choose when to arrive at and to leave work, but subject to minimum and maximum thresholds set by the employer. In Figure 1, employees can arrive when they want between 7 a.m. and 10 a.m., take their lunch break at any time between 12 noon and 2 p.m., and leave work between 4 p.m. and 7 p.m.. They must simply comply with the legal limits on daily or weekly working hours, and be present during a fixed range of times during the day (here, 10 a.m.-12 noon and 2 p.m.-4 p.m.).

Figure 1 - The principle of adjustable working times



Source: Authors

When they first appeared, these adjustable working hours were in fact seen as a managerial policy to enable employees to commute to work outside peak travel periods (Pierce and Newstrom, 1980). In the late 1960s, Swiss employers noticed that employees were finding it increasingly difficult to arrive punctually at work (Grossin, 1996). Every morning, significant production time was lost because employees, instead of being at work, were stuck in traffic jams and were often stressed when they arrived. They therefore decided to offer their employees the option of choosing their time of arrival at work within a particular time range, in order to avoid traffic jams.

This approach subsequently spread to Germany (Thoemmes, 2013) and in the 1970s and 1980s was gradually incorporated into public transport policies in the USA and Europe (Hines 1984; Ravel 1983; Lamparski 1978; Baudraz, 1971). Today, flexible working hours are still perceived as an effective tool in the arsenal of policies for managing

transport demand in peak periods (Yoshimura, 2001). A recent example mentioned by the OECD provides an illustration of this confidence regarding flexible working hours:

“More recently, the Spanish Ministry of Work (Ministerio de Trabajo y Asuntos Sociales), appeared to be the key actor in congestion mitigation, because the inflexibility in working hours causes half of the congestion in Spain. This situation prompted the Ministry to soften the working hours of Government employees. This policy also affects very positively to the conciliation of working and family life.” (OECD, 2010, p. 113)

This goal of mitigating congestion during peak periods contributed to the genesis, spread and finally the definition of free or adjustable working hours. The interpretations seem to be taken for granted: as a result of flexibility in working hours, workers adjust their schedules in order to avoid rush hours. As a result, travel spikes are gradually reduced (Orfeuill, 2000). And for the OECD, the reshaping and flexibilisation of working hours mean nothing less than that “Most large urban areas experience some form of peak spreading of the rush hour” (OECD, 2010, p. 40).

1.2 Flexible is the same as variable?

The idea that flexible working hours can support policies to spread commuter flows during peak travel periods is easy to understand in terms of the possibilities that it offers. The problem is that the practitioners involved in these issues, and also certain some of the research, seem to confuse two words: “flexibility” and “variability”. Whereas flexibility refers to the possibility of change, variability refers to actual change (Shen, 2013). Although “there is never an automatic relationship between the existence of a potential and its use by human beings” (Alter, 2002, p. 17), it would seem that in most people’s minds, “flexible workers” must automatically take advantage of the possibility of travelling outside rush hour periods. Flexibility of working hours thus becomes a synonym for journeys actually made outside peak periods.

These general interpretations prompt us to seek to verify what impact, if any, flexible working hours have in actually mitigating flows around peak commuting periods. To perform this verification, we need first to set aside the question of mobilities and concentrate on the question of work. There is no point studying the possible effect of flexible working hours on the staggering of commuting times if this “freedom” does not immediately bring about changes in actual work schedules.

2. FLEXIBILITY IN WORKING HOURS AND OFFICE ARRIVAL TIMES

2.1 Scheduling Preferences models: the “delays” caused by flexibility

Most research that focuses on the question of peak time travel and the avoidance of high congestion periods is based on econometric methods. These studies seek to model the choice of commuting schedules. They generally refer to so-called Scheduling Preferences models (Small, 1982) which are themselves based on the *bottleneck model* (Vickrey, 1969) used to describe road congestion. These models are based on three central hypotheses regarding commuter behaviour:

- Commuters have a preferred time of arrival at work, whether set by the employer or genuinely chosen.
- Commuters are at least minimally aware of congestion periods.
- Commuters are ready to shift from their preferred arrival time in order to travel outside peak periods and therefore to spend less time in traffic jams.

With these postulates, by comparison with workers restricted to set working times, workers with flexible working hours should find it easier to offset time saved on the road against rearrangements of their schedules (in order to avoid peak times). Indeed, studies show that the “penalty” of arriving “early” or “late” relative to their preferred schedule is smaller for someone with flexible working hours than for someone with fixed working hours (Kristofferson, 2013; Börjesson, 2008; de Jong et al., 2003; Polak & Jones, 1994; Hendrickson & Planke, 1984; Small, 1982). By arriving before or after their preferred arrival time and potentially avoiding the rush hour, workers with flexible working hours are not in principle penalised from a professional perspective. Conversely, workers whose working times are set by their employer can be heavily penalised for failures of punctuality.

The same studies also confirm that flexible workers who arrive “late” to work “incur a cost” that is markedly lower (in other words it is easier for them to offset the delay against time saved on the road) than workers with fixed working times. Indeed, commuters with set working times can potentially adjust their work schedules by arriving earlier, but with difficulty if they arrive later. On the basis of these observations, it may be said that workers with flexible working hours are more likely to get to work later than those with fixed working times.

Nonetheless, these models have numerous limitations. The first is that they primarily deal with private car journeys. Despite recent developments (de Palma, Lindsey, Monchambert, 2015), these models are still hard put to model the mechanisms of substitution between higher levels of comfort in public transport outside rush hours and the cost of “staggering” the time of arrival at work (Kraus & Yoshida, 2002). The second is that these models do not specifically concentrate on the question of the effects of flexible working times. The majority of them simply tell us that flexible workers are more likely to arrive at work in the morning after their preferred schedule. Only very rarely do we know the exact time at which the survey subjects travel and arrive at their workplace. For this reason, we do not know whether, with flexible working hours, travel is deferred long enough to take place outside the peak period.

2.2 Research on flexible working times: journeys during or after peak periods

For their part, other researchers have more explicitly studied the time aspects of flexible working hours. The first to have compared flexibility of working times with commuting times were an Irish and a Canadian researcher (McCafferthy & Hall, 1977), and they did it unintentionally. In 1977, they were trying to model the effect of the socio-economic characteristics (income, travel time, transport mode, number of children) of workers with flexible working times in the Toronto region on the probability that they would choose to travel before or after the evening rush hour (4:30-5:30 p.m.).

The conclusions of this study are tinged with a certain disappointment, since the initial question did not seem to have led to convincing results. The econometric model employed was not able to significantly measure the socio-economic criteria governing whether flexible workers adjusted their working times in order to avoid rush hour periods. On the other hand, and more modestly, the analysis enabled the two researchers to make a discovery that clearly prompted them to correct their initial postulate. Whereas they had thought that the observation of workers with flexible working hours would enable them to closely study a particular population subcategory characterised by its avoidance of rush hour, they realised that workers with flexible working hours travelled just as much during peak periods as other workers.

Much later (according to Kahn, 2007), a study conducted in Geneva would also show that flexible working hours do not have an impact on the time of arrival at work in the morning:

“A study conducted by Geneva University’s logistics research unit, looking at the transport habits of the population living and/or working in Geneva, reveals a certain inertia. Individuals who have flexibility in their working hours are nevertheless in the habit of starting work at fixed times. And 74% of them also choose to begin work between 7:30 and 8:30 a.m.” (Kahn, 2007, p. 246)

The results observed in Geneva confirm the observations made by Hall & McCafferthy on evening rush hour in Toronto: the great majority of workers with flexible working hours start their working day during the rush hour. However, these studies do not establish a causal link between flexibility of working hours and the scheduling habits of the employees.

For their part, more recent studies (He, 2013) based on the USA’s National Household Travel Survey (2009 US National Household Travel Survey – NHTS) are able to precisely quantify the impact of flexible working hours on the probability of starting a commute before, during or after the morning rush hour (6-9 a.m.). They focus on the travel schedules of car commuters in San Francisco and Los Angeles. Their conclusions are a hybrid of the findings based on Scheduling Preferences models and those drawn from the observations in Geneva and Toronto. On the one hand, there is indeed a greater likelihood that flexible workers will arrive after the peak travel period than the rest of the population. On the other hand, these differences are minimal: compared with workers on fixed hours and all other things being equal, workers with flexible hours are 3.3% less likely to arrive before rush hour, 4.1% less likely to arrive during rush hour and 7.4% more likely to arrive after rush hour. We would also note that this propensity of “flexible workers” to arrive at the workplace after the rush hour has recently been confirmed by a survey (Yang, Steiner, Srinivasan, 2016) conducted with commuters in the Miami region.

2.3 Lessons from the sociology of work: flexible but within the rush hour

There are few French studies which focus on the links between flexible working hours and actual working hours. To our knowledge, only a few studies drawing on INSEE’s Time-Use Surveys provide information on the link between the possibility of choosing one’s working hours and the actual hours worked in the working day. One such is the study by Laurent Lesnard (2006) based on the 1999 Time-Use Survey. It indicates that compared with employees with fixed working hours, employees who enjoy a degree of freedom markedly prefer *standard working hours*. Through his definition of *standard working hours*, he shows that people who can choose their work schedule maintain typical working hours such as 9 a.m. to 5 p.m. and therefore travel mostly during peak periods. In addition, he observes that where working hours are not imposed by the employer,³¹⁰ work schedules also tend to run slightly later (e.g. 10 a.m. to 7 p.m.) than the working hours set by the employer.

The findings from these different empirical studies make it difficult to argue that more flexible working hours result in working times being staggered and traffic flows being spread around peak periods. From our point of view, we will note that despite the diversity of the field locations, the results tend to converge in showing that there is not a correlation between flexibility and a staggering of journeys over time. True, according to transport research, flexibility in working hours leads to a general deferment of arrival at the workplace. However, this general deferment is not the same thing as a dilution in the concentration of peaktime journeys. Indeed, if all flexible workers delay their schedules to arrive at work at the same moment, congestion is simply deferred, if not exacerbated. In fact, this is more or less what is observed from research in the sociology of work and in the French case. Here there is indeed a correlation between flexibility and a slight delay in working hours, but also and above all a rise in the concentration of arrivals around *standard times* (Lesnard, 2006).

At this stage, this observation of the situation in France needs to be verified and related more directly to the question of peak hours. This requires us to look in greater detail at a specific case to see how flexible working hours reshape the distribution of the morning rush hour.

3. CONCENTRATION OF WORK START TIMES AND FLEXIBILITY OF WORKING HOURS IN ÎLE-DE-FRANCE

³¹⁰ These working hours combine schedules that can be adjusted from one day to the next and schedules directly decided by employees. According to this classification, 25% of French employees (Time-Use Survey 1999) have working hours that are not imposed by their employer.

3.1 Aspects of framing and methodological explanations

In relation to our research problem, Île-de-France constitutes an excellent field of study. It is the French metropolitan region that contains the largest number of working people with flexible working hours (Bouleau & Leroi, 2016) and where the congestion challenges are the greatest (Koning, 2011). According to the last National Transport and Travel Survey (ENTD 2008), and on the basis of a sample of responses from more than 2000 working people living in Île-de-France, 30% of people in work in this region have flexible work schedules. Intuitively, therefore, one would expect Île-de-France to be a region in which the practice of rush hour avoidance would be found extensively (Munch, 2017).

In consequence, in order to verify some of the information arising from the literature review, we look to see whether flexible work schedules in Île-de-France should or should not be associated with more staggered work start times. To achieve this, we use the latest national travel survey which provides very detailed information on the time of arrival at work on a working day and also on the method of determining working hours.

For the Île-de-France region, therefore, we then relate the method of determining work schedules –whether they are fixed or flexible – to the degree of concentration of arrivals in the workplace.

The populations with *flexible working hours* and *fixed working hours* are compared with respect to this degree of concentration for the “half-hour”³¹¹ that contains the largest proportion of workplace arrivals over a day. This is called the *superpeak*. We will compare the intensity of the *superpeak* (in % of arrivals over the half-hour) between the different populations of workers, depending on whether they have flexible or fixed work schedules. In this way, and by contrast with the majority of authors, we will not construct canonical timeslots, such as 7 a.m. – 9 a.m., to observe whether flexibility leads to more or less journeys during, before or after rush hour.

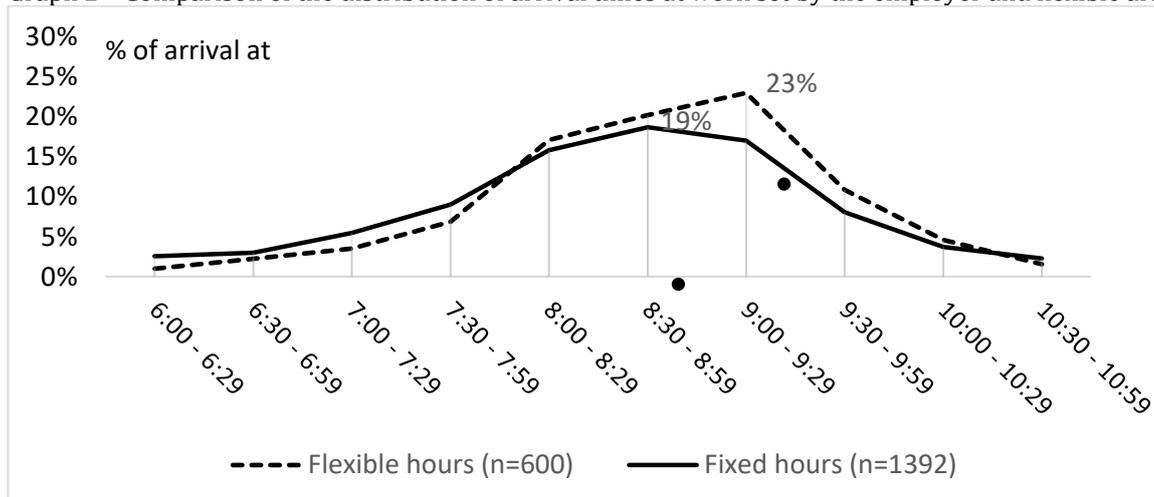
What interests us, at the same time as knowing whether individuals travel during or outside the peak period, is comparison of the intensity of the *superpeak*, i.e. the crucial moment when the density of arrival in the workplace is the most intense.

However, we also assign importance to the temporal position or “the time of the *superpeak*” for each of the populations surveyed. Indeed, a simple accentuation in the concentration of work start times would not necessarily be problematic. The problem arises if the intensity of the *superpeak* for flexible workers is both greater and situated right in the heart of the peak period. It is only under these circumstances that flexible work schedules could be interpreted as particularly negative for congestion on the transport networks. For this reason, it is important to note at this point that, according to the 2008 ENTD, the peak period for workplace arrivals in Île-de-France is between 8:30 and 9:29 a.m. (see Appendix 1).

3.2 Flexibility of working hours is associated with increased synchronisation of work start times in Île-de-France

In the 2008 ENTD, in parallel with a question on the time of arrival at work on the weekday of the survey, respondents who had been at their habitual workplace the day before the survey were asked if it was they or their employer who decided their work schedules. By cross-referencing the answer to these two questions for each individual, we are now in a position to represent the distribution of arrival times at work that are set by an employer and the distribution of flexible arrival times, i.e. the schedules that are set by the workers themselves (Graph 2).

Graph 2 – Comparison of the distribution of arrival times at work set by the employer and flexible arrival times



In Île-de-France, times of arrival at the normal workplace, for a weekday and for the first journey to work. Grouping by 30 minute segment. Produced by the authors. Source: ENTD 2008.

311 The choice of the half-hour time step corresponds to the methods of analysis used by the Île-de-France transport organising authority (Syndicat des Transports d’Île-de-France). In addition, while a one-hour time step does not seem sufficiently close-grained to accurately describe changes in the schedules, a 15 minute time step would not have seemed appropriate, because the hours entered are the declared schedules and most of the respondents enter their work schedules with a degree of precision of half an hour or one hour, and more rarely a quarter of an hour.

Graph 2 highlights two results. First, in Île-de-France flexible working hours are associated with an increase in the concentration of arrivals at work during peak times. For people with flexible work schedules (dotted line), 23% of arrivals are concentrated between 9 and 9:29 a.m.. For people with fixed work schedules (continuous line), only 19% of arrivals are clustered during the period of greatest intensity, i.e. 8:30 to 8:59 a.m..

Secondly, as other authors have observed (cf. point 2.), flexibilisation does indeed seem to correspond to a general delay in the time of starting work, since the spike in arrivals is shifted 30 minutes to the right for people who can decide on their working hours.

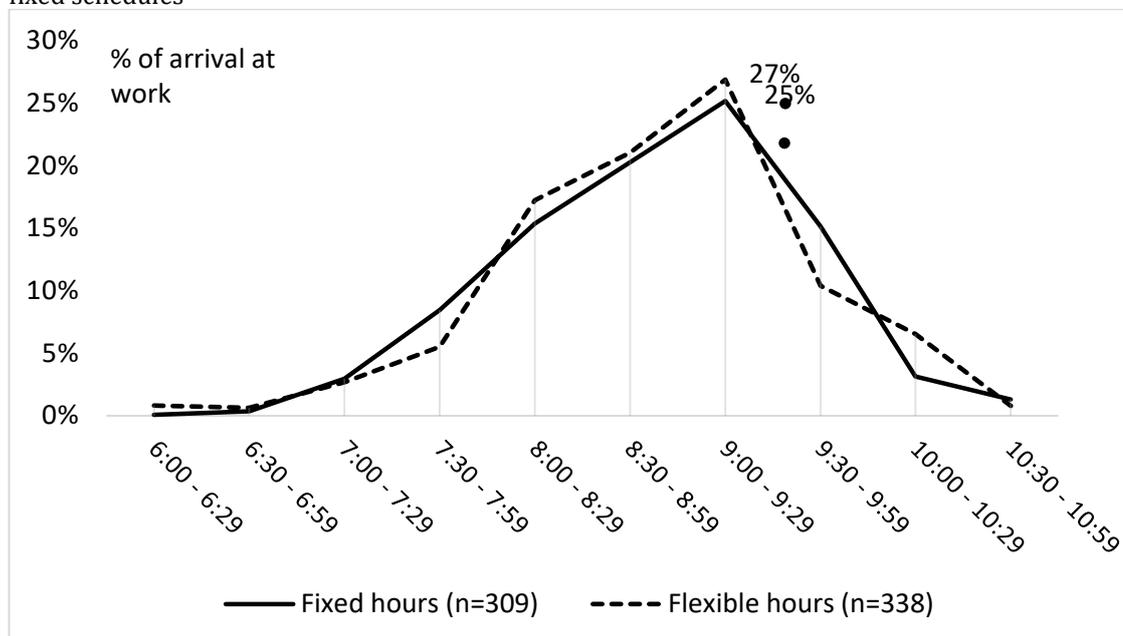
In order to achieve greater certainty on the links between flexibilisation and the concentration of work arrival times in Île-de-France, let us now compare the distribution of flexible and fixed work schedules within a single French socio-professional category: “executives and higher intellectual professions”.

There are several advantages to closely studying the working hours of executives in Île-de-France. First of all, it is a way to smooth out the effect of potential hidden variables that may explain the differences observed between flexible and fixed work schedules. It is known, for example, that regardless of the way work schedules are determined, executives begin their working day later than unskilled workers and office workers (Munch, 2017; Wilson, 1988). Now unskilled and office workers represent 54% of workers with fixed hours in Île-de-France, whereas executives represent 53% of workers with flexible hours in Île-de-France. In consequence, there is a risk that the one-hour delay in starting work for the populations with flexible schedules is not attributable to the method of determining working hours. It could instead be caused by the overrepresentation of executives in the population with flexible hours and the overrepresentation of unskilled and office workers in the population with fixed hours. Working on a single socio-professional category is therefore a way of avoiding this risk of interpretative error.

Next, executives are a particularly interesting subpopulation for the study of the effects of flexible working hours. It turns out that executives are the employees who benefit the most from flexible work schedules in Île-de-France. In 2008, more than half of the executives in this region had flexible working hours. In addition, for these categories of workers, commuting times are perceived as particularly unpleasant “interstitial times”. Indeed, according to the “Stiglitz notes” in the 2010 Time-Use Survey, executives and the higher intellectual professions are the only professionals who classify the morning commute as one of the three most unpleasant activities of the day (Ricroch, 2011). This is also understandable insofar as very few executives have short commuting journeys: only 12% have a commute of 15 minutes or less (OMNIL, 2013).

In looking at the working hours of executives in the Paris region, therefore, we are looking at a population that is inherently extremely sensitive to the problem of the rush hour.

Graph 3 – Comparison of the distribution of arrival time at work of executives with flexible schedules and executives with fixed schedules



In Île-de-France, times of arrival at the normal workplace, for a weekday and for the first journey to work. Grouping by 30 minute segment. Produced by the authors. Source: ENT D 2008.

Yet the observations drawn from Graph 3 and applied only to executives confirm the information drawn from Graph 2 and applied to all working people in Île-de-France. They show that executives with flexible work schedules are clustered more intensely at the time of the *superpeak* than executives with fixed work schedules. Between 9 and 9:29 a.m., the peak in arrivals by executives with flexible working hours accounts for 27% of daily arrivals, while at the same period, the peak in arrivals by executives with fixed working hours only accounts for 25% of the contingent. Although it does not

defer its arrivals,³¹² here again the group with flexible working hours is the group whose arrivals are most concentrated within the *superpeak*.

By cross-referencing the mode of determining working hours with the distribution of arrival times at work in Île-de-France in 2008, we therefore seem to have arrived at an apparently paradoxical conclusion: flexible working times are associated with a clustering in the time of arrival at work.

CONCLUSION

This article discusses the “belief-image” (Laplantine, 1989) that flexible working hours will lead to the phasing of work schedules and a dilution of traffic flows in peak periods. Through a review of the international empirical literature, but above all through the study of the distribution of arrival times at work in Île-de-France, we have identified a set of factors that suggest that this image needs to be turned on its head: the populations who are free to decide on their work schedules globally have a tendency to concentrate their time of arrival at work within the peak period.

This conclusion is not without implications for the congestion observed every day in most big cities. Firstly, in terms of public transport policies, the non-governmental organisations (AFD, 2016; OCDE, 2010) which have promoted flexible working times as a means of spreading traffic flows have, it would seem, gone in the wrong direction. Indeed, if more flexible work schedules lead to greater synchronisation in the times of arrival in the workplace, the effectiveness of such public policies is severely undermined. They might even improve counter-productive, bringing about the reverse of the intended outcome by exacerbating rush-hour congestion. Secondly, with today’s joint dynamic of urbanisation and the tertiarisation of production activities, the percentage of the working population with individualised and flexible work schedules will in all likelihood continue to grow. According to our findings, therefore, the intensity of the spikes in daily commuting and the associated congestion phenomena are likely to continue to increase spontaneously.

This counterintuitive connection between flexibility of working hours and increased concentration of rush-hour arrivals at work recalls other types of surprising findings in situations that lead to variation in travel structure. One is reminded, for example, of the conclusions of Mokhtarian, Collantes and Gerz (2004) regarding teleworking, which demonstrated that teleworkers travel as much if not more than if they were obliged to go out to work, in particular for other reasons (visiting family, shopping...). Or else, in Île-de-France, the general reduction in the distance between the workplace and home would seem unexpectedly to encourage car use to the detriment of public transport (Korsu, Massot, Orfeuill, 2012). Then there is the fact that the increase in the use of new information and communication technologies (ICT), rather than reducing the need for face-to-face meetings, seems to be accompanied by an increase in the number of such meetings (Aguiléra & Lethiais, 2012).

More generally, the revelation of this socio-temporal paradox is an invitation to challenge the way in which sociology traditionally depicts the day-to-day activity patterns of the inheritance of big western cities. At the macrosocial scale, many authors today (Rosa, 2015; Mallet, 2014) speak of a “desynchronisation” in social activities supposedly linked with the flexibilisation of the central link in day-to-day life: work. Except that, while work schedules in Île-de-France seem increasingly individualised and flexible, the times at which people start work also prove to be becoming more closely synchronised at the moment of the arrival spike (around 9 a.m. in Île-de-France).

To move to the microsocial scale, in the light of our findings, it is the foundational assumptions of the econometric models of *Scheduling Preferences* (Vickrey, 1969; Small, 1982) that crumble. The individual freedom offered to employees to choose their working hours seems to be exploited less to escape standard travel times and congestion periods, as assumed by traffic engineering models, than to adhere to the schedules that are already predominantly followed.

Counter to most social science research, this article demonstrates that the individualisation of the relation to working time does not lead to a desynchronisation and diversification of work schedules, but rather to a synchronisation and concentration of working hours. Nonetheless, the theoretical implications of the paradox of working time flexibility and the rush hour remain to be confirmed. For our part, we will refrain from generalising results that are based on a literature review and practices observed at the scale of Île-de-France, in a necessarily specific cultural context. To consolidate our findings further, it will probably be necessary to check empirically whether this socio-temporal paradox also occurs in other agglomerations and regions of the world.

Nonetheless, having described and delineated the phenomenon, it is tempting to look for an explanation for this paradox. It is probably here that our conclusions open up the most stimulating pathways for research. The first research that revealed a paradox between the individualisation and concentration of behaviour patterns (Simmel, 1908) argued that this concentration arose from a process of general rationalisation in the logics of individual action (Weber, 1922). According to this argument, more and more of us are individually free to decide on the form and quality of our actions but, because the logics of our actions are increasingly and uniformly objective and rational and less and less subjective, all of us give them more or less the same form. In this view, we all have a good (and the same) reason to continue to travel during the rush hour.

At this level, however, the explanations are still somewhat too general and too little focused on the question of the temporalities of practices. Once released from regulatory constraints at work, for what reason(s) would we continue to travel during the rush hour, especially in the case of executives in the Paris region, for whom peak time travel is perceived

³¹² This finding confirms the hypothesis that it is above all socio-professional status that is responsible for late or early arrivals, rather than the method of determining the work schedule.

as one of the three most unpleasant daily activities (Ricroch, 2011)? At this point, it is helpful to refer to recent work in the sociology of time. In this domain, the paradoxical way in which we experience day-to-day time is often highlighted to explain this kind of hiatus.

Absorbed by the tempo of life, of the days, weeks, months and years, our experience of time is paradoxical in that we think we possess it, whereas everything suggests that it ultimately possesses us. For Edouard Gardella (2011), for example, “the more time we save, the less we have”. With regard to our subject here, if saving time is choosing one’s time, then the freer we are in our daily work schedules, the less control we have over them. In fact, the wider our universe of choices regarding working hours, the more we find ourselves potentially submerged beneath an ocean of demands. In all likelihood, faced with the pressure of the need for day-to-day synchronisation (work, family, consumption, leisure...), workers who are apparently free to choose their working hours in fact become all the more obliged to fit into the standard and dominant rhythms of life in order to coordinate their multiple activities. Whether we are collectively and explicitly governed by the organisation of work, or individually and implicitly guided by the need to manage our daily schedules, we continue to consume day-to-day temporalities like a mass-produced product.

REFERENCES

- AFD, 2016, “Sustainable Urban Transport : A Sourcebook for Policy-makers in Developing Cities”, Agence Française de Développement (France) et Ministère Fédéral pour la Coopération Économique et le Développement (Allemagne).
- ALTER, N., 2002, « L’innovation : un processus collectif ambigu », ALTER, N. (dir.), *Les logiques de l’innovation*, La Découverte.
- AGUILERA, A. & LETHIAS, V., 2012, « Face-à-face, téléphone ou internet : comment les P.M.E bretonnes communiquent entre elles ? », *Métropolitics*, 20 juin 2012.
- ASCHER, F., 2000, *La société hypermoderne. Ces événements nous dépassent, feignons d’en être les organisateurs*, Éd. de l’Aube.
- BAILLY, J-P., HEURGON E., 2001, *Nouveaux rythmes urbains : quels transports ?*, Rapport du Conseil national des transports, Éd. de l’Aube.
- BAUDRAZ, J-F., 1971, *L’horaire variable de travail*, Impr. Vaudoise.
- BAUMANN, Z., 2000, *Liquid Modernity*, Polity Press.
- BOULEAU, M., LEROI P., 2016, « Nouveaux modes de travail et mobilité », IAU Île-de-France, avril.
- BÖRJESSON, M., 2008. “Joint RP/SP data in a mixed logit analysis of trip timing decisions”, *Transport. Res. Part E : Logist. Transport. Rev.* Vol. 44, n° 6, p. 1025–1038.
- CASTELLS, M., 2000, *The Rise of The Network Society: The Information Age: Economy, Society and Culture*. John Wiley & Sons
- CASTEX, E., JOSSELINE, D., 2007 « Temporalités éclatées », *Espace Populations Sociétés*, vol. 2, n° 3, p. 433-447.
- COULOMBEL, N., EL-MAHRSI, K., MUNCH, E., 2017, « Evaluation du décalage des horaires de l’Université », De PALMA, A., DANTAN, S. (dirs.), *Big data et politiques publiques dans les transports*, Economica.
- DUBET, F., 2009, *Le travail des sociétés*. Ed. du Seuil.
- FOSGERAU, M. & KARLSTRÖM, A., 2010, “The value of reliability”, *Transport. Res. Part B : Methodol.*, vol. 44 n° 1, p. 38–49.
- GARDELLA E., « Vers une pétrification du politique ? », *La Vie des idées*, 18 février 2011.
- GODARD, F., 2007, « Vie publique et vie privée : de nouveaux régimes temporels », *Réseaux*, n° 140, p. 29-65.
- GROSSIN, W., 1996, *Pour une science des temps – Introduction à l’écologie temporelle*, Octares.
- HARVEY, D., 1990, *The condition of postmodernity*, ed. Wiley.
- HE, S., 2013, “Does flexitime affect choice of departure time for morning home-based commuting trips ? Evidence from two regions in California”, *Transport Policy*, n° 25 p. 210 221.
- HENDRICKSON, C., PLANKE, E., 1984. “The flexibility of departure times for work trips”, *Transport. Res. Part A : Policy Pract.*, vol. 18 , n° 1, p. 25–36.
- HINES, E.J., 1984, “Estimating Users and Impacts of a Regional Alternative Work Schedule Program”, *Transportation Research Record*, n° 845.
- de JONG, G., DALY, A., PIETERS, M., VELLAY, C., BRADLEY, M., HOFMAN, F., 2003, “A model for time of day and mode choice using error components logit”, *Transport.Res. Part E : Logist. Transport. Rev.* Vol. 39, n° 3, p. 245–268.
- KONING, M., 2012, *Essais sur la congestion dans les transports à Paris*, PhD Thesis in Economics, Université Paris 1.
- KAHN, R., 2007 (dir.), *Régulation temporelle et territoires urbains- Habiter l’espace et le temps d’une ville*, Harmattan.
- KRAUS, M., YOSHIDA, Y., 2002, “The Commuters’s Time-of-Use Decision and Optimal Pricing and Service in Urban Mass Transit”, *Journal of Urban Economics*, n° 51, 170-195.
- KRISTOFFERSSON, I., 2013, “Impacts of time-varying cordon pricing: validation and application of mesoscopic model for Stockholm” *Transport Policy*, n° 28, p. 51–60.
- KORSU, E., MASSOT, M-H., ORFEUIL, J-P., 2012, *La ville cohérente. Penser autrement la proximité*, La Documentation Française.
- LAPLATINE, F., 1989, « Anthropologie des systèmes de représentations de la maladie », In JODELET, D., *Les représentations sociales*, PUF.
- LAMPARSKI, B.J., 1978, “Alternative work schedules: Reconnaissance and Recommendations”, *Working paper 8*, Baltimore Regional Planning Council.
- LEFEBVRE, H., 1984, translated from French [1968], *Everyday Life in the Modern World*, 1st Edition.
- LESNARD, L., 2006, « Flexibilité des horaires de travail et inégalités sociales », *Conditions de travail et relations professionnelles, Données sociales – la société française*, n° 4, p. 371-378.
- MALLET, S., 2014, « Les rythmes urbains de la néolibéralisation », *Justice spatiale – spatial justice*. Université Paris Ouest Nanterre La Défense.
- McCAFFERTY, D., HALL .F.L., 1982, “The use of multinomial logit analysis to model the choice of time to travel”, *Economic Geography*, n° 58, p. 236–246.
- MOKHTARIAN, P.L, COLLANTES, G.O., GERZ, C., 2004, “Telecommuting, Residential Location and Commute-Distance Travelled: Evidence from State of California Employees”, *Environment and Planning A*, vol. 36, n° 10.
- MUNCH E., 2017, *But why do they all arrive at the same time? The paradox of rush hour and flexible work schedules. A sociological survey of Parisian executives*, PhD Thesis in Urban Planning, Ecole Nationale des Ponts et Chaussées.
- OCDE, 2010, “ Managing urban traffic congestion”, Éd. OCDE.

OMNIL, 2013, « Les déplacements des actifs en Île-de-France », *Cahiers de l'EGT*, n°17, Janvier 2013.

ORFEUIL, J-P., 2000, « L'évolution de la mobilité quotidienne. Comprendre les dynamiques, éclairer les controverses », *Synthèse Inrets*, n° 37.

PIERCE, J.L., NEWSTROM, J.W., 1980, "Toward a conceptual clarification of employee responses to flexible working hours : a work adjustment approach", *Journal of Management* n° 6, p. 117-134.

de PALMA, A., LINDSEY, R., MOCHAMBERT, G., 2015., "Optimal fares and capacity decisions for crowded public transport systems", *Proceedings of the 50th Annual Conference of the Canadian Transportation Research Forum*, p.412-426.

POLAK, J.W., JONES, P.M., 1994, "A tour-based model of journey scheduling under road pricing", *73rd Annual Meeting of the Transportation Research Board*, Washington, DC.

RAVEL, J., 1983, « Le temps choisi », Rapport de mission au ministre d'État, ministre du Plan et de l'Aménagement du territoire.

ROSA, H., 2015, translated from German [2005], *Acceleration – A new theory of modernity*, University of Columbia Press.

SHEN, Y., MEI-PO KWAN, M-P., CHAI, Y., 2013, "Investigating commuting flexibility with GPS data and 3D geovisualization : a case study of Beijing, China", *Journal of Transport Geography*, n°32, p. 1-11.

SIMMEL, G., 2009, translated from German [1908], *Sociology: Inquiries into the Construction of Social Forms, Volumes 1 & 2*, Brill

SMALL, K.A., 1982, "The scheduling of consumer activities: Work trips, *American Economic Review*, vol. 72, n° 3, p. 467-479.

Du TERTRE, C., 2003, « Services immatériels et relationnels : intensité du travail et santé », *Activités, Varia*, n° 2, p. 37-49.

THOEMMES, J., 2013, « L'histoire oubliée des horaires individualisés : de la désynchronisation choisie à la flexibilité pour l'entreprise », *Revue Française de Socio-Économie*, n° 11, p. 35-53.

THORAUGE, M., 2015, *Departure time choice: Modelling individual preferences, intention and constraints*, PhD Thesis in Economics, Technical University of Denmark.

THOMPSON, E.P., 1967, "Time, Work-Discipline and Industrial Capitalism", *Past & Present*, n°38, p. 56-97.

URRY, J., 2000, *Sociology beyond societies: mobilities for the twenty-first century*, Routledge.

VICKREY, W.S., 1969, "Congestion theory and transport investment", *American Economic Review*, Papers and Proceedings n° 59, p. 251-260.

WEBER, M., 1971, [1922], *Economie et Société Tome 2 - L'organisation et les puissances de la société dans leur rapport avec l'économie*, Pocket.

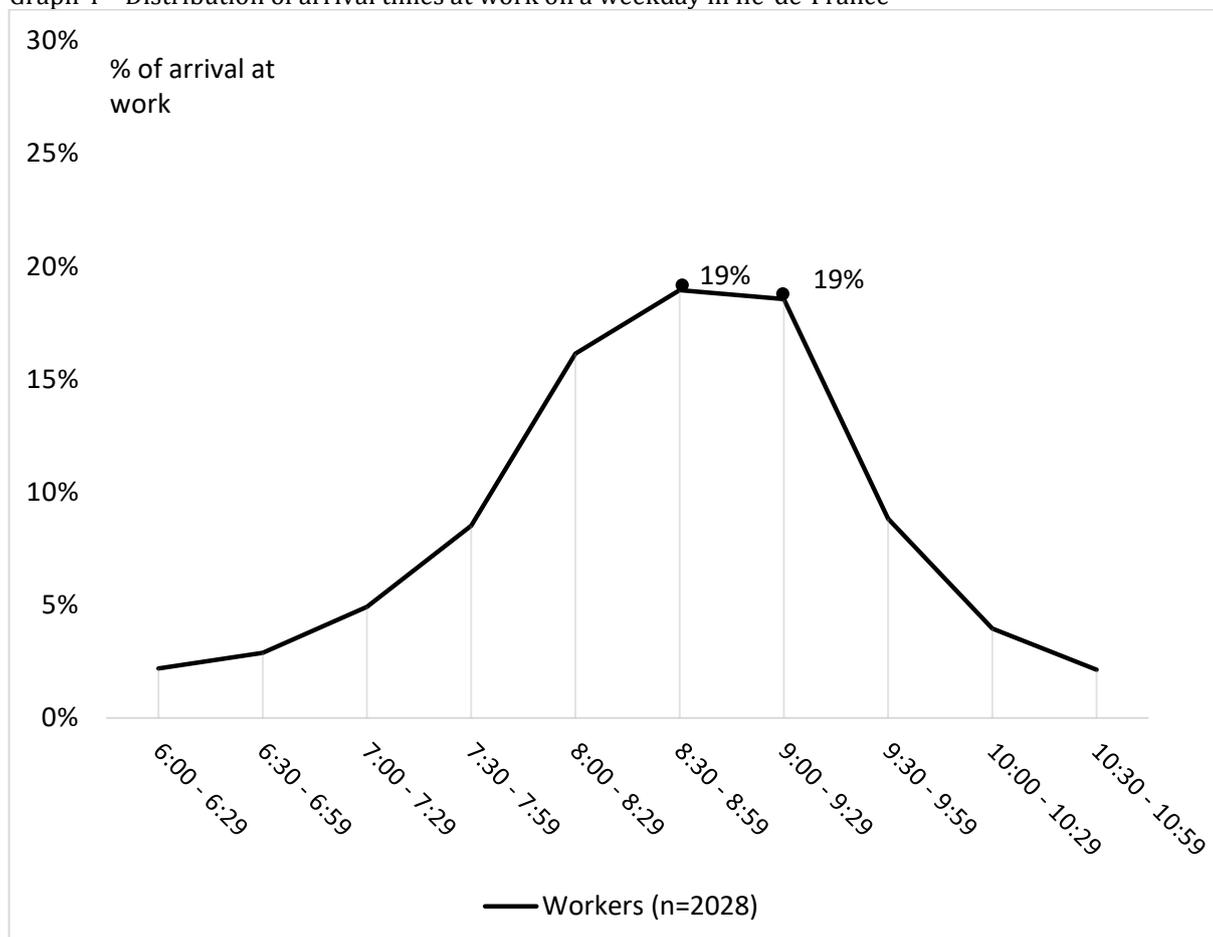
WILSON, P., 1998, "Wage Variation Resulting from Staggered Work Hours", *Journal of Urban Economics*, vol. 24, p. 9-26.

YANG, Y., STEINER, R.L., SRINIVASAN, S., 2016, "The Impact of Flexible Work Hours on Trip Departure Time Choices in Metropolitan Miami", *CICTP 2016 - Green and Multimodal Transportation and Logistics - Proceedings of the 16th COTA International Conference of Transportation Professionals 2016*, p. 2215-2229.

YOSHIMURA, M. & OKUMURA, M., 2001, "Optimal commuting and work start time distribution under flexible work hours system on motor commuting", *Eastern Asia Society for Transportation Studies (EASTS)*, n°10.

APPENDIX

Graph 4 – Distribution of arrival times at work on a weekday in Île-de-France



In Île-de-France, times of arrival at the normal workplace, for a weekday and for the first journey to work. Grouping by 30 minute segment. Produced by the authors. Source: ENT D 2008.

1283 CHALLENGES FOR DEVELOPING BETTER DIGITAL LIVES FOR SMART CITIES

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ABSTRACT

In today's digital age, the initiative of smart city highlights a new wave of developing and reshaping the better digital lives for tomorrow. Digitalization is ensuring a positive force on developing countries to improve their infrastructure and rethinking the role of city leaders in creating better digital lives for smart cities. The core concept behind developing these smart cities is to create highly advanced urban regions and to improve upon quality of life in a larger connected network within society. The role of digital services are critical in this transformation, as it provides the best possible solution to monitor the wide range of aspects of city living and amenities, connecting every citizen to policy-making and administration. The emerging development of smart cities is a visionary step; the use of digital services will enhance its sustainability in through the number of issues in the development of urban lives. As digital India is centred on providing utility to citizens, offering on demand services and digital empowerment, the program will be the nexus of public services, public service providers and the public. On the other hand, some of the digital bangs have affected the smart cities more profoundly in augmenting the existing social dynamism of the community in question. This study is trying to address the emerging issues of comprehensive innovation and digitalization strategies on the people's quality of life in view of discussing the challenges and opportunities for city leaders, citizens and government in creating better digital lives. In thinking about the leverages of digitalization for making smart cities reality, the important questions need to be analyzed that what benefits are associated with a tailored digitalization strategy to the cities for people. Secondly, how well the smart cities are realizing the worth of their information technology, enabling the city to deliver better services more efficiently. The specific objective of the study that we aim is to identify the current approaches of developing digital lives for smart cities and understanding the construct of technology in propelling individual growth. The research design employed for the present study is to showcase the challenges of designing smart cities with people in mind. For the purpose of this a comprehensive and extensive literature review was conducted, analyzing the current approaches of rebuilding the smart cities for the digital age. The implication of the study is to meet the challenges of tomorrow by focussing on the needs of people and building new services through human-centred design. It is also very imperative for the city leaders to improve the services and rebuild the infrastructure for developing better digital lives for the smart cities.

Keywords: Digitalization, Digital Services, Smart Cities

INTRODUCTION

"Smart Cities are those that are able to attract investment"

*Shri Narendra Modi
Prime Minister of India*

India is on the cusp of a digital transformation and it is the collective responsibility of entire stakeholders of India to make sure that the initiatives of smart cities and Digital India mandate transform dream into reality. With the migration from rural areas to urban areas, an international phenomenon, India has also seen similar movements for several years. Now, it is expected that by 2050, 70% population will be living in cities. It is said that this would mean that around 500 new cities would be needed to accommodate this burgeoning population in urban areas. If India properly plans and develops its urban environment, urbanization can provide an efficient way for people to live, enabling economies of scale in the delivery of infrastructure and services. However, without proper planning and services, sprawling cities can become flashpoints of discontent. It is firmly believed that the cities are the engine of growth and intricate bionetwork of many people, public infrastructure and private platforms. Moreover, the proximity and diversity of people can spark innovation, create employment and provide the country's economic engine. Conventionally, city administrations have always been responsible for creating, managing and delivering better ways of living. There has been no dearth of schemes and policies to address the issues that affect the urban sector growth in India.

At the turn of the 21st century, transforming life, transforming India through digital platforms has laid out immense hope of turnaround India's urban centres. India is looking to modernise and in order to keep pace with this development, the Government of India have committed to turning dream into reality by building 100 ultramodern "smart cities" as satellite towns of larger cities by modernizing the existing mid-sized cities across the country. For this, the union cabinet has approved the smart city mission budget and allocated Rs. 48,000 crores for its development. It also renamed the Jawaharlal Nehru National Urban Renewal Mission targeted by the UPA government and renamed it as **Atal Mission for Rejuvenation and Urban Transformation (AMRUT) for which about Rs.50,000 crs. to be allocated for its development.**

The two mission combined is expected to improve the quality of life in urban areas and create better and sustainable cities. Thus as we move to urban economic powerhouses for jobs and opportunities we also have to deal with critical issues like economic hardships such as housing, transport and pollution. And that is really forcing cities to start thinking of how to develop a better digital life for smart cities. The paper addresses the emerging issues of comprehensive concept of smart cities in thinking about the leverages of digitalization for making smart cities reality.

The problem of the research is to analyze how well the smart cities are realizing the worth of their information technology; enabling the city to deliver better services more efficiently and **what are the challenges or stumbling blocks for city leaders, citizens and government that may be encountered in creating the better digital lives for smart cities.**

The aim of this research is to make analysis of understanding the concept of smart cities and outlining a roadmap for the development for citizen, city leaders and government

SMART CITIES CONCEPTS: TECHNOLOGY TREND UNDERPINNING

The age of technology has gifted us with many innovations that affect our lives each day, along with a healthy outlook for how we might use information technology to shape our collective future. Our ability to harness advanced computational power and the internet offers us tremendous opportunities to ignite a revolution of efficiency and improvement to our lives by collecting, processing, sharing, and leveraging data in ways that were previously impossible. “ Smart Cities are new style of city providing the sustainable growth and designed to encourage and designed to encourage healthy economic activities that reduce the burden on the environment while improving Quality of Life(QoL)- such as housing, economy, culture, social and environmental conditions”(Japan Smart City Portal, 2013). Smart city concept is an attempt to answer some of the key questions we dwell into that are: urbanization, contribution to economic growth and challenges to build smart cities.

There are variety of definitions and interpretations of Smart City. It is said that Smart city is an IBM concept in 2008 as part of its Smarter Planet initiative. It is a holistic set of goals where the urban planning can be associated to intensive use of technology so that they have the citizen as protagonist. In the words of Mr. Shirish Sankhe, Director, Mckinsey India, the smartness of city can be defined from all the way to be a technologically smart to all the way to livable and smart and affordable. Smart Cities concept encompasses usually the following areas: smart buildings, smart infrastructures and smart services for citizen of India. According to Mr. Shirish Sankhe, the government is trying to figure out what exactly the missions of smart cities are? The idea of smart cities with IT focus is also there but that has come from the west where the basic needs like clean city, water supply, electricity are fulfilled. They are talking smart city highly IT enabled city. But if smart city is IT enabled then we use IT as the power of technology to be done in better and most efficient way and at a lower cost. The idea of smart cities is to combine the strength of technology to give us the most cost effective solution. That is being the way of modernization and development all over in society. There is a need to create a new city or reshape the old cities.

Prime Minister Narendra Modi said, “Cities in the past were built on riverbanks. They are now built along highways. But in the future, they will be built based on the availability of optical fibre networks and next-generation infrastructure. Smart cities broadly identify themselves with eight key dimensions: Smart Building, Smart term Planning, Smart Waste Management, Smart Safety, Smart Energy, Smart Mobility, Smart Governance, Smart Technology. New Technologies enable the introduction of a new relationship between Local Governments and citizens; in particular regarding the introduction of public on-line services and the use of New Technologies to improve the participation of citizens in public decision-making. In general, e- Government can be considered as a concept that consists in improving public governance and the provision of public services through the use of ICT (e-Government), improving the consultation and decision-making processes using ICT (e-democracy) and improving public policy making, with the use of ICT, incorporating more critical agents throughout the process (e-Government). In all these aspects, the role played by citizens has a special impact. The new relationship emerging from e-Government has led to the emergence of a new kind of citizen, the e-citizen.

On the basis of the above mentioned explanation, the evolving concept of smart cities is increasingly becoming realistic and today the bigger challenges of building smarter cities can be seen across the world. Modern citizens expect to be able to interact with organizations, including digital government through digital technology, not least as private sector firms flood the market with apps tailored to customer needs. And city employees are looking for consumer-grade experiences too. They want user-friendly systems that enable them to be productive anytime and anywhere. In response to this trend, cities need to put greater focus on IT agility. Cities need ecosystems of applications that can, while still remaining simple and agile, be bolted together to tackle the most challenging problems, and can be easily scaled up where greater capacity is needed.

SIGNIFICANCE OF SMART CITIES IN THE INDIAN PERSPECTIVE

India is tackling its growth in the digital age – which gives them far more technology-enabled choices and allows them to build in smartness from the ground up. The urban developments have to be comprehensive including the development of physical, institutional, social and economic infrastructure. Comprehensive development is important in improving the quality of life and attracting people and investments to the city, setting in motion a virtuous cycle of growth and development. Smart cities are urban eco-systems which are represented by these four pillars of comprehensive development. A smart city needs to be a system which grows in an intelligent way is quite compact, it doesn't have sprawl in terms of economic development. One good part of this initiative is that a lot of decentralization is envisaged. The cities are supposed to come up with their own plans and what is it they wanted to do. The real positive in this initiative is the government or political leaders are recognising the importance of smart cities for economic development, growth and from shifting people from rural areas to urban areas.

"McKinsey Global Institute study estimated that cities would generate 70% of the new jobs created by 2030, produce more than 70% of the Indian gross domestic product and drive a fourfold increase in per capita incomes across the country." Smart city is a city that makes sure that all our citizens have a good quality of life. Also its cities where people are able to meet their aspirations.

Smart cities highlight the stronger relevance of cities for society and populations in a country marked by strong technological development. The Smart City Mission is being worked upon in close coordination with the projects like Make In India and Digital India. As per the Make in India programme, a few smart cities are already coming up across the country such as Kochi Smart City, Gujarat International Finance Tec-City (GIFT) in Ahmedabad, Naya Raipur in Chhattisgarh, Lavasa in Maharashtra and Wave Infratech's 4,500-acre smart city near New Delhi. Cities are going through a deep transformation – the main driver is digitization.'

SMART CITIES CHALLENGES

Today's cities face significant challenges – increasing populations, environmental and regulatory requirements, declining tax bases and budgets and increased costs. Moreover, the cost of Information and Communication Technologies has plunged making it economical for the government to implement them. Citizens are increasingly getting instant, anywhere, anytime, personalized access to information and services via mobile devices and computers. And they increasingly expect that same kind of access to city services. There is an urgent need to think very differently about how to solve the problem. The India Smart Cities Challenge is a competition designed to inspire and support municipal officials as they develop smart proposals to improve residents' lives. In the Indian context, the approach is necessarily different. Since many Indian cities lack basic infrastructure, institutional frameworks, and proper governance, smart city initiatives will first and foremost involve providing basic civic requirements and making the infrastructure robust and scalable. Given below are some of the key challenges that governments/businesses in India will face while implementing their smart city strategies:

- 1 **Acquisition of Land:** The biggest challenge is the acquisition of land for creating smart cities. The land acquisition law might prove to be a deterrent and make the acquisition costlier, thereby making the residential and commercial units costlier. While the government is considering amendments in the Land Acquisition Bill, these changes may take time.
- 2 **Replacing Existing City Infrastructure to Make It "Smart City-Ready"**
There is a number of latent issues to consider when reviewing a Smart City strategy. The most important is to ascertain the business case that will justify the replacement of existing infrastructure. The integration of formerly isolated systems in order to achieve city-wide efficiencies can be a significant challenge.
- 3 **Economic Growth:** Economic growth is the key for the setting up of a smart city. The growth of the city depends on the mix of industries and sectors. A clear plan of vibrant economic growth of the city provides the right mix of livelihood to those migrating to it.
- 4 **Dealing with different stakeholders:** One of the other main challenges in the Indian smart city space is that (usually) software infrastructure in cities contains components supplied by different vendors. Hence, the ability to handle complex combinations of smart city solutions developed by multiple technology vendors becomes very significant.
- 5 **Employment Opportunities:** The other area of concern is the kind of employment these smart cities will generate. While the smart city will act as a centre of economic growth, it should also provide the right mix of livelihood to those migrating to it. Else, the migration of people will continue to pose a threat to the overall socio-economic scenario of the city.
- 6 **Investment in Infrastructure: India requires around 120 dollars per capita per year in average spending so on overall basis its one trillion dollars of capital investment and one trillion dollars of operating in operational expenses investment over the next 15 years so from that perspective there is a huge gap because normally we spend something like 1/8 or 1/10 of this that's why we can see that urban infrastructure is lagging enormously in India so from that perspective even a small drop is always welcome and the smart cities mission which focuses as a facilitator mechanism on getting our cities to a world- class level . A new city would take a long time to develop both the requisite economic drivers and the infrastructure - only after that will it see people stepping in. By the time the city is habitable and has a basic population, the project would at least be 7 to 10 years in the making. Unfortunately, the current funds available for this sector are only for the short-term of 10-15 years. Unless the development of the city is done out of funds that have a 20 to 30 year horizon, these projects are unlikely to survive. India needs a sea change in the way it looks at funding these cities, or their infrastructure.**

Commenting on the development, Arindam Guha, Senior Director, Deloitte in India, said: "The Smart City Challenge continues to generate significant enthusiasm throughout the country. With the addition of these 27 cities, a total of 60 cities are now eligible for funding under the programme." The high interest and participation levels in the Smart City plan development phase now needs to be sustained through quick implementation on the ground, he added.

ROADMAP FRAMEWORK

The aim of the presented below smart city roadmap framework is to put forward a new vision and strategies of creating and developing better digital lives. When we are designing a city what we really doing is to design a way of life, what kind of life will make us happier so the first thing before we do anything is to take some time to dream without restrictions what the ideal way of life in a city would be, what would be the ideal city would be it's about having smartness in every aspect of the city. The answer to these questions are it means a smart way of governing , it means smartness in the way

institutions are managed, it means smartness in the way big pieces of infrastructure are set up and designed and maintained and down to the smallest pieces of what seemed to be low tech innovations but are smart nonetheless. The focus should be more on aligning the strategic goals of government with that of the cities so as to make the city more economically competitive, developing the strategy in co-operation with the ICT companies and foreign collaboration. The implication of the study is to meet the challenges of tomorrow by focussing on the needs of people and building new services through human-centred design. In response to this trend, cities need to put greater focus on IT dexterity. Cities need ecosystems of applications that can, while still remaining simple and agile, be bolted together to tackle the most challenging problems, and can be easily scaled up where greater capacity is needed.

The crossroads of future Internet technologies and smart cities persistently appearing the shift to the cloud, smart city pilots, and city-wide open platforms of embedded systems. These areas are of primary importance for city policy makers all over the world that are deploying strategies for smart cities, e-infrastructure and e-services to address the contemporary challenges of competitiveness and sustainable development. Thus, the roadmap allows formulating some policy recommendations to city authorities for mastering the new interdisciplinary planning for intelligent / smart cities and the interlinked layers of digital technology, people-driven innovation ecosystems, urban activities and infrastructure.

DISCUSSION

From the present review, one can easily understand that smart city mission is been a very competitive process as some of the other states saying that their city also should have been there in the first 20 but it's absolutely clear right from the beginning that it has been a competitive process and the city challenge was very well evolved at the very outset. Besides it is the role of the city leader to push the city on the road to become smart. They must have bold vision and mission specifically around technology. What does technology mean for the city and what ways can it contribute towards quality of life and at that time you know did some research and it came up with this vision statement which was to build and enable a leading digital city.

One of the things with city governments that people have a perception of is that they don't take risk to go ahead invest in the infrastructure to make it smarter more connected city and then we're willing to make that investment and to allow people to experiment to run pilot programs and to really be innovative. There is really a need to do work like a start-up. The smart city solution remains an integrated database and decision making system that incorporates innovative ICT technologies to simultaneously generate, process and analyse spatial, transport, energy, municipal services and socio-economic data, the capability and resource base to enable holistic decision making and finally a governance system that encourages informed and prompt decisions.

Cities, of course, can get around the problem of creating smart city proposals by employing consultants-if they are willing to pay. Nevertheless, there will be many challenges beyond; even after cities get picked. It is the city leaders ability to interpret such data in all its complexity and holistic scope, special- purpose vehicles function will have to be formed to implement the smart city mission- the state and the urban local body , freedom of action must be given to them, to run situation for energy efficiency, cost efficiency and financial feasibility and use them all for efficient economy, safer and well performing spaces, effective governance and responsive mobility that would truly drive us to smarter cities.

REFERENCES

- Aijaz, Rumi, 'Social Marginalisation in Urban India and the Role of the State'. *ORF Issue Brief*. No.118, December 2015b. *Business Today*. 'Delhi is World's Most Polluted City: WHO Study', 8 May, 2014
- Batagan, L., (2011), Smart Cities and Sustainability Models, *Informatica Economica*.Vol.15,no.3/2011, ISSN 1453-1305,pp,80-87
- Gupta, R. (2014). The Pattern of Urban Land-use Changes A Case Study of the Indian Cities. *SAGE Journals*, 5(1), 83–104.
- Hoon Lee, J. (2012). *Toward a framework for Smart Cities: A Comparison of Seoul, San Francisco & Amsterdam*. Seoul: Yonsei University in Seoul.
- McKinsey Global Institute. (2010). *India's urban awakening: Building inclusive cities, sustaining economic growth* (p. 232). India: McKinsey & Company. Retrieved from http://www.mckinsey.com/insights/urbanization/urban_awakening_in_india
- MIT Press. (n.d.). *Why Cities Exist*. Retrieved from http://mitpress.mit.edu/sites/default/files/titles/content/9780262016360_sch_0001.pdf
- Ministry of Urban Development (MoUD). E-Book. Available from: <http://moud.gov.in/sites/MoUDEBook/moudEBook.html#p=1>, May 2016.
- Peace Research Institute Oslo (PRIO) and Observer Research Foundation (ORF). *Emerging Challenges in an Urbanising India*. Project Report, 2016.
- The Economic Times of India. (2014) Intel looking to partner in India's Smart Cities initiative: Debjani Ghosh, VP & MD, Intel South Asia. *The Economic Times of India*. 4 December
- The Indian Express*. 'Quality of Life: Which is the best Indian City to Live in', 3 July 2016a.
- The Wire*. 'Ahmedabad is no city for the poor, says study', 12 June 2015
- https://www.niua.org/sites/all/files/consultationworkshop/Nasscom_TechnologyArchitectureFramework.pdf
- [http://smartcities.gov.in/upload/uploadfiles/files/SmartCityGuidelines\(1\).pdf](http://smartcities.gov.in/upload/uploadfiles/files/SmartCityGuidelines(1).pdf)
- https://www.niua.org/sites/all/files/consultationworkshop/Nasscom_TechnologyArchitectureFramework.pdf

1346 PLANNING PARADIGM SHIFT FOR URBAN SYSTEMS IN OUR NEAR FUTURE

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ABSTRACT

Our society is forwarding to new drastic different technology driven society that shows us modern time was calm plateau. Passions and desires of human beings drove to be realized both in reality in physical/ spatial reality into their cities and in virtual reality (VR) & augmented reality (AR), VR&AR hereafter *multilarity*, into their cultures and sciences which ancestors imagined and thought of their passions and desires in their time as same as present human beings do.

This paper aims to discuss and to draw following ideological 2 issues of planning paradigm Shift for urban systems in our near future which covers both reality in space and *multilarity* in our urban phenomenon including new urban dynamics under rapid industrial transformation pressure.

Smart City, autonomous urban systems, will be lead our cities fully equipped by intelligence explosions and emergence of super-intelligence revolutions based on big-data analysis, specified A.I. systems with deep learning, quantum computing, IoT/ IoE, Industry4.0 which is so called “Technological Singularity” in 2045, that revolution changes our cities, urban, suburban and rural drastically like disappearing car parking lots, industrial transformations, full autonomous factories without labours, urban vegetable factory & smart agriculture in rural area, autonomous fleet logistics and warehouses and drone delivery systems. At the same time, new urban planning systems raises new type of “New Technology for planning” and “New Technology of Planning”. Former one is fully 3D digitalized city database and simulators in a cyber space like “Virtual Singapore” developed by Dassault Systems, if real estate developer submits Singapore government 3D CAD development plan data for entire buildings complex, those data will be put into “Virtual Singapore” and simulated analyzing many situations like Thurman-wind phenomenon changes will be tested in the systems. Latter one is ontology planning systems with multiple city sensors’ aggregation sets which will be fundamental of Smart Society.

Secondly issue is explosion of economic growth both without employment and without labors under Industry4.0 and smart agriculture makes drastic changes our life styles in our future society. Explosion of economic growth will be achieved by A.I. production/ service tax will be replaced instead of labor’s income tax. But at the same time, many of labors will be fired that shifts our life styles from labor to gaming. Engaged economy is constructed with shared economy and basic incomes from explosion of economic growth. Instead of annual average of hired working hours will be reduced, playing time in the game becomes longer rather than another pastime like watching TV. Playing electric games and watching games together became formal games as same as Olympic games right now in 2017. The eSports becomes large new industry around the world and attracts new generations’ important life events. Our sound future will be achieved gaming society for keeping sustainable governance both in private sectors and public sectors.

Key words: virtual reality, augmented reality, multilarity, smartcity

1 INTRODUCTION

It is common terminology for “*Technological Singularity*³¹³ (2045)” by Raymond Kurzweil but expanded terminology “*multilarity*³¹⁴” by Prof. Tom M. Mitchell are shown ICT magazines and news sites recently.

This paper aims to explore discussing about and also drawing following ideological two issues of planning paradigm shift for urban systems in our near future which covers both reality in space and *multilarity* in our urban phenomenon including new urban dynamics under rapid industrial transformation pressure in near future time-span.

2 HISTORICAL BACKGROUND FOR URBAN DYNAMICS

This chapter reviews history of Paradigm shift with Industrial Revolutions which made drastic impacts toward urban systems changes which is so called urban dynamics.

It is very common city structure in Figure1 that there are three conceptual spaces where are located core (urban), ring (suburban) and rural in the city or urban region likewise a greater-city-region after Industrial Revolution since 1830s, nowadays so called 1st Industrial Revolution in Table1. According to rapid expansion of economic growth by factories

313 Raymond Kurzweil, Google’s Director of Engineering, is a well-known futurist who predicts that during the 2030s some tech will be invented that can go inside your brain and help your memory. He says it will be a future of unparalleled human-machine synthesis and claims (technological) singularity will happen by 2045 which is when humans will multiply our effective intelligence a billion-fold, by merging with the intelligence we have created.”

<http://www.kurzweilai.net/>

314 Prof. Tom M. Mitchell founded and chairs the Machine Learning Department at Carnegie Mellon University. Stephen. Ibaraki Microsoft MVP uploaded his interview to Microsoft-TechNet where showed that Prof. Mitchell said “...I take this singularity hypothesis as something like there will come a time when computers are more intelligent than people and what’s going to happen then?...The whole idea that there is a single question to ask (are they smarter than us or dumber than us?) is I think misguided and we should replace the singularity notion by multilarity and just say it’s not an all or nothing or one or zero kind of question. There’s a whole vector of different competences...I don’t think computers will get stupider over time and I don’t think people will either, but I do think that computers will get better than us at more of those things and I think that’s the more interesting way to think of it. I think it’s a disservice to the discussion to pretend that there is a single notion of computers being more intelligent than we are...”
<https://blogs.technet.microsoft.com/cdnitmanagers/2014/03/10/chat-with-tom-mitchell-global-top-scientist-shares-deep-insights-on-machine-learning-the-brain-and-policy/>

operated mass productions using fossil fuels, coals attracted many migrants from rural and other regions and foreign countries as factory or mining labors in Table 2.

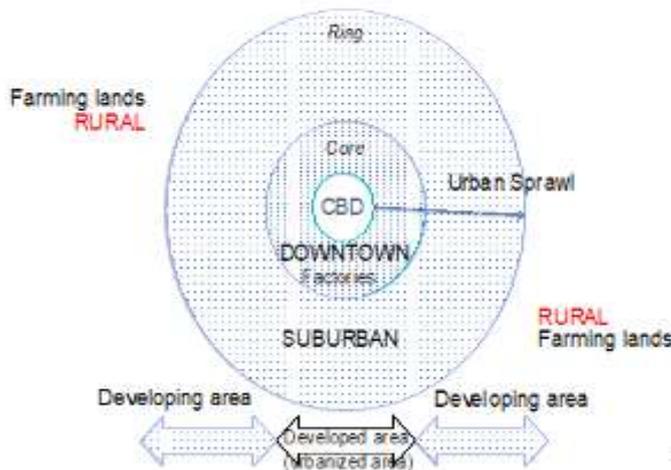


Figure 98: Basic city structure

Table 1: Industrial Revolutions and Key Technology

	1 st IR	2 nd IR	3 rd IR	4 th IR
General Purpose Technology(Key Technology)	Steam engines	Internal combustion engines & Electric motors, Battery	ICT, PC, Internet & Digital communication	AI (gAI) Big Data IoT Global Brain Architecture
Hegemony Nation State	UK	USA	USA	USA, Germany, China, India, Korea, Japan
Period	1770 - 1830	1860 - 1914	1995 -	2030-2045

Source : T. Inoue Bunshu Bunko JPN 2016

Table 2: History of Paradigm shift

		Great Tipping point			2 nd Great Tipping point		
			Mechanical Economics (Capitalism)			Pure Machinised Economics (Tequium Economy + Shared economy)	
Collection hunting	Agriculture	manufacturing industry (Mass-production)	Service industry, ICT business		Gaming ara, SNS-Game, E-Sports		
	Slave times	Machine era, Labor times	Systems era		Digital era Specific AI era	general-purpose integrated AI era	
BC10000		AD1770	1865		1995	linguistic walls	2030
	Settlements revolution	First industrial revolution (Steam engines)	Second industrial revolution (Internal combustion engines & Electric motors)		Third industrial revolution (PC & Internet)		Fourth industrial revolution (gAI, IoT, loE, Global brain architecture)

Source : T. Inoue Bunshu Bunko JPN 2016

Since the city as a shelter had surrounded walls long time ago, the same urban planning was existed. It is not so old established current urban planning in these 2 -3 centuries which are driven by new technology and engineering introduced that is so called “Modern urban planning” was established according to the progress of the industrial revolutions. Basically, urban planning since modern days started after the (first) industrial revolution which is space control systems only intended for (urban) economic development. At the beginning of urban planning did not have functions to protect urban residents from poisons and environmental pollution, or to protect urban dwellers from natural disasters.

The worst situation of the urban planning in London during the (first) Industrial Revolution. Urban planning is deviated towards the development of a social infrastructure, such as development of ports and transportation networks to decline economic growth from shortage of infrastructures, and the system of the waste is also left to natural self-cleaning systems of the environmental carrying capacity of entire city and surrounding areas. Human has been implementing urban planning as a tool of economic development for a long time. Particularly, bringing the energy of fossil fuels to cities made a place of mass production of artificial factories which have production function of the artifacts as industrial in the space of the city agglomerated many populations of labors, workers from rural areas or foreign countries as geek immigrants. Those process of the agglomeration of dwellers/ inhabitants into the city core, many households have no window, the inner door had many room's doors to avoid taxes, and three to seven households live together in such worst environment in one house that caused health problems several times like bronchial disease and infectious disease.

After 1st industrial revolution, modern city planning starts for connecting both inner city, intra city and inter city transportation network peripheral cities, towns and villages.

At the beginning and early factory workers had no choice but to live inside of a city (core) like the current big cities such as cities in China and cities in India, with worst air & water polluted toxic urban environment and worse public health conditions. H. Azuma (1991) wrote that “the first authors admire, ironically, the industrial revolution made newly middle class who desired well and safe residential houses and settlements from current inner-city (core area/ urban) poor environment rather in a well condition Ebenezer Howard’s “Garden Cities of To-Morrow (1898)” developed bed towns linked by mechanical lines using fossil fuels. Although Howard wishes to build neighborhood lifestyle with one’s workplace is near one’s home, reality was different from the idea of a rural city due to the proximity of the original job place to the suburbs of the environment. It could be stated that this newly middle class was greatly welcomed as a Great Social Movement (Garden City Movement). Both Letchworth and Welwyn Garden City, prototypes of this bed town, are not only UK phenomenon but also occurred combination of satellite town development around the world. A newly-emergent class of citizens which is so called the bourgeoisie in the society at that time pushed new social movements Ebenezer Howard’s “Garden Cities of To-Morrow (1898)” as intensity of new-town/ satellite-town/ bed-town development outside of the city core with mass-transit. Those new middle class becomes white-color has been driven suburbanization habitants of the 2nd IR in Table 1.

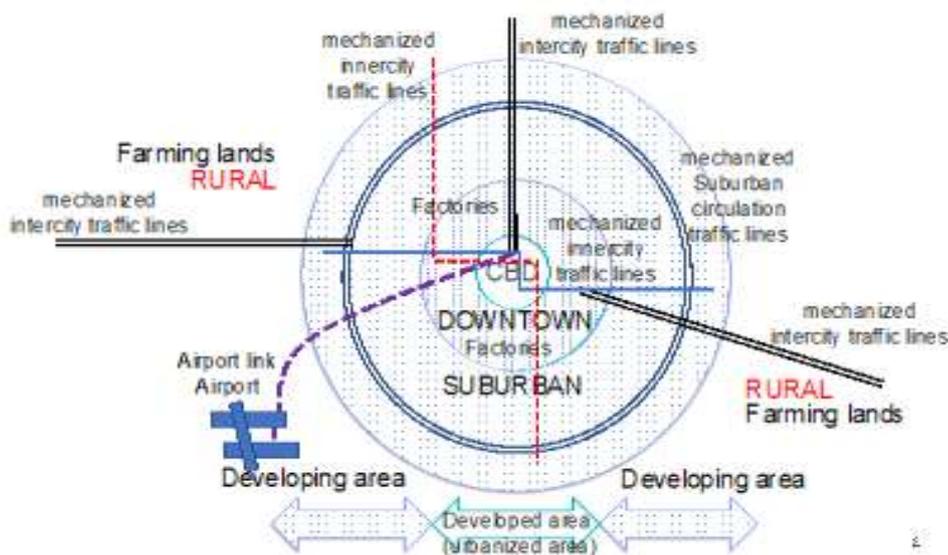


Figure 2: Typical city structure after 2nd stage of Spatial Cycles

In the 2nd “decentralization and growth” stage in Figure 3. It has already shifted major economic growth driving force in megacities around the world from secondary sector to tertiary sector of industry. Such kinds of megacities have almost same structure of Figure 2 where have ring and star connected/network transportations in both core (urban area) and ring (suburban area).

3 URBAN TRANSFORMATION MODEL BASED ON SPATIAL CYCLES MODEL

This chapter reviews theory of “Spatial Cycles (SC)” or “Spatial Cycles Model/ SCM)” by Leonardus Hendrik Klaassen, Nederlands Economisch Instituut, et al. in Figure 3. It is very common structure that there are three conceptual spaces where are located core (urban), ring (suburban) and rural in the city or urban region likewise a greater-city-region after Industrial Revolution since 18 century, nowadays so called 1st Industrial Revolution.

M. G. Docampo (2014) wrote that “The standard model of urban cycles implies an indefinite sequence of growth and decrease between the core and the ring. The basic, more general, and widely disseminated presentation is based on four phases or moments of growth: 1/urbanization, the process of population concentration in cities, also generating suburban rings to the detriment of rural territories; 2/deconcentration (exurbanization) when the urban ring grows at the expense of the urban core; 3/deurbanization or counterurbanization, when both the urban core and its ring lose population; 4/reurbanization, when the core changes again to a positive balance, while the ring loses population.”.

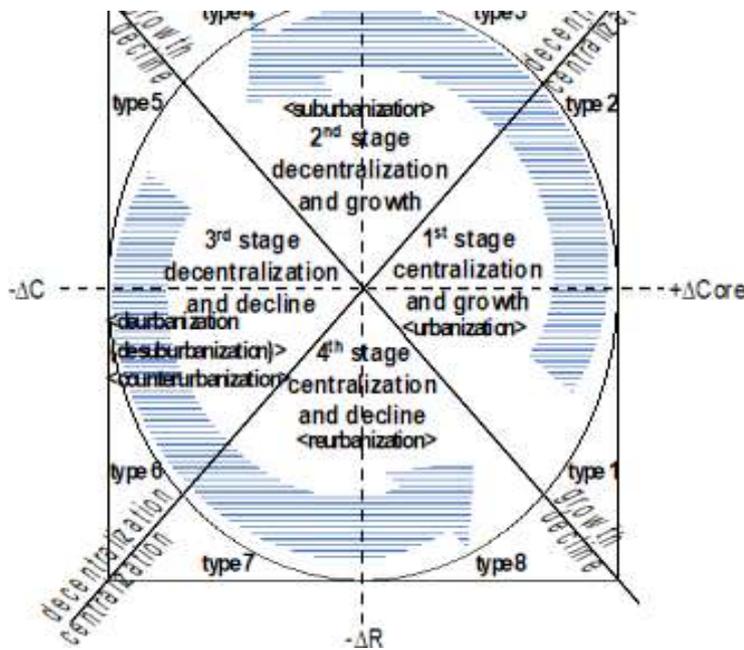


Figure 3: 4 stages & 8 types in Spatial Cycles Model

By the way, Smart City, autonomous urban systems, will be lead our cities fully equipped by intelligence explosions and emergence of super-intelligence revolutions based on big-data analysis, specified A.I. systems with deep learning, quantum computing, IoT/ IoE, Industry4.0 which is so called “Technological Singularity” in 2045.

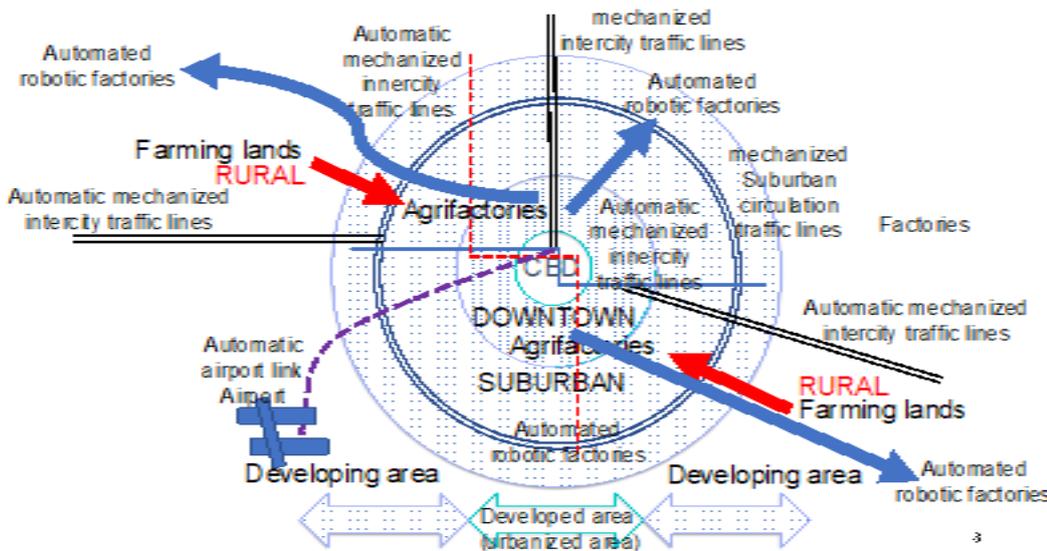


Figure 4: New Urban Transformation near future

Such a new 4th revolution changes our cities, urban, suburban and rural drastically in Figure 4 like disappearing car parking lots, industrial transformations, full autonomous factories without labours, urban vegetable factory & smart agriculture in rural area, autonomous fleet logistics and warehouses and drone delivery systems that are shown Figure 5.

Is Reforming Urban region renewal near future in Figure 5 next 1st stage in SCM? As long as deeply consideration, it seems that compact city, urban renewal, gentrification or gated city are almost the “counterurbanization” in the current stage, but at the same time location free industrial transformation led by new-techs with A.I. and automatic revolution makes our human being free from labor with some redistribution of wealth ways like “basic income” with “shared economy”.

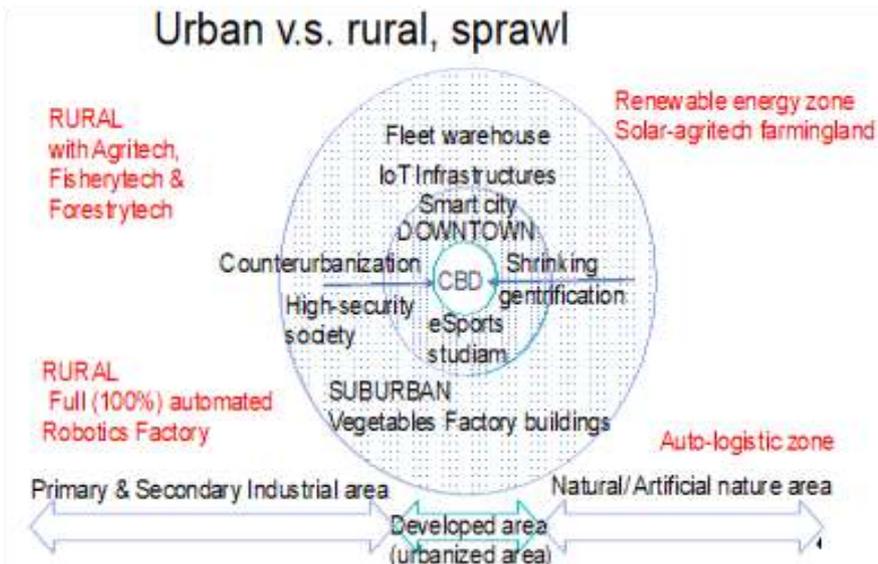


Figure 5: Reforming Urban region renewal near future

Inoue (2016) defined such an advanced automated robotic and A.I. economy as “*Pure Mechanized Economy*”.

At the same time, new urban planning systems raises new type of “New Technology for planning” and “New Technology of Planning”. Former one is fully 3D digitalized city database and simulators in a cyber space like “Virtual Singapore” developed by Dassault Systems, if real estate developer submits Singapore government 3D CAD development plan data for entire buildings complex, those data will be put into “Virtual Singapore” and simulated analyzing many situations like Thurman-wind phenomenon changes will be tested in the systems. Latter one is ontology planning systems with multiple city sensors’ aggregation sets which will be fundamental of Smart Society.



Figure 6: The proposal process and requirement priorities of THSR

4 URBAN TRANSFORMATION MODEL BASED ON SPATIAL CYCLES MODEL

This chapter treated second issue that is explosion of economic growth both without employment and without labors under Industry4.0 and smart agriculture makes drastic changes our life styles in our future society. Explosion of economic growth will be achieved by A.I. production/ service tax will be replaced instead of labor’s income tax. But at the same time, many of labors will be fired that shifts our life styles from labor to gaming. Shared/ engaged economy is constructed with shared economy and basic incomes from explosion of economic growth. Instead of annual average of hired working hours will be reduced, playing time in the game becomes longer rather than another pastime like watching TV. Playing electric games and watching games together became formal games as same as Olympic games right now in 2017. The eSports becomes large new industry around the world and attracts new generations’ important life events. Our sound future will be achieved gaming society for keeping sustainable governance both in private sectors and public sectors.

It is just a sample, Table 3 shows resent prediction of SONY corporation which tells us prior business of SONY was *Financial Services* in FY2017 but in 2018 forecasting would be expected shifting main business pillar of SONY from *Financial Services* to *Game & Networks Services*.

Table 3: statement of accounts and forecasts of SONY 2018

FY2018 Results Forecast by Segment (Reclassified)

		FY16	FY17	FY18 Forecast	Change from FY17
Game & Network Revenue (GNR)	Sales	1,848.6	1,992.8	1,988	-04.8
	Operating income	336.5	372.6	390	+17.5
Music	Sales	247.7	238.5	238	-08.5
	Operating income	75.8	127.8	132	+52.8
Publishing	Sales	803.1	1,011.1	983	-28.1
	Operating income	82.8	21.7	42	+20.9
Home Entertainment & Services (HES)	Sales	1,258.7	1,322.7	1,355	+32.7
	Operating income	55.5	68.4	81	+12.8
Imaging Products & Tools (IPT)	Sales	272.5	252.9	263	+10.1
	Operating income	47.3	34.9	25	-9.1
Media Communications (MC)	Sales	338.1	323.7	347	+23.7
	Operating income	15.2	-27.8	18	+45.6
Home Appliances	Sales	375.1	358.5	370	+11.5
	Operating income	-7.5	166.5	160	+93.0
Financial Services	Sales	1,537.5	1,228.4	1,273	+44.9
	Operating income	266.5	118.9	112	-6.9
All Other Corporate and elimination	Sales	-115.7	-87.6	-86	+1.6
	Operating income	-115.7	-87.6	-86	+1.6
Consolidated total	Sales	1,003.3	3,334.5	3,380	+45.5
	Operating income	286.7	734.9	873	+138.1

The fiscal year forecasts for each segment are shown on this slide. I will now turn to the situation in each of our businesses.

Source: SONY corporation; FY2017 Consolidated Financial Results

Recent Japanese younger generation under 18 years plays e-games more than 2 hours per day constantly. Adults also mainly playing smartphone play e-games close to 1 hour/day. It becomes major e-games into eSports universities league, new industry and new pastime arise. Some city has plans to build some eSports stadium in a city.

5 CONCLUDING REMARKS

It was shown that priorities of requirements are potentially changed depending on three types of evaluation axis: time-scale, decision makers, and dynamic factors under long-term paradigm shift makes our 4th industrial revolution. It has a big chance to confirm and test of next Spatial Cycles could be launched or not using ROXI index fitting Klaassen's SCM which the author has not been finished yet. However, new technology makes different types of urban transformation with fully automated robotic factories in the rural area without environmental heavy loading with proper fitting location likewise data center in high latitudes.

REFERENCES

Cristoforo S. Bertuglia, Manfred M. Fischer, Giorgio Preto Eds., "Technological Change, Economic Development and Space", 1995, Springer

Jane MacGonigal, "Reality is Broaken Why Games Make Us Better and How They Can Change the World", 2011, Penguin Books

Kostas Rontos, Christos Mavroudis, Luca Salvati, "Suburbanisation and Urban Growth: Revisiting the Life Cycle Hypothesis", 2012, URL: http://www.grupposervizioambiente.it/aisre/pendrive2012/pendrive/Paper/Salvati_suburbanization_athens_ERSA.pdf [accessed on 30/04/2018]

L.H. Klaassen, J.A.Bourdrez and J.Volmuller, "Transport and Reurbanization", 1981, Gower Publishing Company Limited.

L H Klaassen, J H P Paelinck, "The Future of Large Towns", 1979, Environment and Planning A: Economy and Space, SAGE

Leo Van Den Berg, Leland S. Burns, Leo H. Klaassen, "Spatial Cycles", 1987, Studies in Spatial Analysis, Gower Pub Co

Manuel García Docampo, "Theories of Urban Dynamics", 2014, International Journal of Population Research Volume 2014, URL: <https://www.hindawi.com/journals/ijpr/2014/494871/> [accessed on 30/04/2018]

Patrick Rérat, "The New Demographic Growth of Cities: The Case of Reurbanization in Switzerland", 2011, Journal of Urban Studies

Richard D. Duke, "Gaming: The Future's Language", 1975; 2014 reprint, Wbv Media GmbH

Sony Corporation, "FY2017 Consolidated Financial Results (Fiscal year ended March 31, 2018)", 27 April 2018, URL: https://www.sony.net/SonyInfo/IR/library/presen/er/17q4_sonyspeech.pdf [accessed on 30/04/2018]

Susan S. Fainstein, Scott Campbell and others, "Readings in Planning Theory", 2003, Wiley-Blackwell

Tatsuhiko KAWASHIMA, Atsumi FUKATSU and Noriyuki HIRAOKA, "Re-urbanization of Population in the Tokyo Metropolitan Area: ROXY-index / Spatial-cycle Analysis for the Period 1947-2005", 2007, Gakushuin Economics Study Vol.44-1, Gakushuin University

Tomohiro Inoue, "The future of artificial intelligence and economy", 2016, Bunshubunko in Japanese

1358 RECLAIMING THE LOST IDENTITY: A METHODOLOGY FOR GENERATING SMART URBAN DESIGN SOLUTIONS IN TRADITIONAL CITIES - CASE OF VARANASI**Vidhu Pandey^{1*}, Joy Sen²**

1Research Scholar, Indian Institute of Technology, Kharagpur, India

2 Professor, Indian Institute of Technology, Kharagpur, India

*E-Mail: ar.vidhupandey@gmail.com, TP: +919775837630**ABSTRACT**

Indian traditional cities can be considered as a vibrant microcosm which have evolved gradually over time, amalgamating culture and modernity. However, when we put them in the course of rapid urbanisation then the situation gets drastically modified. These cities are comparatively more sensitive to the issues of urbanization from their modern counterparts because they are simultaneously trying to balance an age old traditional heritage with dynamic needs of a modern civilization. Rapid urbanization takes a toll on the existing urban conditions and start affecting the physical spaces, tending to haphazard urban development. One of the major shortcomings of the phenomenon, as observed is a gradual degradation of urban form, which existed earlier by the virtue of urban patterns of traditional societies. Generally, mitigation of this urban issue is done through charting policies which somehow capitulate in the execution phase. This can be attributed to a lack of integration among indigenous spatial and cultural inputs along with technology in design and renewal procedures. Robust urban design strategies with an innovative approach which bridges the gap between traditional heritage and modern living might be the answer to this issue. This research attempts to find the solution of aforementioned problem through case study based approach. The case study taken here is Varanasi which is revered as one of the holiest among Indian cities and captures the spot of the oldest continuously living city in the world. It has also been nominated among the probable cities which would be converted to a 'Smart City' hence making it the perfect candidate for conducting this urban experiment. This research has been broadly divided into three parts. In the first part, research would examine the shortcomings of current spatial policies regarding urban design in traditional cities by critically reviewing the existing plans, strategies and guidelines. In the second part, the gap between the current scenario and the people's perception of the smart city scenario regarding smart urban design would be highlighted through primary survey and semi structured interview method. In the third part, the research would evolve smart place making based solutions which would provide an alternative to conventional urban regeneration and design policies. These place making based smart urban design policies would not only be able to bridge the gap between the current and perceived perception of city but would also be more sensitive in retaining the character of urban design of a traditional city. The methodology for evolving this research is based on the work of Christopher Alexander viz. 'A Pattern Language'. Network analysis is used as a preliminary analytical method allied with 'A Pattern Language' for validation purpose.

Key Words: Smart urban Design; Pattern Language; Network Analysis; Traditional Cities; Form based codes; Spatial Policies

1 INTRODUCTION

India is a land of diversity and has always held its legacy as a land of myriad cultural dimensions. This includes not only the amalgamated social-cultural scenario but also its tangible expression, the **physical spaces**. The Indian traditional cities have developed in an organic format with their own pace. They can be considered as the vibrant microcosm with each one having its own story of evolution. Physical spaces in India are diverse in their nature and have different interpretations for different facets of life for all concerned stakeholders. When we introduce factors of urbanisation and globalisation in this equation, then not only the urban patterns of these physical spaces start affecting the existing urban conditions but also start governing the course of future development.

A 2013 International Business Times' article writes about India as one of the major stakeholders of this population growth and is predicted to become the most populous country swapping its position with China by 2050 (Bansal, Pandey, & Sen, 2016). As stated in sustainable development goals', more than half of the world's population now live in urban areas. By 2050, that figure will have risen to 6.5 billion people – two-thirds of all humanity. Sustainable development cannot be achieved without significantly transforming the way we build and manage our urban spaces (UNDP, 2016). Not only does it leave the 'new Indian cities' in need to get in tune with latest tools and techniques so as to empower their arsenal with competent urban services but also it requires 'traditional cities' to come at par with their modern counterparts and become proficient in dealing with the urban issues of the new age.

1.1 Traditional cities and issues in Urban Regeneration

The traditional cities have deep-seated cultural values associated with them which render a unique aura to these regional composites. Here, the built environment is the most salient manifestation of heritage. History serves as the base upon which the city thrives, and the Historical Built Environment or HBE is the principal spatial element on which the interplay between time and space is played out. Although historic preservation has played an increasingly important role in shaping urban form yet demolition and removal of historic structures and the haphazard placement of new developments are all too common in the cities worldwide and Indian cities are no different (Chhabra, Healy, & Sills, 2003). Juxtaposition of new development with once historic environments can sometimes empty the latter of their deep and cultural significance (Newman, 2016). Here it is required that those in power of decision making and designing, like urban

planners and designers, must do a better job preserving and modifying existing built forms for new development schemes, rather than the typical Tabula Rasa approach.

One of the major shortcomings of the phenomenon, as observed in traditional cities of India is a gradual degradation of a natural form of a city, which existed earlier by the virtue of urban patterns which helped to distinguish one city from the other. **Generally, mitigation of this urban issue is done through charting urban policies which mostly overlook the indigenous needs and aspirations of the stakeholders on one hand and causes identity crisis by lacking the natural order of spaces on the other hand.** Urban regeneration for such cities generally fails in the execution phases as there is a lack of integrating indigenous spatial and cultural inputs along with technology in renewal procedures. Hence, this study proposes an exploration of urban regeneration strategies through historic pattern based place making approach. This involves, simultaneous consideration of indigenous spatial requirements and cultural responses that befits existing urban fabric. The study attempts to look into the case area through the lens of spaces as a concept and a physical entity since they have gone through a multitude of change in the past few decades and it's important to manage them in the magnitude they are present. This study draws its inspiration from the works of Christopher Alexander viz., A Pattern Language technique and is applied along with allied techniques for observing the various urban spaces against a larger continuum of the sustainable traditional urban environment.

1.2 Rationale of Planning and role of Government

The basic idea behind urban planning is to produce some kind of explicit rationality driven by collective purposes that are capable of regulating the multitude of individual decisions that build the city over time. How this rationality is constructed and what are the underlying criteria and analytical interpretations, remains one of the most critical questions in urban planning. In fact, in order to be effective, a plan should be informed by a stringent diagnosis of the reality it aims to conduct and regulate, and it must also be able to prognosticate, at least to a certain extent and with a reasonable degree of confidence, the expected outcomes of the proposed planning strategies. On both these stages of the planning process – diagnosis and prognosis - objective analytical methods and predictive models are the key. However, in what concerns the physical and morphological dimensions of urban planning, this kind of methods and models remain largely speculative, if not simply absent from the regular practice (Serra, Gil, & Pinho, 2011). Hence a series of not so successful urban endeavours by the development agencies and other concerned organizations leads to turmoil in the minds of citizens and in a way breeds to reluctance of acceptance for designed environments for areas in general and Indian urban scenario in particular.

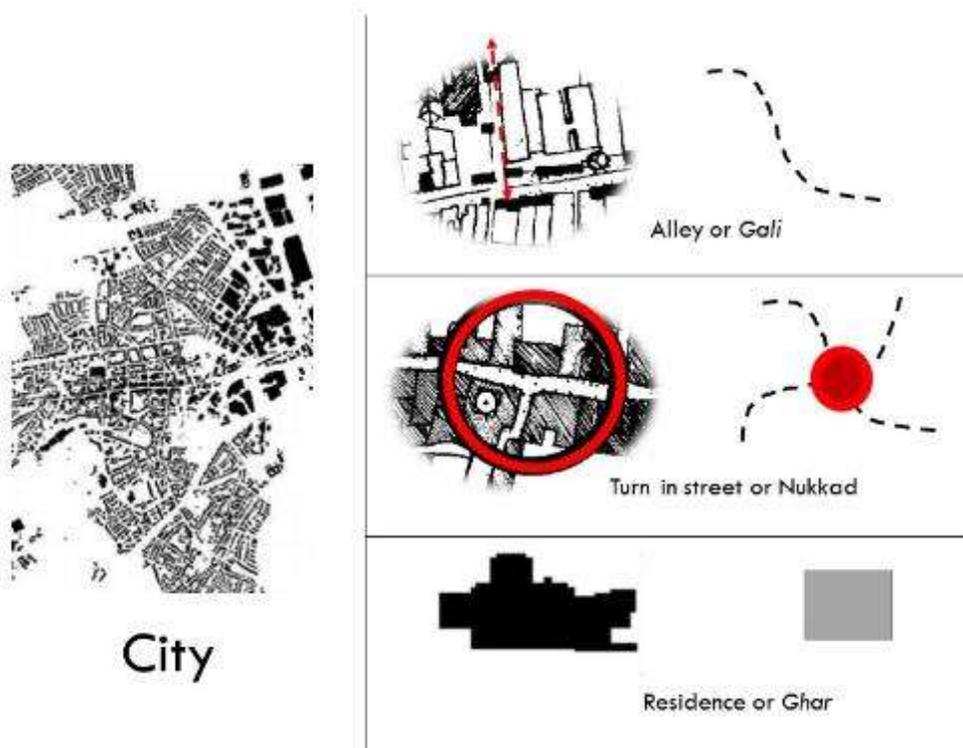


Figure 99: Illustration of city and its components

The consequential effect of the above discussed scenario leads to another observation as of now, that is, the 'design of urban environments' is still an issue of concern for citizens in Indian context especially the traditional cities. The inhabitants of these cities find comfort and a sense of belongingness with the organic layouts of Mohallas (residential colonies), Gali (narrow lanes) and Nukkads (small urban gathering areas formed on the junction/ crossing of streets or lanes) (Figure 1) with which they have started to associate their own identity and any idea to disturb this symbiosis is generally reckoned as an intrusion to the culture of indigenous habitants. Moreover, the general notion propagates 'Designed Environments' as a thing of elites and a domain which doesn't include the everyday man into the loop of the processes. This in turn can be attributed to the fact that the said schemes are never presented in a style or format which

is easily accepted or comprehended by the citizens. The living structure which is needed to sustain us and nurture us and which did exist to some degree in the traditional societies, rural communities and early urban settlements has disappeared. We don't know how to create it or generate it any more. This was not the case long ago, earlier with the help of the shared pattern languages which existed in traditional society, people were able to generate a complete living structure (Saligaros, 2005).

Thus, the need of the hour is to invoke the pre-requisites for a process which can take a holistic view of current urban scenarios and might lead to some plausible conclusion on the steps which could be taken for battling this issue at a grass root level. Hence, the motivation of the research lies in finding solutions to the aforementioned issues in context with the traditional cities in general and Indian traditional cities in particular.

2 GAP AREA IDENTIFICATION

Literature review started with the analysis key topic that is Urban Regeneration so as to examine the various terms involved and their implications on the desired research flow. It was then followed by investigating the urban renewal policies of India and what was plaguing them in the context of traditional cities.

2.1 Urban Regeneration

Regeneration in biological terms is the process of renewal, restoration, and growth that makes genomes, cells, organisms, and ecosystems resilient to natural fluctuations or events that cause disturbance or damage. The analogy can as well be true for a city which is considered as a living organism exhibiting each and every nuances of its life cycle. Oxford dictionary defines urban regeneration as the process of improving derelict or dilapidated districts of a city, typically through redevelopment. It is called as Urban Renewal (in United Kingdoms) Urban Revitalisation (in United States) and is a program of land redevelopment in areas of moderate to high density urban land use. Historically the concept of urban renewal as a method for social reform emerged in England as a reaction to the increasingly cramped and unsanitary conditions of the urban poor in the rapidly industrializing cities of the 19th century (Figure 2) (Worldbank, 2007).

Rapid urbanization scars the city's organic growth with its overwhelming demands of space and infrastructure. A city reeling under its pressure can succumb to its ill effects and lead to congested cores and sprawling suburbs which in turn add to the grievances of the citizens. It is a multifaceted phenomenon and can have various perspectives to look into, spatial and economic being one of them. Interventions on sub-city and neighbourhood level need to be applied so as to restore the city to its native stage. These restorative measures or redevelopment can be accounted to urban regeneration. Just like any process has its own appraisal and critique, similar is the process of Urban Regeneration: On one hand it has been termed as a way of becoming a growth engine, an efficient reform mechanism, and a way of enhancing existing communities whereas on the other hand it is beckoned as a tool of demolishing neighbourhoods and a means of control mechanism. There is always an inherent tension between **top-down technical and managerial** approaches to urban regeneration and **bottom-up or grassroots environment needs, expectations, and initiatives** (Worldbank, 2007).

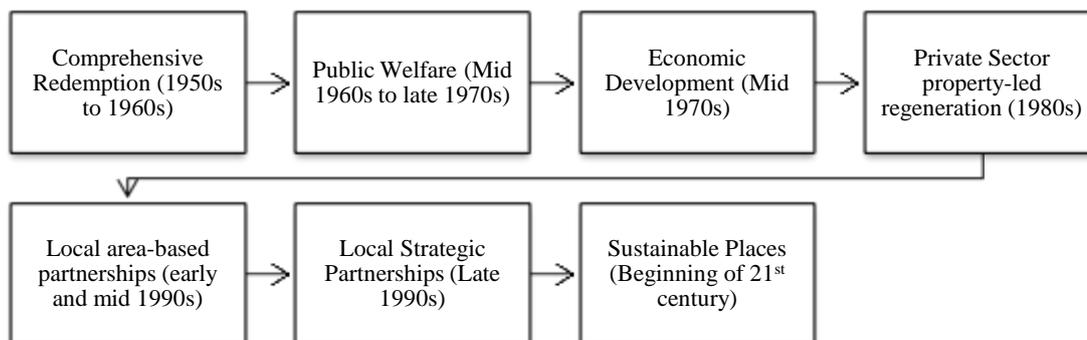


Figure 100: Evolution of Urban Regeneration (Worldbank, 2007)

One can distinguish in each historic city specific urban patterns or features such as the nature and density of land uses, height of buildings, width and pattern of circulation routes (roads, alleys, and footpaths), building typologies, as well as specific infrastructure components. These form the components of the 'Urban Tissue' (Steinberg, 1996). Hence, for area conservation and rehabilitation it is essential that the maximum possible preservation of the original tissue pattern should become the prime objective. Experts remain divided on this approach too. Some think it as being too specific to a place whereas others perceive it has a parts to whole solution.

2.2 India's Urban Renewal Policies

India's urban renewal initiatives are discussed as below:

JnNURM

JnNURM or Jawaharlal Nehru National Urban Renewal Mission, was one of the biggest initiative of the government of India for carrying out urban renewal process in the Indian Cities. The primary objective of this mission was to be: Productive, Efficient, Equitable and Responsive in it deliverance mechanism. The mission's focus areas were:

- Integrated development of infrastructure services

- Securing linkages between asset creation and maintenance for long run project sustainability
- Acceleration flow of investment into urban infrastructure services
- Planned development of cities including peri-urban areas, outgrowths and urban corridors
- Renewal and redevelopment of inner city areas
- Decentralization of urban services

The objectives, apart from the other areas, also included renewal and redevelopment of inner city areas which is of interest to this study. The subtasks of this policy have been illustrated in the next segment to get an overall view of the work intended to be performed under this scheme (Figure 3).



Figure 101: Subtasks of JnNURM (Ministry of Urban Development and Ministry of urban employment and poverty alleviation , GoI, 2011)

While investigating the appraisal reports for various JnNURM projects it was found that there existed many anomalies in the documents at the proposal level itself which led to the discrepancies at the execution level. Hence, leading to a lack of effectiveness of the scheme in many of the projects eventually.

HRIDAY

Heritage city Development and Augmentation Yojana or HRIDAY is an ongoing mission developed by Ministry of Urban Development, GoI. It is stated in the policy statement **that it would bring a paradigm shift in India's approach to city development, bringing together urban planning/ economic growth and heritage conservation in an inclusive and integrated manner** with focus on livelihoods, skills, cleanliness, security, accessibility and service delivery (Ministry of Urban Development , 2015).

The heritage development of city is often misinterpreted as revitalisation of few patches, instead it is a holistic development of the entire city. Past efforts of conserving historic and cultural resources in Indian cities and towns have often been carried out in isolation from the needs and aspirations of the local communities as well as the main urban development issues, such as local economy, urban planning, livelihoods, service delivery, and infrastructure provision in the areas (Ministry of Urban Development , 2015).

The main objective of HRIDAY is to preserve character of the soul of heritage city and facilitate inclusive heritage linked urban development by exploring various avenues including private sector.

The objectives of the scheme are:

1. Planning, development and implementation of heritage sensitive infrastructure.
2. Service delivery and infrastructure provisioning in historic city core areas.
3. Preserve and revitalize heritage wherein tourists can connect directly with city's unique character.
4. Develop and document a heritage asset inventory of cities – natural, cultural, living and built heritage as a basis for urban planning, growth and service provision & delivery.
5. Implementation and enhancement of basic services delivery with focus on sanitation services like public conveniences, toilets, water taps, street lights with use of latest technologies in improving tourist facilities/amenities.
6. Local capacity enhancement for inclusive heritage-based industry.
7. Create effective linkages between tourism and cultural facilities and also the conservation of natural and built heritage.
8. Urban heritage adaptive rehabilitation and maintenance, including appropriate technologies for historic buildings retrofitting.

9. Establish and manage effective public private partnership for adaptive urban rehabilitation.
10. Development and promotion of core tangible economic activities to enhance avenues of livelihoods amongst stakeholders. This would also include necessary skill development amongst them including making public spaces accessible and developing cultural spaces.
11. Making cities informative with use of modern ICT tools and making cities secure with modern surveillance and security apparatus like CCTV etc.
12. Increase accessibility i.e. physical access (roads as well as universal design) and intellectual access (i.e. digital heritage and GIS mapping of historical locations/ tourist maps and routes) (Ministry of Urban Development , 2015).

Projected outcomes of HRIDAY Scheme:

The followings are the specific outcomes envisaged under HRIDAY.

1. Clean and improved sanitized environment
2. Improved basic urban infrastructure at existing and emerging tourist destinations and gateways
3. Improved sanitation standards at natural and cultural tourist attractions with convenience and safety for visitors
4. Properly conserved, revitalized and beautified heritage monuments
5. Greater participation by local communities in tourism-related economic and livelihood activities
6. Heritage resources are mainstreamed with city systems and city economy
7. Improvement in the service level benchmarks indicators for urban service delivery
8. Increase in the inflow of the tourist to cities
9. Increase in the duration of stay of the tourist in the town
10. Improvement in social safety and reduction in crime
11. Substantial improvement in local economy and quality of life of its communities

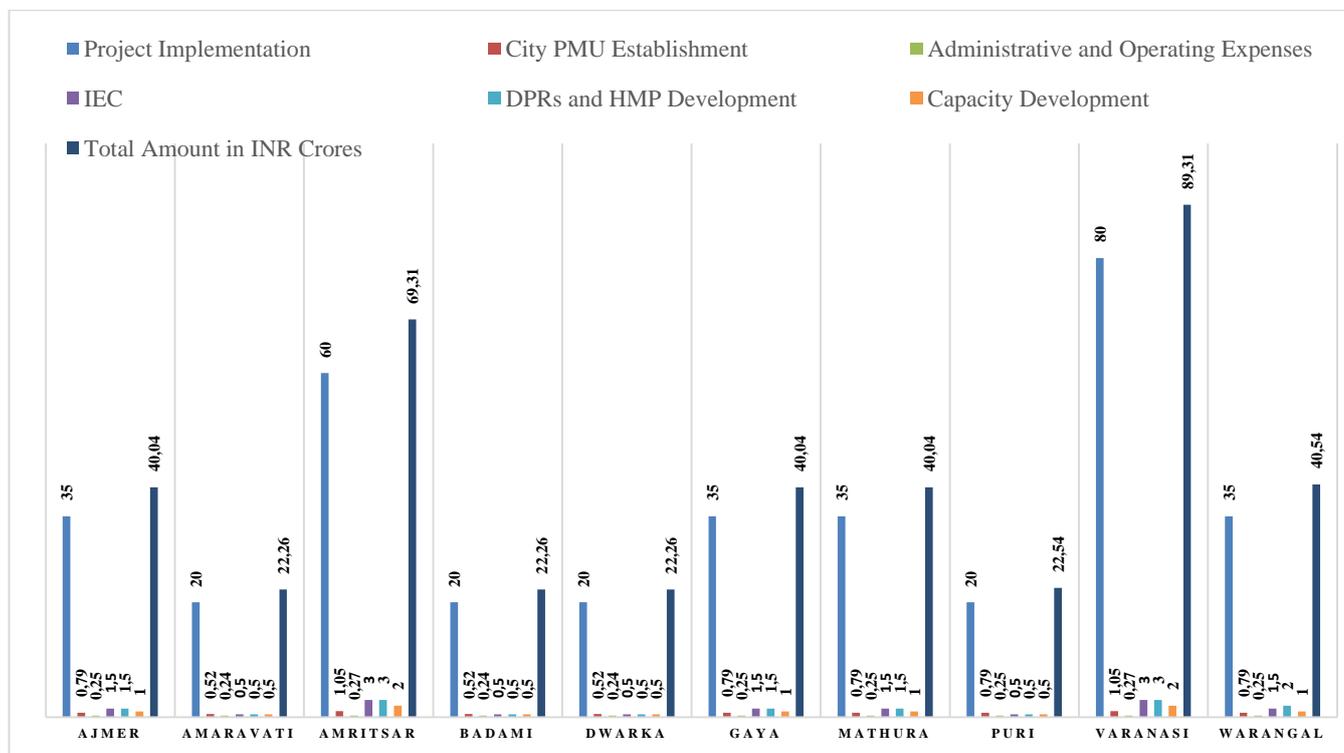


Figure 102: HRIDAY: Budget Outlay (Ministry of Urban Development, 2015)

Figure 4 illustrates the budget outlay of HRIDAY for various cities for the scheme tenure, that is from December 2014 to March 2018. The mission is ongoing hence the total objective achieved by the process yet remains to be evaluated.

AMRUT

Atal Mission for Rejuvenation and Urban Transformation or AMRUT has been launched as a primary mission to provide basic services (e.g. water supply, sewerage, urban transport) to households and build amenities in cities which will improve the quality of life for all, especially the less privileged sections of the society. The objectives of the mission have been grafted on the base of learnings from the previous mission which states that infrastructure creation should have a direct impact on the real needs of people, such as providing taps and toilet connections to all households. This means that the focus should be on infrastructure creation that has a direct link to provision of better services to people (Ministry of Urban Development, 2015).

The mission would be covering 500 cities in this domain for which a total outlay of Rs. 50,000 crores for five years from FY 2015-16 to FY 2019-20, has been allocated.

The Mission will focus on the following Thrust Areas:

- A. Water supply
- B. Sewerage facilities and septage management
- C. Storm water drains to reduce flooding
- D. Pedestrian, non-motorized and public transport facilities, parking spaces
- E. Enhancing amenity value of cities by creating and upgrading green spaces, parks and recreation centres, especially for children (Ministry of Urban Development, 2015)

Major Components of AMRUT:

1. Water Supply
2. Sewerage
3. Septage
4. Storm Water Drainage
5. Urban Transport
6. Development of Green Spaces and Parks
7. Reforms Management and Support
8. Capacity Building
9. Indicative list of inadmissible components

The mission is undergoing hence the total objective achieved by the process yet remains to be evaluated.

Inferences

After reviewing the major schemes which are contributing towards urban regeneration we can give a holistic review of JnNURM only as it has been completed and evaluated. These are as follows:

- 1) Lack of Focus on Cultural input based on historical built environment
- 2) Lack of Public Participation in development works

Though HRIDAY and AMRUT do consider some of the above mentioned ideas in their agenda but it is yet to be witnessed by the country. In aligned to the new policies we also have SMART city initiatives which include traditional cities as the future smart cities too. The purpose of the Smart Cities Mission is to drive economic growth and improve the quality of life of people by enabling local area development and harnessing technology, especially technology that leads to Smart outcomes. Area-based development will transform existing areas (retrofit and redevelop), including slums, into better planned ones, thereby improving liveability of the whole City. This needs to incorporate the above two points which came out as the drawbacks of JnNURM.

Moreover, policy makers in association with urban planners and designers must do a better job of **attaching and recycling existing built forms for new development schemes**, rather than the typical clean-slate approach. The appropriate **reuse of existing vacant heritage structures and the design characteristics of new developments should also play a vital role in future preservation**. The designation of landmarks and iconic heritage structures, salvaging of vernacular elements, inclusion of lost histories, **increased preservation of non-landmark historic structures and strategic applications of renovation and adaptive reuse** can all play a role in increasing the endurance of built environment.

2.3 Pattern Language Technique

Every urban setting is made up of many smaller components. It is this cumulative effect which can be interpreted in the form of language which is expressed as our built environment. The town planner Christopher Alexander invented design patterns in the 1970s. He addressed the challenge that many problems in planning were (and are) too large and complex for one person to consider them in their entirety at one time; and that it is hence necessary to break them down into sub-problems.

Pattern language when first conceived, was based on certain generative schemes that exist in traditional cultures. These generative schemes are sets of instructions which, carried out sequentially, will allow a person or a group of people to create a coherent artefact, beautifully and simply. The number of steps vary: there may be as few as half a dozen steps, or as many as 20 or 50. When the generative scheme is carried out, the results are always different, because the generative scheme always generates structure that starts with the existing context, and creates things which relate directly and specifically to that context (Alexander, *The Origins of Pattern Theory: The Future of the Theory, and the Generation of a Living World*, 1999).

Christopher Alexander in his work 'A Pattern Language' describes design practices which can be used to design spaces at various levels which are aesthetically feasible and functionally viable. This work tries to break down the language of built environment into its components to form a vocabulary of pattern syntax which can be interpreted for various urban levels. This particular research intends to view the direction of research through the lens of Pattern syntax and which can be defined for Indian context (figure 5).



Figure 103: Examples of Pattern syntax from 'A Pattern Language' (Alexander, Silverstein, & Ishikawa, A Pattern Language, 1977)

2.4 Planning support systems (PSS)

In research areas pertaining to urban planning, the decision support systems can be redefined as Planning Support Systems (PSS). It is a new member of a family of computer aid for planners and is closely related to the fields of Large Scale Urban Models and Spatial Decision Support Systems (Brömmelstroet, 2013).

Planning support systems are a subset of computer-based geo-information instruments, each of which incorporates a unique suite of components that planners can utilise to explore and manage their particular activities. The components may include data sets, computer algorithms and display facilities, as well as more abstract theoretical constructs, knowledge and modelling capabilities (Geertman & Stillwell, 2003). A PSS not only act as reservoirs of planning information but can also be used as solution providers for the urban planning problems of modern times

This particular study delves into the domain of area based solutions using smart urban design as an enabler. Although the research is still in the conceptual stage and doing various iterations in finding the right idea, the author would like to put forward the current flow of activities which can be performed to achieve the desired goal. The idea proposes a smart Planning support system which would aid planners and designers to automate their place based urban design solutions and would give them iterations so that the best possible solution can be incorporated for the execution. In the next section author would detail out the methodology to approach such design flow.

3 METHODOLOGY

The urban regeneration scenario in India is based on conventional schemes and strategies which mostly focus on providing or augmenting hard-core infrastructure and generally lack the element of cultural sensitivity while providing the solutions. This research proposes to evolve an integrated system of Place making strategies based on Pattern Language and other allied analysis techniques based integrated system which would provide an alternative to conventional urban regeneration strategies. This study proposes a methodology for identifying appropriate urban patterns from different parts of city areas, best suited for classifying and retaining the character of a city. These patterns should be socially and culturally viable and also economically feasible representatives, eligible to be reiterated during formation of new urban spaces grafted on a historic urban landscape.

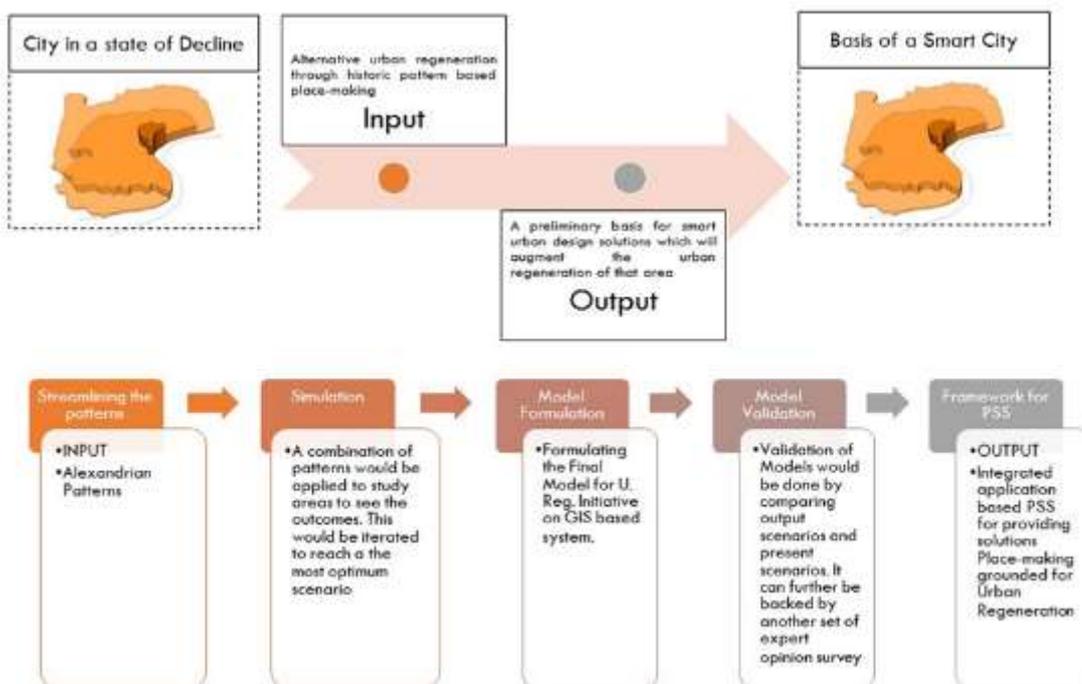


Figure 6: Methodology-Task flow

Organic nature of Indian cities gives them an inherent complexity which needs to be thoroughly analysed before proposing any reform mechanism. The study intends to conclude into a framework of place-making based Planning Support System which could assist the concerned stakeholders (Authorities, Planners, Designers and Users) while making decisions regarding the urban configurations whether it be in core city layers or the outer layers.

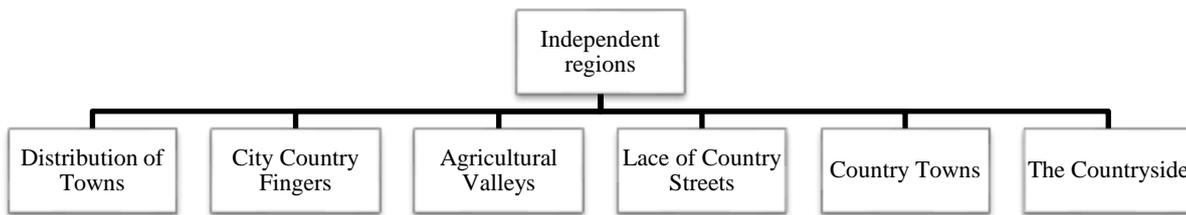
This is an ongoing research and the work which is included in this paper would focus on the very first step that is streamlining and appropriating patterns as per the context of the city.

3.1 Approach for Pattern Mining

The process for pattern mining starts by doing reconnaissance survey of the spots in the city which might have patterns (tangible and intangible) embedded into the urban fabric. The location of the spots is derived by doing extensive literature review of secondary sources and by doing semi structured interviews of the stakeholders which are linked with those spots. In this way author proposes to construct a repository of Patterns.

A Pattern Language has 253 patterns (Alexander, Silverstein, & Ishikawa, A Pattern Language, 1977) illustrated which are broadly divided into three categories, Town Planning, Architectural and Construction Patterns hence forming a hierarchy of patterns. For example, the starting pattern in the book is Independent Regions which is one of the Macro patterns, this is followed by six connected patterns and which again have their own smaller parts. These groups are not mutually exclusive and has many overlapping connections. It is then followed by examples of patterns at various scales which exist in the Alexandrian pattern language.

Case of **Independent Regions**:



Here, if P_N is a macro design pattern then the language which forms this element would be a group of patterns which would be below in the hierarchy to the pattern P_N. Moreover, the patterns are interconnected among themselves (Figure 7).

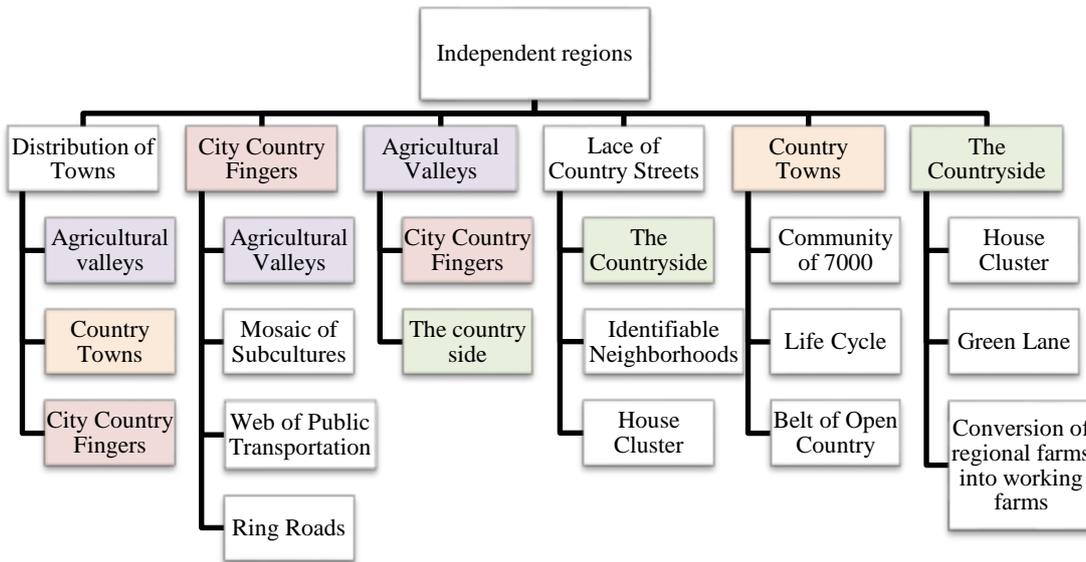


Figure 104: Interconnection among the Sub-Patterns

Eg. P_N = P_{I Reg}

$$L(P_{I Reg}) = f(P_{DT}, P_{CCF}, P_{AV}, P_{LCS}, P_{CT}, P_{CS})$$

Where,

- P_{I Reg} = Independent regions
- P_{DT} = Distribution of Towns
- P_{CCF} = City Country Fingers
- P_{AV} = Agricultural Valleys

- P_{LCS} = Lace of Country Streets
- P_{CT} = Country Towns

For current study author has opted for case study based research and the next section will show excerpt from the semi structures interviews in identifying the possible urban spaces for extracting these patterns.

3.2 Piloting a stretch (field survey)

A pilot survey was conducted in the Panchganga Ghat Zone for the assessing the probability of identifying urban patterns. Reconnaissance survey was conducted along with semi structured interviews for collecting the data of this study. One of the major query was to understand about the public places of that region and how are the people associated with those areas are interacting with them. Details of 21 respondents with one significant question is given below:

Table 31: Excerpts from Interview from Panchganga Ghat Zone

S. No.	Name	Place of Residence	What are the most popular urban places near your residence and workplace?
1.	Renu Aggrawal	Gopal Mandir Compound	Thatheri Bazaar, Vishwanath Gali, Chowk
2.	Rashmi	Govind Ji nayak Lane	Gopal Mandir, Vallabhacharya Temple
3.	Krishna Kumar Rastogi	Barah Dari, Thatheri Bazaar	Panchganga ghat
4.	Mohan Laal Yadav	Panchganga Ghat	Alamgiri Mosque, 5 rivers meeting point (Panchganga), Baba Tailang Swami Math
5.	Raj kumar Sahni	Rajghat	Kaal Bhairav Mandir, Bindu Madhav Mandir, Alamgiri Mosque, Sherwali Kothi, Gopal Mandir
6.	Gaurav Yadav (Information Similar to Rajkumar Sahni)	Bibi Hatia	Kaal Bhairav Mandir, Bindu Madhav Mandir, Alamgiri Mosque, Sherwali Kothi, Gopal Mandir
7.	N. K. Gujrati (Information Similar to Rajkumar Sahni)	Nati Imli	Kaal Bhairav Mandir, Bindu Madhav Mandir, Alamgiri Mosque, Sherwali Kothi, Gopal Mandir
8.	Mohan Laal Yadav	Panchganga Ghat	Panchganga Ghat (Confluence of 5 rivers), Tailang Swami, Alam Giri Mosque, Maths
9.	Raj Kumar Srivastava	Gaumath chowk	Kashi Viswanath, Sankatha Temple, Bindu Vinayaka Mandir, Kashmiri Mahal Haveli (now in Ruins), Kath ki Haveli near Chaukhamba
10.	Naomi Tripathi	Assi Ghat	Gopal Mandir, Tulsidas ji ki Gufa, Bindu Madhav, Panchganga Ghat, Bhonsale Kothi
11.	Nanda LaL Tripathi	Chunar	Gopal Mandir, Kall Bhairav, Kashi Vishwanath, Annapurna Mandir, Sankatha Temple, Panchganga Ghat
12.	Sachiv Kumar Shah	SherWali Kothi (Lion Mansion)	Gopal Mandir, moti jheel Palace, Raman Nivas
13.	Pappu	Nakki Ghat/ Earlier from Teliya Bagh	Kangan Haveli
14.	Arun Pandey	Doodh Vinayak Area/ Originally from Lucknow	Mangla Gauri Mandir, Brahmcharini Mandir, Tailang Swami Mandir, Gokarna Math
15.	Makrand Maheshkar	Brahma Ghat	Bindu Madhav Mandir (Vishnu Kashi). It was established by Aundh state of Maharashtra. Tailang Swami, Sant Eknath Maharaj staying Place (Kutiya), Kangan Haveli, Dakshinmukhi Hanuman
16.	Saloni Tewari	Rajendra Pratap Mitra's (from Bengal) Palace/ Original Family lives in Luxa	Bhairav Nath, Vishwanath, Sankatha mata mandir, Mangla Gauri Mata Mandir, Bindu Madhav Mandir, Panchganga Ghat
17.	Priest of Kangan Haveli (Family of 50 +32)	Kangan Haveli	Mangla Gauri Mandir, Brahmcharini Mandir, Tailang Swami Mandir, Gokarna Math
18.	Mukun Lal and Sushil Kumar	Thatheri Bazaar	Siddhivinayak Temple, Thatheri Baazar, Madhav Rao's Dharara (Now Alamgiri Mosque)
19.	Dayashankar	Panchganga Zone	Sankatha Mandir, Siddheshwari Gali, Lakkhi Chautara
20.	Vishnu Singh	Panchganga Zone	Shops of Thandai (Local Delicacy) Pathak Thandai and Banke Thnadai, Chaukhamba Sweet Shop, Maa Kali's Statue, Tailang Swami's Temple
21.	Dr. Manohar Shyam (9336917365)	Panchganga Zone	Aurangzebi Mosque, Sankatha Mandir, Gauri Mangla Mandir, Panchganga Ghat, Some Foodjoints

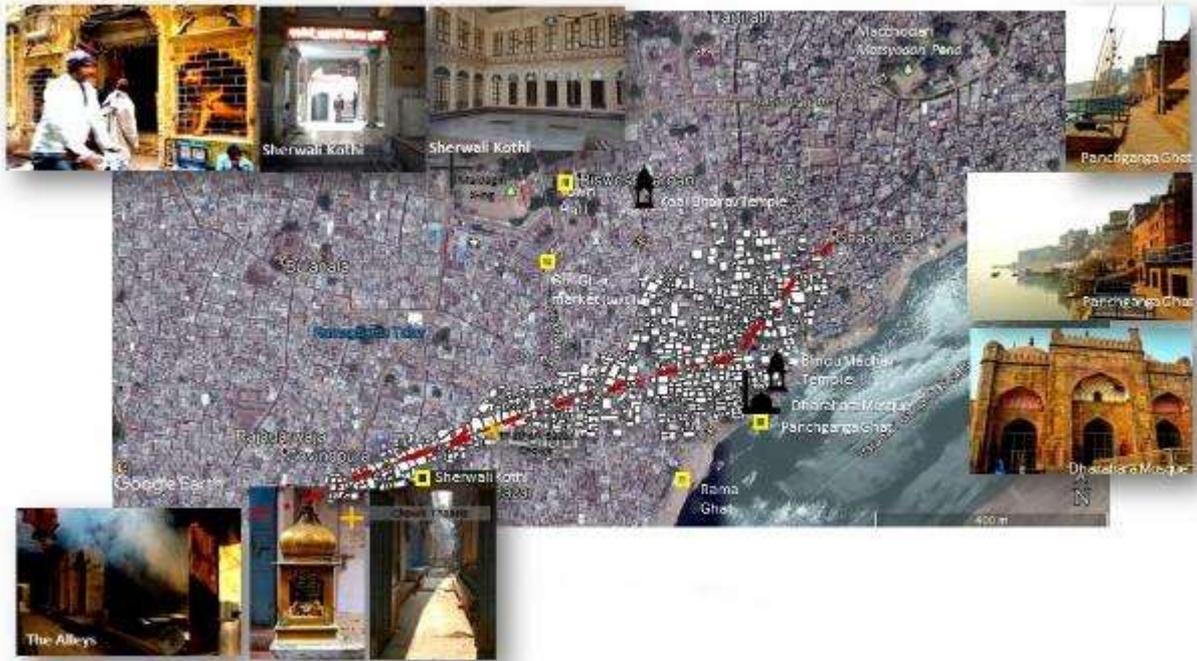


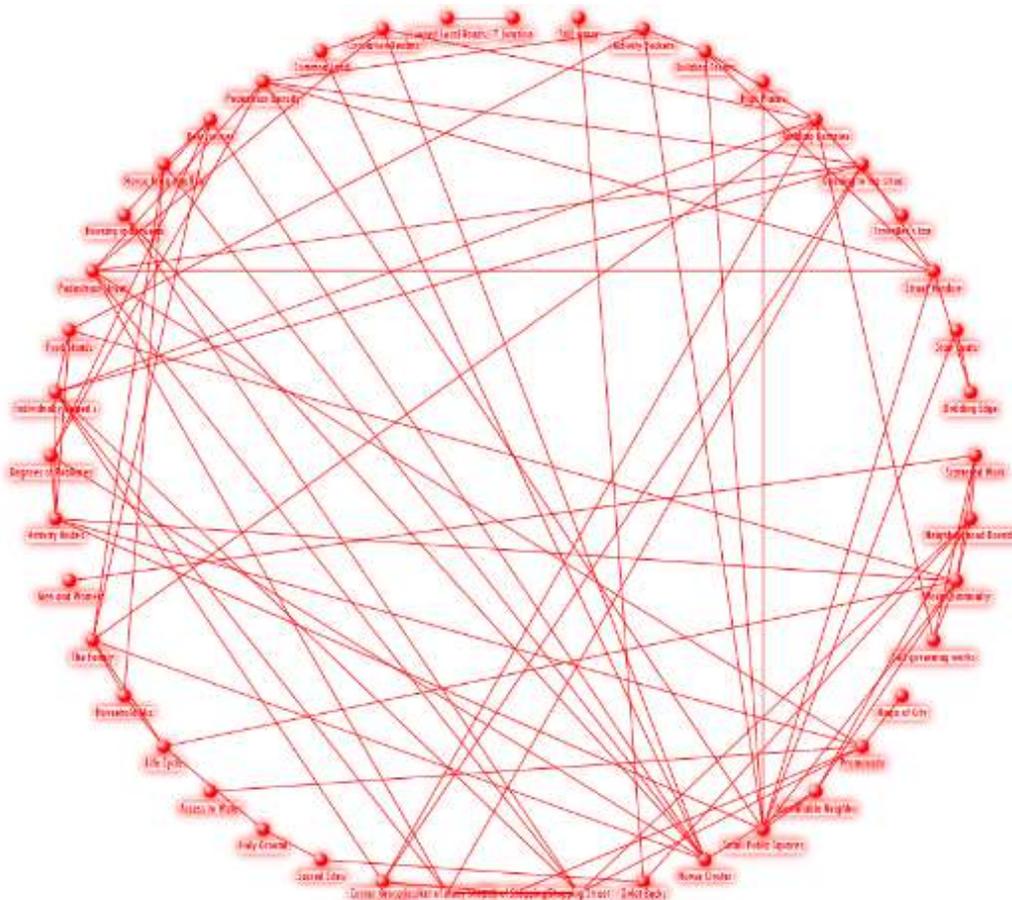
Figure 105: Panchganga Ghat zone

3.3 Conceptual idea for a PSS

The data from the respondents are utilised for extracting the patterns according to Alexandrian pattern language. These can be used as elements of design which can be used iteratively to proceed towards design solution.

Panchganga Ghat- Network Analysis

Process started by creating an edge list in which patterns existing in Alexandrian language were taken as base and through reconnaissance survey of the site, existing patterns were observed. From the holistic edge list, those patterns were dropped which did not exist in the site. All the nodes were recorded. These nodes were then fed into the network analysis software (NodeXL) to understand the kind of relations existing between them and visualising them (Figure 9).



Created with NodeXL (<http://nodexl.codeplex.com/>)

REFERENCES

- Adhya, A. (2007). *Report on University Research, Vol. 3. AIA.*
- Alexander, C. (1999). *The Origins of Pattern Theory: The Future of the Theory, and the Generation of a Living World.* Retrieved July 2017, from <http://dx.doi.org/10.1109/52.795104>.
- Alexander, C., Silverstein, M., & Ishikawa, S. (1977). *A Pattern Language.*
- Bansal, S., Pandey, V., & Sen, J. (2016). Re-defining and exploring the smart-city concept in Indian perspective: case study of Varanasi. In *From Poverty, Inequality to Smart City.* Springer.
- Brömmelstroet, M. t. (2013). Performance of Planning Support Systems. *Computers, Environment and Urban Systems, Elsevier.*
- Chhabra, D., Healy, R., & Sills, E. (2003). Staged authenticity and heritage tourism. *Annals of Tourism Research, 30*(3).
- Gadwa, A., & Markusen, A. (2010). *Creative Place-making.* National Endowment for the Arts.
- Geertman, S., & Stillwell, J. (2003). Planning support systems: an inventory of current practice. *Computers, Environment and Urban Systems (Elsevier), 291-310.*
- Kural, N. (2014). Urban Design for Sustainability: Parameters of Place Formation as Tools of Sustainability Projects in the Case of Temelli, Ankara, Turkey, .
- Kush, D. (2015). People and their Spaces. IIA NATCON.
- Mehta, V. (2014). Evaluating Public Space. *Journal of Urban Design, Vol. 19, No. 1, Routedledge, Taylor and Francis, 53-88.*
- Ministry of Urban Development . (2015). *Guidelines for HRIDAY.* Govt. of India.
- Ministry of Urban Development. (2015). *Atal Mission for Rejuvenation and Urban Transformation (AMRUT)- Mission Statement and Guidelines.* Government of India.
- Ministry of Urban Development and Ministry of urban employment and poverty alleviation , GoI. (2011). JnNURM Overview.
- Newman, G. D. (2016). The eidos of urban form: a framework for heritage-based place making. *Journal of Urbanism: International Research on Placemaking and Urban Sustainability, 9*(4), 388-407.
- Robinson, R. (2013). Do we need a Pattern Language for Smarter Cities? *The Urban Technologist.*
- Saligaros, N. A. (2005). The Structure of Pattern Languages. In *Principles of Urban Structure.* Amsterdam: Techne Press.
- Serra, M., Gil, J., & Pinho, P. (2011). Challenges of Portuguese urban planning. *Proceedings of 7VCT,* (pp. 505-509). Lisbon, Portugal.
- Short, J. (1998). *The Urban Order: An Introduction to Cities, Culture, and Power.* MA: Blackwell Publishers.
- Steinberg, F. (1996). Conservation and Rehabilitation of Urban Heritage in Developing Countries.
- UNDP. (2016). *Sustainable Development Goals.* United Nations.
- Worldbank. (2007). *URBACT II.* Worldbank.

SS02.2. Smart Cities Initiatives for the 21st Century: Myth or Reality

1066 MIND THE GAP: SMART CITIES AS ENTREPRENEURIAL ECOSYSTEMS?

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ABSTRACT

The concept of the smart city gained increasing expression and has become an intensely discussed field in the recent past among, either the research community, either the political stakeholders. In this paper, the importance of deepening the understanding about smart cities entrepreneurial ecosystems is explored. This involves working on existing knowledge about smart cities but extending its application to entrepreneurship and innovation.

This paper aims, first, to contribute to shed light on the meaning of the word *smart* in the context of urban development through an approach based on an in-depth literature review of pertinent studies and then, to establish the links with the determinants of entrepreneurship that can help guide more effective urban development policies. Furthermore, the paper underlines the critical importance of being innovative and entrepreneurial in the approach for smart cities, aiming to deepen and improve policy-making on the subject of promoting entrepreneurial mindsets and contexts, speculating on some principles and guidelines that may help fertilize urban dynamics and build smarter cities. The entrepreneurial ecosystem concept has potentialities that may enable smart cities to adopt more profound and structural broad spectrum strategies to respond to competitiveness urban challenges.

Keywords: Smart city, urban policy, entrepreneurial ecosystem, entrepreneurship, innovation policy

1 INTRODUCTION

Estimates predict that 66% of the world's population will live in cities by 2050. Cities are facing an increasing pressure to deploy themselves as livable and sustainable places that offer many services to improve the quality of life of citizens [47]. Cities have always been economic and cultural poles, but recently they have been augmenting their political importance and their capability to contribute to the wealth of nations. City resource endowment is a competitive factor differentiating the better urban areas and driving localization of RD&I infrastructures, firms, cultural entities, and so on [4, 35]. Calls for promoting and establishing smart cities are all the rage nowadays, and not just in the city management and urban policy context. Academics and urban theorists, engineers and policy makers are involved in a rich variety of contemporary debates on several aspects of what it means for a city to be smart. The smart city approach emerged as an urban strategy that using high technology, and especially ICT, for supporting a participated, attractiveness social and economic development of the cities, upgrading their cohesion levels, their competitiveness profiles and their sustainability. Competitiveness on a global scale is requiring new answers from the territories. The challenges cities and regions are facing require they must be capable of developing further key competences in the exploitation of their assets and strengths. Smart cities are a new approach to the problem of urban competitiveness and differentiation in the global arena assuming that the "one size fits all" archetype cannot be the solution to the problem [25, 33, 45].

The smart city concept is intrinsically associated to the viewpoint that technology is the critical factor for cities to follow the pace of change of society and meet the expectations and requirements of the community. Furthermore, this notion has demonstrated to be crucial in the process of making urban territories more efficient and in offering good quality of life and resource management through increasingly community mobilisation and participatory dynamics. Thinking about smart cities implies to take into account the urban, social, and environmental aspects of urban spaces, otherwise it would signify missing the ultimate strategic aim of the development of cities which means to improve the quality of life of all the community. That is why, arguably, to be considered smart, a city has to comprise dimensions related to governance, planning, infrastructure, and how this is can boost human, social and economic territorial assets [4, 53].

The main objective of this article is precisely, first, to discuss the importance and necessity that the smart city concept incorporates a deeper understanding and implementation of the issues related to entrepreneurship, analyzing, also, the main criticisms those approaches are arising among some researchers. Then, the paper discusses the challenging reconfiguration urban policies have to address in the promotion of smart cities competitiveness, pointing out some axis for the redesign of an entrepreneurial approach to smart cities. Finally, a brief conclusion will summarize the main features of the paper.

2 THE SMART CITY ENTREPRENEURIAL CHALLENGE

Despite there is some kind of compromise that the label smart city symbolizes innovation in city planning and management, its services and infrastructures, a common meaning of the term has not yet been formulated. There is a wide diversity of definitions of what a smart city could be. Nevertheless, two tendencies can be clearly identified in relation with what are the foremost features that smart cities must take into consideration. On the one hand there is a set of definitions that put accent just on one urban dimension (technological, ecological, etc.) leaving apart the rest of the dynamics involved in the urban set. This group of mono-dimensional explanations are misunderstanding that the ultimate objective of a smart city is to provide a new approach to urban development in which all aspects are treated with the interplay that takes place in the factual life of the city [18, 36]. Improving just one aspect of an urban ecosystem does not entail that the difficulties of the whole are being resolved. On the other hand, there are some authors that highlight how the main difference of the smart city concept is the interconnection of all the urban aspects. The intertwined problems between urbanization are infrastructural, social and institutional at the same time and this

interlinking is reflected in the smart city model. From the definitions, it can be noticed that infrastructures are a central piece of the smart city and that technology is the enabler that makes it possible, but it is the combination, connection and integration of all systems what becomes fundamental for a city being truly smart. A smarter city absorbs and disseminates information into its physical infrastructure to improve conveniences, facilitate mobility, add efficiencies, conserve energy, improve the quality of air and water, identify problems and fix them quickly, recover rapidly from disasters, collect data to make better decisions, deploy resources effectively, and share data to enable collaboration across entities and domains [37]. However, infusing intelligence into each subsystem of a city, one by one is not enough to become a smarter city, as this should be treated as an organic whole [10, 43].

Surprisingly, even on the basis of a sustainable approach, meaning that a city has to get a wise equilibrium among economic, social and environmental policies, the smart city concept largely omits, or, at least, undervalues the reference to the need for the cities to be competitive – it is, in fact, as if there is a somehow optimistic vision that, as you digitize the society and the economy, the city competitiveness responds immediately to those investments and increases entrepreneurial and territorial competitiveness. According to this logic, the smart city paradigm seems an illustration of a growing tendency of technologization of the city. Smart city archetypes derive from the key role of digital networks, data, and technical expertise in redesigning the urban environment in the key of enhanced efficiency, information, and knowledge about how, why and when the city functions. In this light, there has been the emergence of a set of critiques focused on critically interrogating the smart city and its myriad iterations [19, 32, 48].

Yet, some authors have been alerting for the need to underline the role the reinforcement of an entrepreneurial strategy can have on the whole functioning of the urban system [5, 9, 24, 25, 26, 28, 37, 45, 53]. From these definitions it can be inferred that the smart city concept implies a comprehensive approach to city management and development (Table 1). These definitions illustrate an equilibrium of the technological, economic and social factors involved in an urban ecosystem. The notions reveal a holistic approach to the urban problems taking advantage of the new technologies so that the urban model and the relationships among the public and business stakeholders can be redefined.

Table 1 - Overview of smart city characteristics

Authors	Smart city dimensions
Kraus et alii, 2015	Underlines the importance of the contextual conditions that need to be fulfilled to promote entrepreneurship and innovation on smart cities
Anttiroiko, 2015	Smart city facing the challenges of being an innovative, entrepreneurial and creative ecosystem, with a strong information technology network
Caragliu, Del Bo, & Nijkamp, 2009	Human and social capital as fundamental basis for urban competitiveness
Kumar et al, 2017	The importance of the smart economy, based on qualified human resources and innovative business strategies for creating smarter cities
Nam & Pardo, 2011	The critical role of information dissemination and knowledge production for strategic purposes
Toppeta, 2010	Creative and innovative vision, entrepreneurial character, use of technology and industries in the IT area
Letaifa, 2015	Holistic vision of the smart city emphasizing the importance of innovation on smart services as a key dimension for urban competitiveness and sustainability
Kourtit & Nijkamp, 2012	Smart cities are based on a mix of human capital (e.g. skilled labor force), infrastructural capital (e.g. high-tech communication facilities), social capital (e.g. intense and open network linkages) and entrepreneurial capital (e.g. creative and risk-taking business activities).
Zygiaris, 2013	Smart cities possess the ability to raise innovation based on knowledgeable and creative human capital intellectual ability that addresses several innovative socio-technical and socio-economic aspects of growth

It is in this context that entrepreneurship has come up a top priority strategy for urban competitiveness promotion. There is a vast array of innovation and entrepreneurship policies but evidence is showing evidence of lack of coordination, *stop-and-go* problems, lack of effectiveness in their design and implementation [20, 51]. There are various interventions that local governments and urban development agencies can make to improve this situation. Knowledge spillovers are crucial to innovation in competitive and sustainable business initiatives, but their exploitation requires an active investment by firms and participation in inter-firm and university-industry relationships [31, 40]. Problems commonly arise when the linkages between the two domains of knowledge exploration (universities, research organisations, etc.) and knowledge exploitation (business, intermediary organisations, etc.) are poor, when there is a lack of non-local sources and outlets of knowledge, or still when related sectors do not work together (3, 7, 38). Over the last few decades, the roles and influence of key stakeholders involved in creating optimal social and economic condition for entrepreneurship has evolved. As the knowledge economy progresses, there is a more rapid pace of scientific and technological development, further advances in ICT and a more effective transition of research to the market place [2, 12, 39]. These and other changes have been conditioning the profile of innovation and entrepreneurship policies that city governments adopt to increase either the birth rate of enterprises, namely new micro, small and medium sized technology-based firms, either economic competitiveness as a whole and, therefore, also territorial competitiveness.

Recent advances on the understanding the innovation process and phenomenon, principally coming from the regional innovation systems approach and from the theorization around the concept of “triple helix”, have given an impulse to entrepreneurship promotion to be understood as an objective resulting from an integrated and systemic policy, involving more and more an ample latitude of spheres of action, namely economic, social and political-institutional [23, 27, 29].

Besides, high levels of entrepreneurship are closely correlated with urban economic growth. Places with abundant new start-ups also usually experience faster income and employment growth. Areas with more small, independent firms far in the past have tended to do better. Unsurprisingly, local policy makers who are looking for ways to revitalize the economic engines of their cities are interested in policies that can generate additional entrepreneurship formats.

The most successful urban territories are those which are characterized by the ability of firms and institutions for adopting voluntary learning dynamics - in products, processes and organizational structures - and to adapt to the pressures induced by market dynamics [11, 22]. Political intervention emphasis should, accordingly, move from the enterprise level (micro) to the level of the *milieu* itself (meso), since it is assumed that it is precisely the innovative territorially embedded dynamics, not necessarily each firm taken individually, which is responsible for the urban innovation upgrading process. There is a need, Dirks et alii argue [14], to promote urban innovators and recognize traditional entrepreneurs as legitimate experts in the area where they work. It is absolutely vital to support them and help upscale innovative and successful local actions. Towards more progressive smart cities, cities should start with people from the human capital side, rather than uncritically believing that IT itself can automatically transform and improve cities [21]. To do all this, it is also urgent to reconsider our strategies towards the urban world. In this respect, it seems important to have a positive approach, that starts from, but is not restricted to local ideas, which focuses on cities communities's strengths and explores the particular opportunities open to them at a international scale - rather than dwelling on their weaknesses and problems, or worse, ignore them.

This means that each city has its own unique characteristics and strengths. Instead of trying to [recreate places like Silicon Valley](#), the concept of smart city is based on building strong entrepreneurial ecosystems by identifying their competitive advantages and leveraging them.

3 SMART CITIES AND ENTREPRENEURIAL ECOSYSTEMS

There is now a tendency to understand the archetyp of a global city-region elsewhere around the world, facing about any expression of territorial specificity as a reply to global restructuring. This created model is then spread and sold back to urban and regional stakeholders as a model to emulate, so producing *new wine in old bottles*, the fundamental question remaining of how much these examples of smart cities are an interpretation of the world and how much they are a mere brand marketing construction.

Definitional critiques are nothing new, of course, but they are fundamental if the smart model is to be taken as anything more than a new glossy way to invest into highly marketable technologies and therefore getting the catching smart tag [22, 49].

Above all, it seems crucial to ensure that discussions over smart urbanism do not become entrenched in an ambiguous idea that smart cities are necessarily qualifying and upgrading developments in the urban dominion [27, 30]. It is important for key concepts such as *smart* not to be simply empty signifiers, and to question and debate what is smart in a way which allows urban politics to thrive, and not to be removed from the need to rethink urban competitiveness.

A recurrent criticism to smart cities resides on the apparent assumption that digital technology is being seen as an end on itself, assuming that the ICT investments will automatically turn the cities into more innovative and competitive world arenas. Some authors already criticize the deficit of social and governance issues on the construction of the smart city approach. It is, nevertheless, rare to question the importance that smart city success also needs to address innovation and entrepreneurial interventions. Till now, on this ambit, the smart city basically configures a classic top-down approach similar to the linear innovation model, which prioritizes scientific and technological research as the source of innovation, and plays down the role of political, academic and economic players in the innovation dynamics [1, 16, 43].

It is important to recognize a smart city as one with a broad commitment to innovation and entrepreneurship in technology, as well as in management and policy making. There is a gap in the orthodox literature of the smart city [41]. The vast majority of authors only cares and addresses technological domains, often disregarding reflections of the policy and managerial side of innovation and entrepreneurship.

While technology in the form of smart city infrastructure is an integral part of a smart city competitiveness, it should only be seen as an enabler to meet the needs of the economic stakeholders [6, 15]. Smart infrastructure development should therefore rely on an entrepreneur-centric approach that responds to the sustainable development needs of firms, thus avoiding the reductionist technology-centric perspective. Smart infrastructure should be chosen and designed with a deep understanding of economic agents' profiles, needs and motivations. Entrepreneurial-focused initiatives in successful smart cities are demand-driven rather than supply-driven, or there is usually a trade-off between the two approaches.

Table 2 - From the "traditional" smart city approach to the entrepreneurial smart city approach

Smart City Approach	Entrepreneurial Smart City Approach
Knowledge as a public good	Institutional and entrepreneurial empowerment as a learning process
Focus on technological innovation infrastructure	Broad spectrum of innovative outputs (hard and soft, including also organizational, market and social innovations)
Focus on high-tech firms	Inclusive logics, encompassing also medium and low-tech firms and traditional sectors
Based on R&D institutions	Strategically focused on firms and, mainly, on the urban socioeconomic <i>milieu</i>

Knowledge diffusion as the main instrument	Stimulation of the absorption capability of firms and on <i>glocal</i> networking promotion
Competitive advantages	Differential advantages; built advantages
Mechanical transfer of successful urban-metropolitan case studies	Pedagogical and experimental approach, contextual policies and instruments
Entrepreneurial demand as a no problem situation	Entrepreneurial demand as a key challenge – search and stimulation of the hidden or latent demand, strategies that go beyond the mere intermediation of RD&I factors with the usual dynamic firms and new technology based start-ups
Based on the RD&I infrastructure	Focus on the firms, on the entrepreneurs and, mainly, on the socioeconomic <i>milieu</i> ; search for an equilibrium between supply and demand driven dimensions
Demand-pull or science-push instruments	Interactive and ecosystemic dynamics

Adapted from: [41]

This renewed entrepreneurial smart city approach must have the fundamental mission of promoting the competitiveness of the productive system in a context of globalization of economic relations and the acquisition of competitive advantages resulting from the ability to innovate. In fact, it should be understood as a means to reinforce urban competitiveness (Table 2).

Thus, business-led urban development has to be emphasised as a smart city key characteristic. A gradual transformation in the urban governance from a managerial to an entrepreneurial focus has to be accomplished. After all, there is a decisive need for businesses in a smart city: public investments are often too marginal to be effective for a cost-intensive smart and competitive urban growth. Companies representing private capital markets are needed to supply the city with a sufficient amount of money. These companies comprise small- and medium-sized enterprises (SMEs) as well as large corporations. To attract them, local governments have to deliver and offer advantageous conditions for businesses [17, 27, 44]. The need for constant private capital should make the smart city attractive for new businesses and what they mean for a smart economy. This is based on the idea of a smart city offering an innovative spirit, which is particularly important for entrepreneurship [30, 46], making a smart city an entrepreneurial city which provides new economic opportunities. Smart cities must increasingly function as seedbeds or incubators for creativeness, innovation and entrepreneurship [5, 32]. Knowledge spillovers are likely to occur as the availability of above the average skilled labour force is high.

We need to underline that that this new set of policy instruments, not being founded on large scales or in infrastructural projects, requires a high degree of decentralization in their design, delivery and management, as well as a consensual and cooperative work among the various actors involved, not forgetting the need for a clear territorial leadership without which it seems difficult to bring together the various rationales into play [19, 39, 42]. This suggests, of course, that an increase in urban capability for innovation inevitably involves new forms of organization and institutional partnership to help improve the structural competitiveness of the companies [34, 35, 50]. If we agree that the intervention by the authorities should give priority to the implementation and strengthening of a relational culture, then policies have to comply with the existing overall network architecture and its specific territorial assets, rather than focus more on punctual and atomized actions. It is, thus, important to reinforce the mechanisms for horizontal coordination and partnership, as well as interface management, avoiding political intervention supported in sectorial logics or fragmented actions. The vast majority of cities will only take advantage from smart cities projects by financing them through robust business cases grounded on a combination of financial efficiency and social, environmental or economic value [17, 26, 35]. The fundamental question seems to be, thus, how territories organise themselves to further enhance policy innovations. This really seems to be the challenge for cities and a critical assessment must be done to the implementation of ready-made recipes [24, 34].

It should be an important aim to involve SMEs as much as possible on all the ongoing, evolving process, to make sure that their long term needs are duly taken into consideration. It is undeniable that this dimensional group of enterprises may require specific assistance and there is a need for additional empirical evidence of the capacities of the different categories of SMEs so that a more pragmatic appreciation of this sector will be gained in order to formulate targeted policy-measures aimed at stimulating greater SME participation, a *sine qua non* condition for the achievement of a systemic innovation process [46]. It seems important to develop knowledge providers and/or link the firms to external knowledge sources and to promote consistent efforts to reinforce the technology absorption capacity of SMEs - a *glocalisation* dynamics supported by networking inside the cities and beyond. Anyway, public intervention should be closer to SME, they must not be neglected on the construction of the city competitive advantages [13, 26, 30].

The availability and quality of ICT infrastructure and usage, which is considered the most basic characteristic of the smart city [6, 20, 52], has thus to be understood as a starting point for a renewed entrepreneurial strategy that may help increase their innovation and competitiveness profiles.

The problematic of long-term urban competitiveness has become a critical issue, mainly now that the rhythm of structural change imposed by the global economy is dictating new patterns of territorial behavior and competition. That is why, arguably, the promotion of territorially embedded urban innovation ecosystems seems a fundamental and coherent strategy to face contemporary urban development challenges, as long-term urban competitiveness and sustainability has less to do with cost-efficiency and more to do with the ability of firms and institutions to improve their knowledge base and to innovate. Digital skills and entrepreneurs are key dimensions to accelerate the digital

transformation process [4, 14, 39]. The digital transformation of a territory is only possible if local businesses have the accurate talent with the pertinent skill set to acquire and bind the required digital technologies. Entrepreneurial talent is not only important for local companies. Local politicians, universities, and research centres also need to attract key talent, entrepreneurs and *intrapreneurs* with the adequate competences to shape the city's entrepreneurial ecosystem.

Current trends are urban centric, and we are aware the creative class has started to migrate to urban areas in cities around the globe. Lower-cost innovation and less need for physical space have converged and changed the way people work today. As part of the creative class, high-tech entrepreneurs are increasingly preferring to live and work in dense, cosmopolitan urban areas. Even though, there is also a need – not just a technological need, but a political, institutional and governance need – to analyze current smart urban challenges and opportunities, and to study how to integrate smart systems into a framework of urban competitiveness [8, 35, 48].

The smart city isn't a mere technological concept and artifact. The smart city is still an emerging paradigm and therefore not yet adequately integrated into national STI and ICT strategies in most countries. Existing national STI and ICT policies may not adequately integrate the needs of developing smart city initiatives [9, 23, 33]. Doing so involves the strengthening of a supportive innovative and entrepreneurial ecosystem that permits the development of smart infrastructure, including human capabilities, legal frameworks, technology policies, institutional mechanisms and data use policies on a multi-level governance scheme.

A smart city is not only a municipal phenomenon but also a national or global movement. It is important to insert them in the context of global competitiveness. The impact of a smart city naturally surpasses local, regional or national boundaries – smart cities are, by definition, *glocal* territorial protagonists.

On this context, it is worth noting that inter-urban competition can also displace competitive advantages across cities lower down the hierarchy [17, 24]. Some cities may begin irreversible decline as they are outmaneuvered by innovations in other established or emerging cities; this is especially likely where their initial superiority in the hierarchy was based on static comparative advantage [4, 45]. This requires smart cities to actively pursue the formulation and implementation of systematic strategic approaches to innovation and entrepreneurship

4 CONCLUSIONS

Technology is clearly a necessary condition for a smart city, but entrepreneurs' understanding of the concept is about the development of urban fabric for a more qualified and resilient economy. The adoption of up-to-date technologies per se is not a *sine qua non* condition for the success of smart city initiatives. Success, on the economic sphere, is dependent on the way cities involve all stakeholders on an innovation and entrepreneurial dynamics, it is not merely determined by technology or technical capital. Technology itself does not make any contribution to innovation. It seems urgent to overcome the scarcity of strategic analysis on the design of smart cities, evolving from a techno centric intervention to a socio-organizational approach that may encompass, on the economic sphere, a wider mobilization of the entrepreneurial city assets. Smart cities are principally characterized by its innovative, entrepreneurial and creative ecosystem and a strong information technology network. In order to keep up with the increasing global competition in the field of smart cities, they need to develop an entrepreneurial character and an innovative and creative vision.

While it is certainly instructive to examine and learn from successful smart cities, policy makers should be wary about treating them as exemplars that can be easily replicated or emulated in their own territories. Policies rarely travel well: successful strategies in one city do not transfer easily into other urban areas. In fact, given that many of the sources of urban competitive advantage are locally rooted and embedded, policies necessarily have to respond to, and take account of, city idiosyncrasies. It is therefore unlikely that there is one size fits all recipe for promoting urban innovation potential and competitiveness.

Moreover, special attention should be paid to the design of the intervention policy, trying to avoid the classical functional top-down and supply-side approach; innovation-led smart city policies must basically address the questions of enhancing the territorial capabilities to foster interactiveness among the city actors, of engaging the actors in processes of collective learning and of producing strategic knowledge or, more synthetically, to promote social capital. Entrepreneurial smart cities policies should, in essence, concentrate on catching up learning but it is necessary to ensure that the architectures of the policy-design and of the policy-delivery are open and inclusive.

Usually, traditional theoretical frameworks fail to take account of the diversity of actors and activities contributing to urban development and hence failed to reckon the diverse types of knowledge and human skills needed to sustain city competitiveness in the globalizing knowledge economy. The focus should be put, as mentioned before, less on the technological infrastructure initiatives, *per se*, and more on the innovation and entrepreneurial process, as a whole. Policy interventions must recognize the need for international interfaces, while simultaneously making sure that knowledge accumulates domestically and filter out into the economy for re-use, recombination and experimentation.

Smart cities strategies have thus to fully assume a new narrative where cities are seen as growth engines which constitute the key to economic prosperity, suggesting that cities have to apply the mechanisms associated with entrepreneurial promotion in order to survive and prosper as vital entities. The capacity of global cities to remain at the top of both world and national hierarchies seems, more than ever before, linked to their ability to remain at the forefront of economic and institutional innovation.

REFERENCES

- [1] Ahvenniemi, H., Huovila, A., Pinto-Seppä, I., and Airaksinen, M. (2017). What are the differences between sustainable and smart cities? *Cities*, 60(A): 234-245.
- [2] Al-Hader, M., & Rodzi, A. (2009). The smart city infrastructure development & monitoring. *Theoretical and Empirical Researches in Urban Management*, 4(2), 87-94.
- [3] Albino, V., Berardi, U., and Dangelico, R.M. (2015). Smart cities: definitions, dimensions, performance, and initiatives. *Journal of Urban Technology*, 22(1): 1-19.
- [4] Angelidou, M. (2015). Smart cities: a conjuncture of four forces. *Cities*, 47: 95-106.
- [5] Anttiroiko, A.-V. (2015). Smart cities: Building platforms for innovative local economic restructuring. In *Transforming City Governments for Successful Smart Cities*; Rodríguez-Bolívar, M.P., Ed.; Springer International Publishing: Cham, Switzerland, 2015; pp. 23-41.
- [6] Boulton, A., Brunn, S. D., & Devriendt, L. (2011). Cyberinfrastructures and “smart” world cities: Physical, human, and soft infrastructures. In P. Taylor, B. Derudder, M. Hoyler & F. Witlox (Eds.), *International Handbook of Globalization and World Cities*. Cheltenham, UK: Edward Elgar.
- [7] Bradford, N. (2004). Place matters and multi-level governance: Perspectives on a new urban policy paradigm. *Policy Options*, 25(2), 39-45.
- [8] Camagni, Roberto, Capello, Roberta and Lenzi, Camilla (2014). A Territorial Taxonomy of Innovative Regions and the European Regional Policy Reform: Smart Innovation Policies, *Scienze Regionali*, 1, 37, P. 69-105.
- [9] Caragliu, A., Del Bo, C., and Nijkamp, P. (2009). Smart cities in Europe. In *Proceedings of the 3rd Central European Conference in Regional Science*, Košice, Slovak Republic, October 7-9.
- [10] Dameri, R. P. (2013). Searching for smart city definition: a comprehensive proposal. *International Journal of Computers & Technology*, 11(5), 2544-2551.
- [11] Dawes, S. S., Cresswell, A. M., & Pardo, T. A. (2009). From “need to know” to “need to share”: Tangled problems, information boundaries, and the building of public sector knowledge networks. *Public Administration Review*, 69(3), 392-402.
- [12] Dawes, S. S., Pardo, T. A., Simon, S., Cresswell, A. M., LaVigne, M. F., Andersen, D. F., & Bloniarz, P. A. (2004). *Making Smart IT Choices: Understanding Value and Risk in Government IT Investments* (2nd ed.). Albany, NY: Center for Technology in Government. Available at
- [13] Dirks, S., Gurdgiev, C., & Keeling, M. (2010). *Smarter Cities for Smarter Growth: How Cities Can Optimize Their Systems for the Talent-Based Economy*. Somers, NY: IBM Global Business Services. Available at <ftp://public.dhe.ibm.com/common/ssi/ecm/en/gbe03348usen/GBE03348USEN.PDF>.
- [14] Dirks, S., Keeling, M., & Dencik, J. (2009). *How Smart is Your City? Helping Cities Measure Progress*. Somers, NY: IBM Global Business Services. Available at <ftp://public.dhe.ibm.com/common/ssi/ecm/en/gbe03248usen/GBE03248USEN.PDF>.
- [15] Dobbs, R., Smit, S., Remes, J., Manyika, J., Roxburgh, C., & Restrepo, A. (2011). *Urban World: Mapping the Economic Power of Cities*. McKinsey Global Institute.
- [16] European Commission (2016). *European Innovation Partnership on Smart Cities and Communities (EIP-SCC)*. Online: <https://eu-smartcities.eu/>
- [17] Giffinger, R., Fertner, C., Kramar, H., Kalasek, R., PichlerMilanović, N. and Meijers, E. (2007). *Smart Cities: Ranking of European Medium-Sized Cities*. Vienna, Austria: Centre of Regional Science (SRF), Vienna University of Technology.
- [18] Hadjuk, S. (2016). The concept of a smart city in urban management, *Business, Management and Education*, 14(1): 34-49.
- [19] Hall, R. E. (2000). The vision of a smart city. In *Proceedings of the 2nd International Life Extension Technology Workshop*, Paris, France, September 28.
- [20] Harrison, C., Eckman, B., Hamilton, R., Hartswick, P., Kalagnanam, J., Paraszczak, J., & Williams, P. (2010). Foundations for Smarter Cities. *IBM Journal of Research and Development*, 54(4).
- [21] Hollands, R. G. (2008). Will the real smart city please stand up? *City*, 12(3), 303-320.
- [22] Hospers, G.-J. (2008). Governance in innovative cities and the importance of branding. *Innovation: Management, Policy & Practice*, 10(2-3), 224-234
- [23] Kourtit, K. and Nijkamp, P. (2012). Smart Cities in the Innovation Age. *Innovation: The European Journal of Social Science Research*, 25(2), 93-95.
- [24] Kourtit, K. and Nijkamp, P. (2013). In praise of megacities in a global world, *Regional Science Policy and Practice*, Vol. 5, No. 2, pp. 167-182
- [25] Kraus, S., Richter, C., Papagiannidis, S., and Durst, S. (2015). Innovating and exploiting entrepreneurial opportunities in smart cities: evidence from Germany. *Creativity and Innovation Management*, 24(4): 601-616.
- [26] Kumar, T.M., and Dahiya, Bharat (2017). In: Kumar, T.M. (ed.), *Smart Economy in Smart Cities*. Springer, Singapore, 3-76.
- [27] Lee, J.H., Hancock, M.G., and Hu, M.-C. (2014). Towards an effective framework for building smart cities: Lessons from Seoul and San Francisco. *Technological Forecasting and Social Change*, 89(1): 80-99.
- [28] Letaifa, S. (2015). How to strategize smart cities: Revealing the SMART model. *Journal of Business Research*, 1414-1419.
- [29] Leydesdorff, L., and Deakin, M. (2011). The triple-helix model of smart cities: A neo-evolutionary perspective. *Journal of Urban Technology*, 18(2): 53-63.
- [30] Lombardi, P., Giordano, S., Caragliu, A., Del Bo, C., Deakin, M., Nijkamp, P., Kourtit, K. and Farouh, H. (2012). An Advanced Triple-Helix Network Model for Smart Cities Performance. In: Erkoskun, O.Y. (ed.), *Green and Ecological Technologies for Urban Planning: Creating Smart Cities*, Hershey, USA: IGI Global, pp. 59-73
- [31] Luke, B., Verreyne, M., & Kearins, K. (2010). Innovative and entrepreneurial activity in the public sector: The changing face of public sector institutions. *Innovation: Management, Policy & Practice*, 12(2), 138-153.
- [32] Marceau, J. (2008). Introduction: Innovation in the city and innovative cities. *Innovation: Management, Policy & Practice*, 10(2-3), 136-145.
- [33] Marsal-Llacuna, M. L., Colomer-Llinàs, J., and Meléndez-Frigola, J. (2015). Lessons in urban monitoring taken from sustainable and livable cities to better address the Smart Cities initiative. *Technological Forecasting and Social Change*, 90(B): 611-622.
- [34] Martin, R., & Simmie, J. (2008). Path dependence and local innovation systems in city-regions. *Innovation: Management, Policy & Practice*, 10(2-3), 183-196.
- [35] Meijer, A., & Bolívar, M. P. (2016). Governing the smart city: a review of the literature on smart urban governance. *International Review of Administrative Sciences*, 82(2), 392-408.
- [36] Neirotti, P., De Marco, A., Cagliano, A.C., Mangano, G., and Scorrano, F. (2014). Current trends in smart city initiatives: some stylized

facts. Cities, 38: 25-36.

[37] Nam, T. and Pardo, T. (2011). Smart city as urban innovation: Focusing on management, policy and context. The 5th International Conference on Theory and Practice of Electronic Governance.

[38] Pardo, T. A., & Burke, G. B. (2008). Government worth having: A briefing on interoperability for government leaders. Albany, NY: Center for Technology in Government, The Research Foundation of State University of New York.

[39] Pardo, T. A., Nam, T., & Burke, G. B. (2016). Egovernment interoperability: Interaction of policy, management, and technology dimensions. Social Science Computer Review.

[40] Paroutis, S., Bennett, M., and Heracleous, L. (2014). A strategic view on smart city technology: the case of IBM Smarter Cities during a recession. Technological Forecasting and Social Change, 89(1): 262-272.

[41] Santos, D. (2017). Mind the gap: smart cities and entrepreneurship policies. SCAMS'17 Mediterranean Symposium in Smart City Application Tangier, Morocco - October 25 - 27, 2017, ACM New York.

[42] Santos, D. and Simões, M. J. (2014). Regional innovation systems in Portugal: a critical analysis, Investigaciones Regionales, 28, pp.149-168.

[43] Simões, M. J. e Santos, D. (2014). Cidades e Regiões Digitais - uma oportunidade perdida?. In Baudin, G. e Vaz, D. (eds.), Transação Territorial - novas relações cidade-campo, V. N. Famalicão: Húmus, pp. 87 - 104.

[44] Stratigea, A., Papadopoulou, C.-A., and Panagiotopoulou, M. (2015). Tools and technologies for planning the development of smart cities. Journal of Urban Technology, 22(2): 43-62.

[45] Toppeta, D. (2010). The Smart City Vision: How Innovation and ICT Can Build Smart, "Livable", Sustainable Cities: The Innovation Knowledge Foundation. Available at http://www.thinkinnovation.org/file/research/23/en/Toppeta_Report_005_2010.pdf.

[46] Tranos, E. and Gertner, D., Smart Networked Cities? (2012). Innovation: The European Journal of Social Science Research, Forthcoming. Available at SSRN: <https://ssrn.com/abstract=2032620>.

[47] United Nations (2014). World Urbanization Prospects, New York: United Nations.

[48] Van Winden, W. (2008). Urban governance in the knowledge-based economy: challenges for different city types. Innovation: Management, Policy & Practice, 10(2-3), 197-210.

[49] Vanolo, A. (2014). Smartmentality: The Smart City as Disciplinary Strategy. Urban Studies, 883-898.

[50] Visnjic, I., Neely, A., Cennamo, C., & Visnjic, N. (2016). Governing the City: Unleashing Value from the Business Ecosystem. California Management Review, 59(1), 109-140.

[51] Walker, R. M., Damanpour, F., & Devece, C. A. (2011). Management innovation and organizational performance: The mediating effect of performance management. Journal of Public Administration Research and Theory, 21(2), 367-386.

[52] Washburn, D., Sindhu, U., Balaouras, S., Dines, R. A., Hayes, N. M., & Nelson, L. E. (2010). Helping CIOs Understand "Smart City" Initiatives: Defining the Smart City, Its Drivers, and the Role of the CIO. Cambridge, MA: Forrester Research, Inc.

[53] Zygiaris, S. (2013). Smart City Reference Model: Assisting Planners to Conceptualize the Building of Smart City Innovation Ecosystems. Journal of the Knowledge Economy, 4(2), 217-231.

1155 CRITERIA TO KEEP A CITY WITH A DECREASING POPULATION SUSTAINABLE IN JAPAN - A CASE STUDY OF SUITA CITY IN OSAKA PREFECTURE

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ABSTRACT

In Japan, as a result of increase in the number of elderly people and the decreasing number of births, the total population has been declining. Therefore, a neighborhood that meets the needs of elderly people, encourages the birth of children, and maintain diversity of generation and lifestyles is important for the redevelopment of a sustainable city. In this study, questionnaire surveys were conducted, focusing on the lifestyle of dog owners, which is suggested as a healthy lifestyle, based on the World Health Organization's (WHO) criteria of age-friendly city. This study examined Suita City, which comprises both completely planned areas and Sprawling areas in one municipality; questionnaire surveys were conducted and information from Suita City reports, maps, and field work were analyzed to clarify specific issues that should be examined.

Keywords: Sustainable city, Age-friendly city, Friendly city for dog owner, Walkability

1. INTRODUCTION

1.1 Background and Objectives

Recently, both the number and percentage of elderly people in Japan have been increasing, while both the number and percentage of children have been decreasing. As a result of this situation, the overall population has been decreasing.

Regarding the increasing elderly population, it is necessary that neighborhoods meet their corresponding needs as well as the needs of children, since the birth of children must be encouraged. Elderly people should take walks or engage in activities such as volunteerism, hobbies, etcetera, to maintain good health.

In this research, questionnaire surveys focusing on activities that involve leaving one's house were conducted. The surveys were administered in two different types of residential areas; one was developed under the strong plan related to C. A. Perry's theory of neighborhood units and the other was developed in a sprawling manner. Survey results from the two areas were compared and neighborhood factors affecting friendliness were analyzed.

Another perspective studied in this survey was keeping dogs. It is suggested that dog owners should walk their dogs and this activity is associated with healthier lifestyles.

1.2 Research Method

In this research, Suita City in Osaka Prefecture was evaluated. As previously stated, one area of Suita City was planned and developed according to Perry's theory of the neighborhood units (hereafter, New Town area) introduced in the 1920s, and the other area was developed in a sprawling manner (hereafter, Sprawling area). These two areas were easy to compare because they were located in the same municipality.

Several reports from survey questionnaires conducted by municipalities, plans related to urban regeneration.

A survey questionnaire was conducted in the abovementioned two areas. Between 14 and 16, 2017, 500 questionnaires were delivered to mailboxes in each area (total - 1,000).

The number of collected questionnaire was 378, including 203 from the New Town area and 175 from the Sprawling area. The collected questionnaires represented 37.8% of the total distributed questionnaires (40.6% in the New Town area and 35% in the Sprawling area). In addition, geographical information about the area obtained from maps and field work was analyzed.

Finally, results of the analysis were judged using the World Health Organization's (WHO) age-friendly city criteria; the findings highlight several issues that required careful and precise investigation.

1.3 Preceding Studies

In the Japanese context, studies on activities involving leaving one's house have focused on elderly people, particularly on their walks. Research on walking activities of children are generally associated with nursery schools or preschools activities. Such studies have been conducted carefully and precisely in specific areas. However, no study has compared the two areas mentioned herein.

In this research, investigations for both areas were conducted comparatively, although the analysis can be considered rough compared to preceding studies. The results of this research are generalized and helpful in identifying issues careful examination.

2. SUITA CITY

2.1 Suita City

Suita City has population of about 370,000 and an area of 36.0 km² (Suita City, 2018). Suita City is surrounded by Osaka City, Toyonaka City, Minoh City, Ibaraki City, and Settsu City (Suita City, 2015). Most of the area has been urbanized and

used for residential purpose. There are five university campuses and several research centers in the area. According to reports published by the municipality, about 70% of the residents are satisfied with their neighborhood and public transportation, and 61% are satisfied with green areas and open spaces.

Figure 1 Japanese population by age range

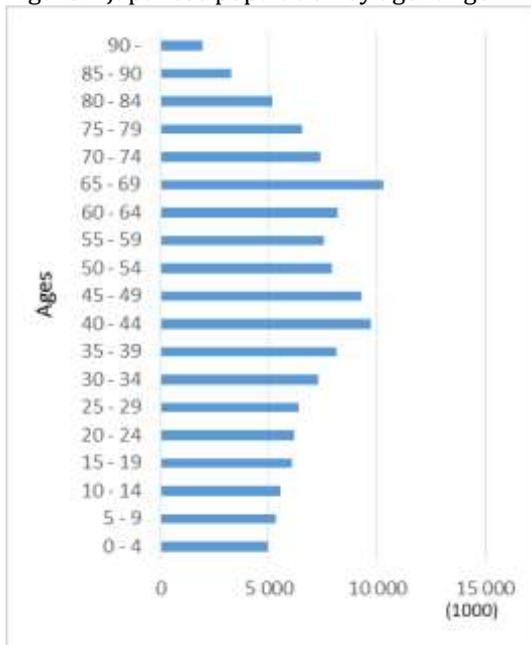


Figure 2 Suita City's population by age range

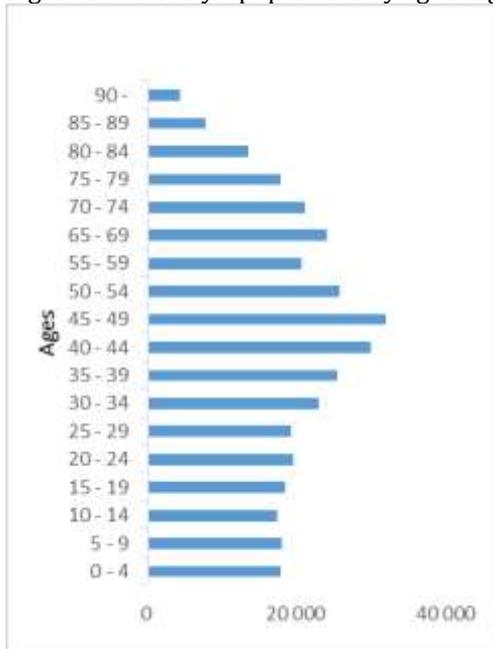


Figure 1 presents the distribution of Japanese populations by age range. Figure 2 presents the same distribution for Suita City and exhibits a similar shape.

2.2 New Town Area

The New Town area was originally constituted hills. The development of towns began in the 1960s; the first residents settled in the area in 1963. In addition to the development of neighborhood units, railways were constructed with several stations that are accessible from each neighborhood units. Because of the original topographic features, the areas have gradients. Furthermore, there are many slopes.

In the New Town area, the theory of neighborhood units was modified and shopping centers in neighborhood units were placed at the center of each neighborhood unit, although most of them have become outdated. These units also include parks and green fields.

In addition to a detached housing area, there are apartment houses organized by the municipality and the Urban Renaissance Agency (UR), condominiums, and employees' housing of several companies. All types of houses are mixed in one area. Recently, several apartment homes organized by municipalities and UR have been replaced, most of them become with high-rise apartment buildings. The landscape has been changing, and open spaces have been decreasing. Moreover, young families have been coming into the area.

Figure 3 shows New Town area's population and the shape is different from that of Suita City's. Many people have lived in the area since its initial development, and more people have moved to the area with the development of apartment homes.

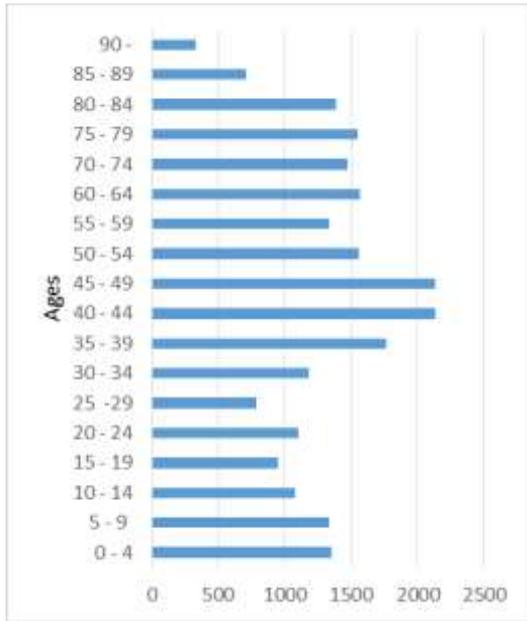


Figure 3 New Town area's population by ages range

2.3 Sprawling Area

The Sprawling area investigated in this study was mostly covered by small detached houses. Gradients and many slopes characterize the topography. Houses were built without plans, and streets are narrow without pedestrian access. Further, there are only a few small parks for small children

There was no public transportation for a long time, but community buses could be used by residents. The nearest station is about 1000m from the opposite edge of the area. Near the station and along main streets outside the area are shops, restaurants, hospitals, and so on.

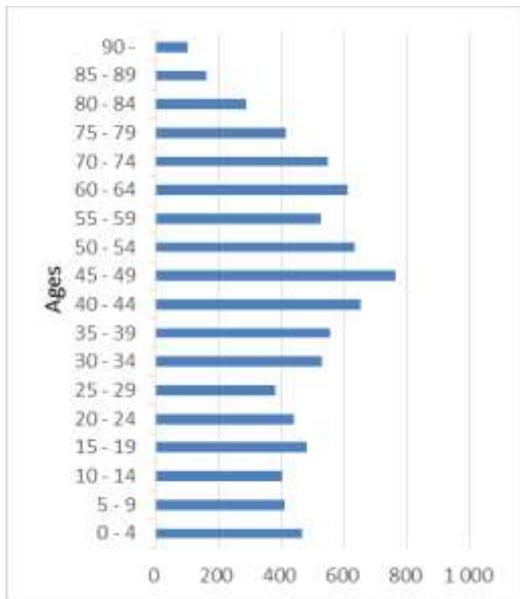


Figure 4 Sprawling area's population by age range

According to Figure 4, the Sprawling area's population is shaped similar to that of Suita City.

3. ACTUAL SITUATION

3.1 Survey Method

Collected reports and plans published by municipality and general trends for each area indicated by the results of the survey questionnaires were analyzed for each area. Questionnaires were dropped in mailboxes at individual dwellings. Dwellings for questionnaire distribution were selected randomly in both areas and included all kinds of residences. In total, 500 questionnaires each were distributed in the New Town and Sprawling areas.

As mentioned previously, the number of collected questionnaires was 378, including 203 from the New Town area and 175 from the Sprawling area.

3.2 Attributes of respondents

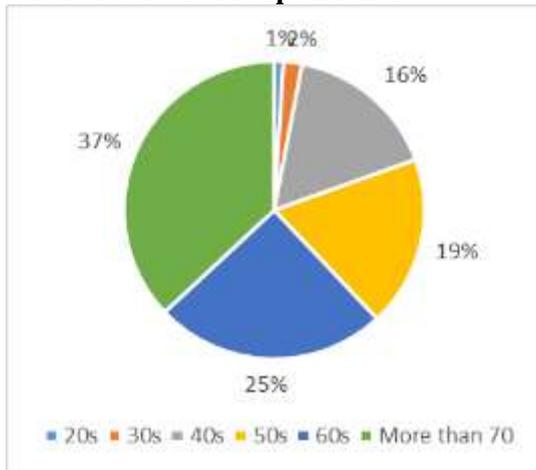


Figure 5 Ages of respondents in New Town area

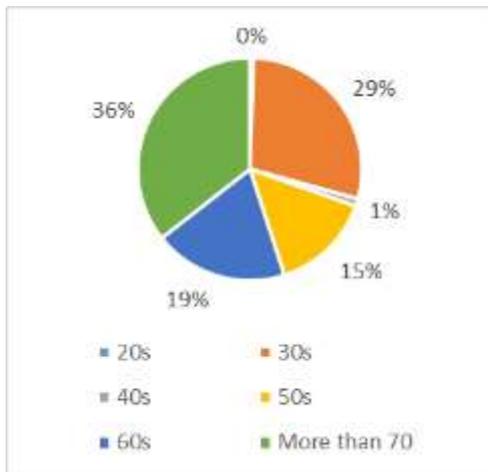


Figure 6 Ages of respondents in Sprawling Area

Regarding the New Town area, 16% of the residents were in their 40s, while in the Sprawling area, only 1% were in this age group. The comparison for people in their 30s living in each area was also revealing.

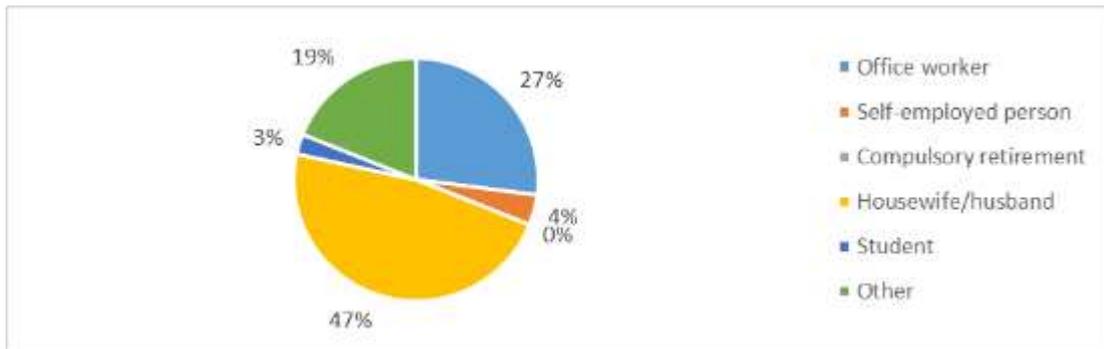


Figure 7 Occupation of respondents age below 59 years in the New Town area

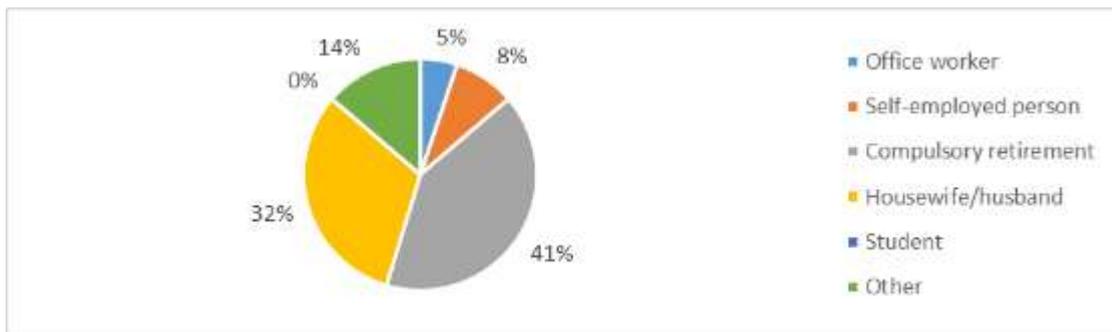


Figure 8 Occupation of respondents aged over 60 years in New Town area

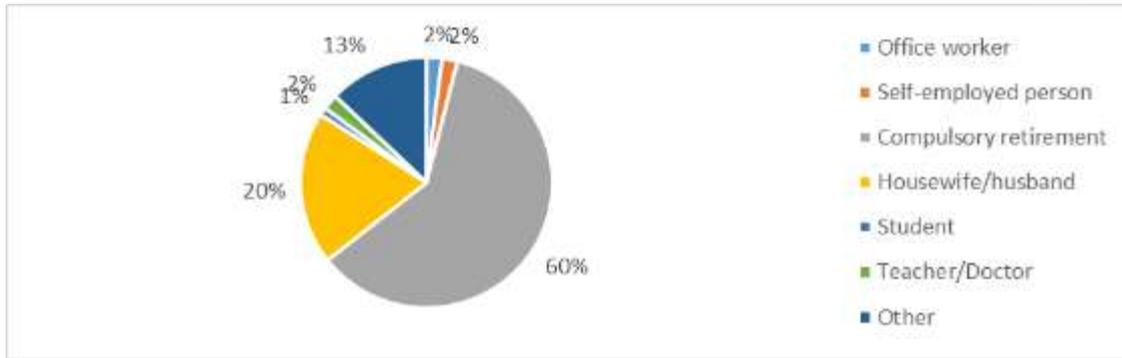


Figure 9 Occupation of respondents aged below 59 years in Sprawling area

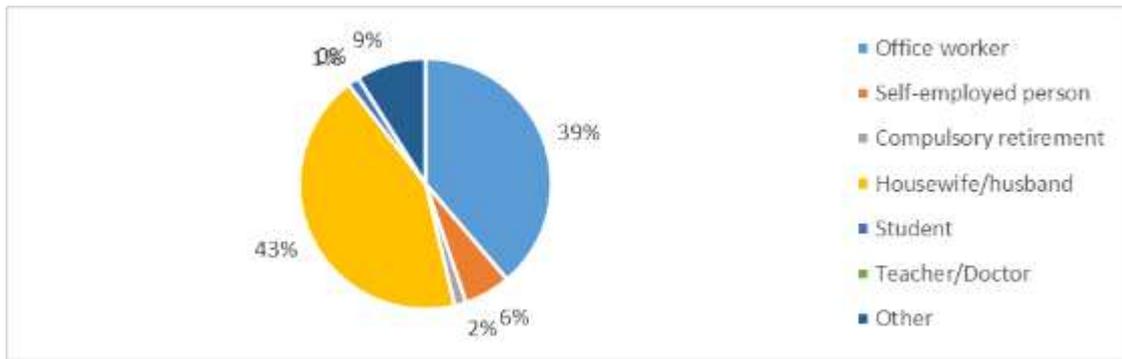


Figure 10 Occupation of respondents aged over 60 years in Sprawling area

The person from each family who spent the most time at home was asked to complete the questionnaire for this study. Regarding occupation, the respondents were affected by compulsory retirement. Moreover, 18% of respondents in the New Town area and 14% of respondents in Sprawling area chose “live alone.”

It should be noted that 32% of the respondents in the New Town area were living in public housing (apartment), whereas no respondents from the Sprawling area were living in public housing. The difference for house owners were also revealing.

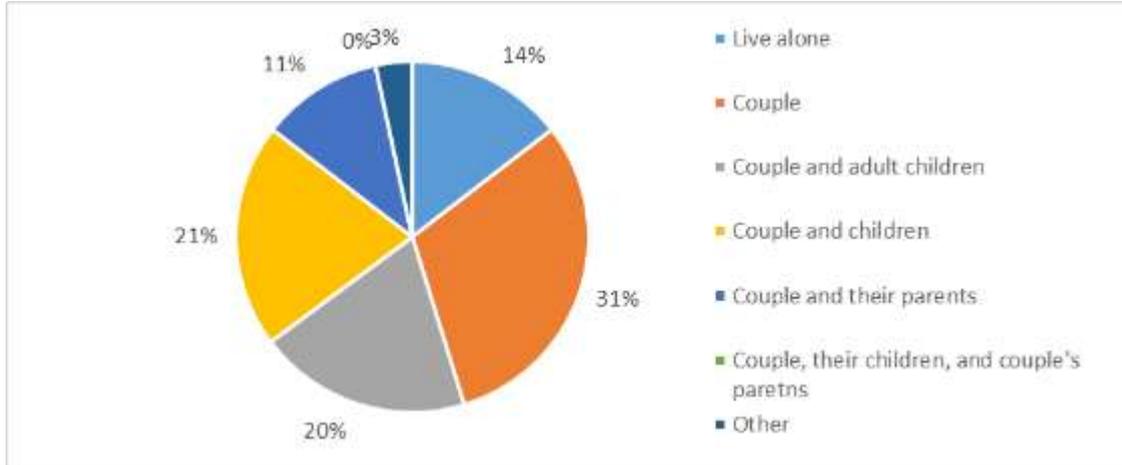


Figure 11 Family situation of respondents in New Town area

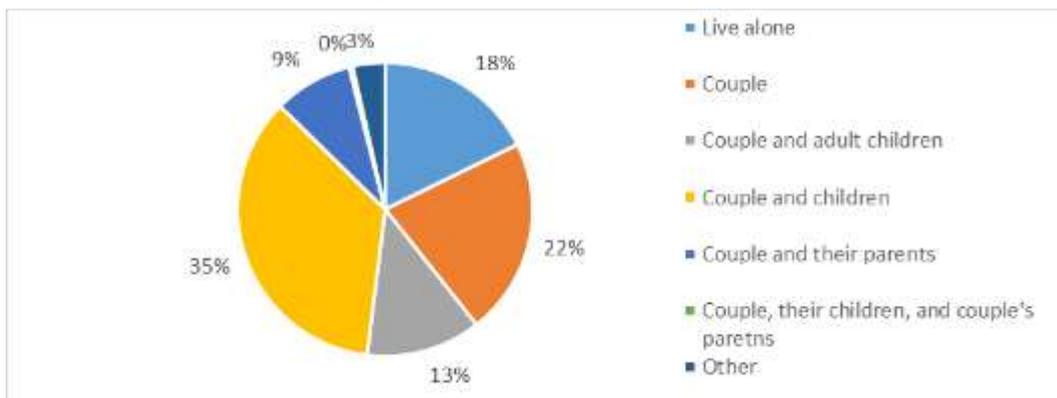


Figure 12 Family situation of respondents in sprawling area

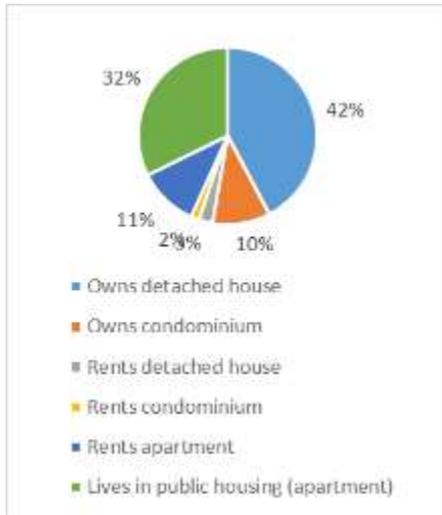


Figure 13 Housing situation in New Town area

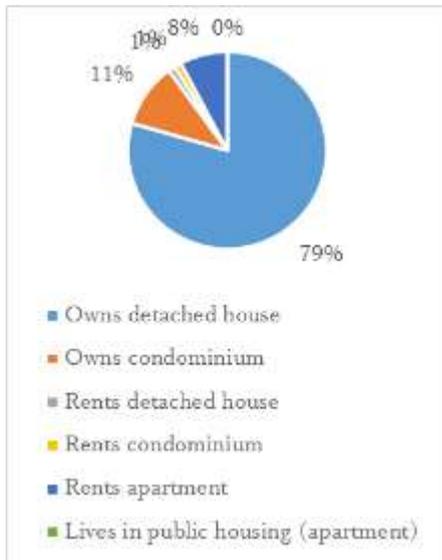


Figure 14 Housing situation in Sprawling area

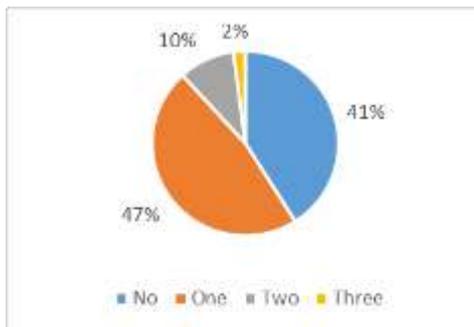


Figure 15 Respondents who own cars in the Figure New Town area

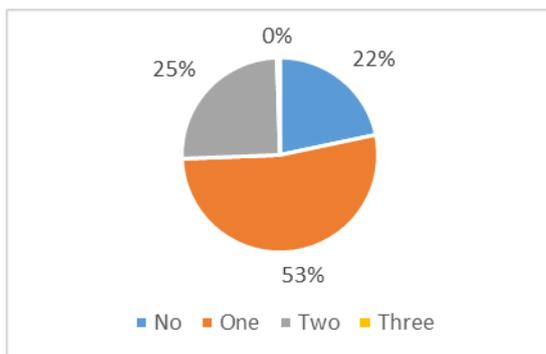


Figure 16 Respondents who own cars in the Sprawling area

In the New Town area, 41% of the respondents did not have their own cars. The percentage was almost twice as that in the Sprawling area.

3.3 Activities of leaving house

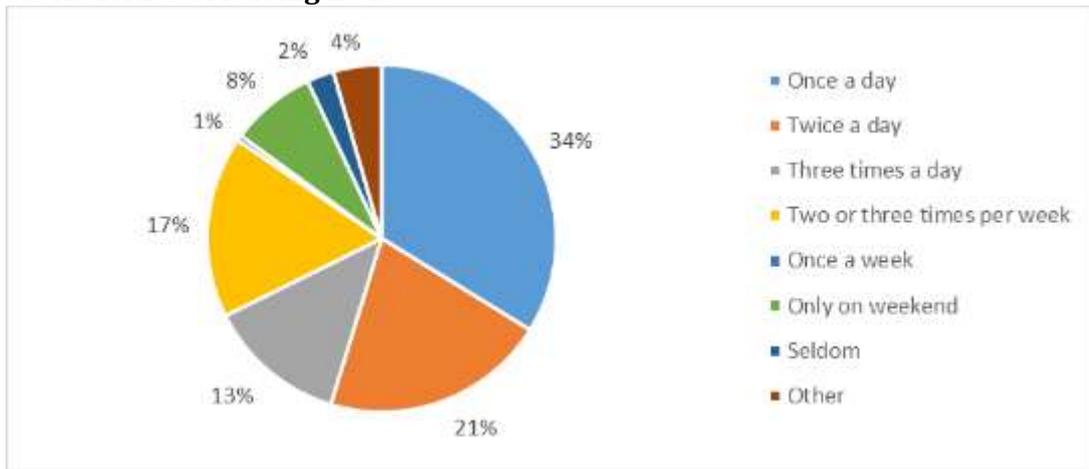


Figure 17 Frequency of leaving one's house in the New Town area

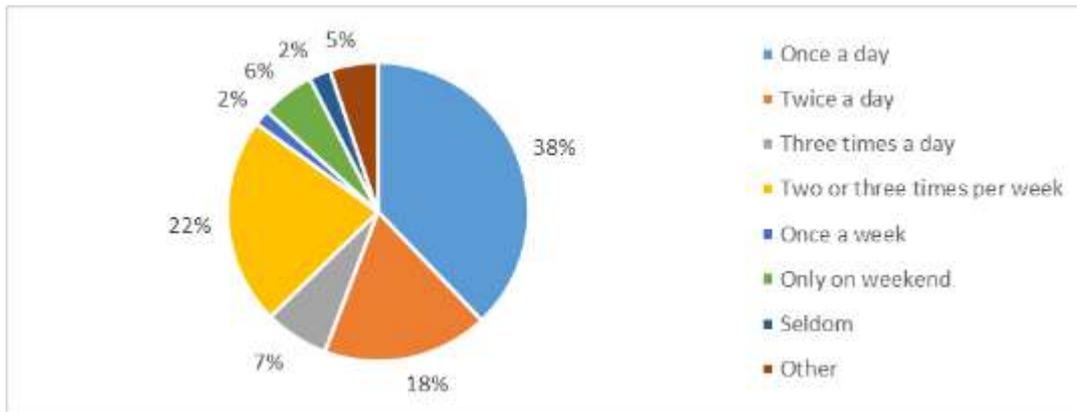


Figure 18 Frequency of leaving one's house in the Sprawling area

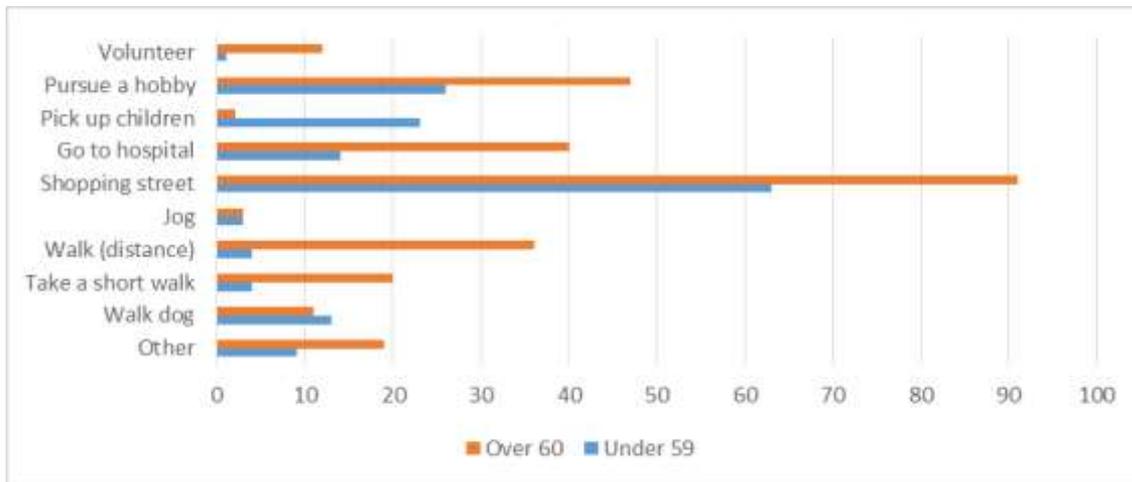


Figure 19 Reasons for going out in the New Town area (comparative graph by ages)

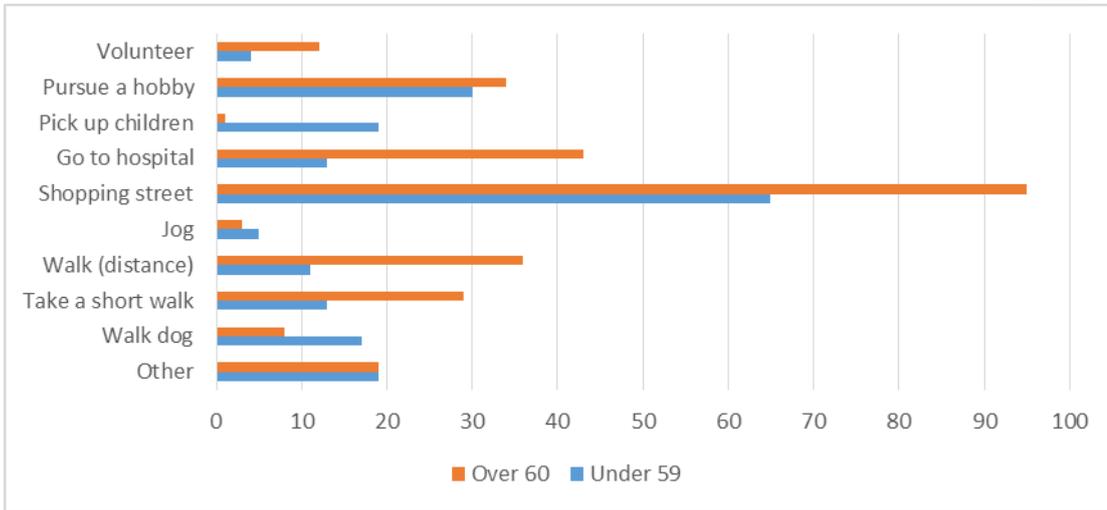


Figure 20 Reasons for going out in Sprawling area (comparative graph by ages)

The most frequent reason for going out was to “Shop,” and they go shopping on foot or in their own cars or bicycles.

Figures 19 and 20 show different reasons for going out based on age (i.e., below 59 years and over 60 years); the outstanding difference is that the respondents over 60 years chose “go to hospital” more often, whereas those aged below 59 years chose “pick up children” frequently. According to the results of this survey, 60 years is a critical age associated with retirement (Figures 7 to 10).

In the questionnaire, respondents were asked to identify the place when they customarily walked. According to Figures 21 and 22, parks were more often destinations for walkers in the New Town area, whereas streets were more popular destinations in the Sprawling area. According to the map and guidebook edited by Suita City, there are almost no parks in the Sprawling area.

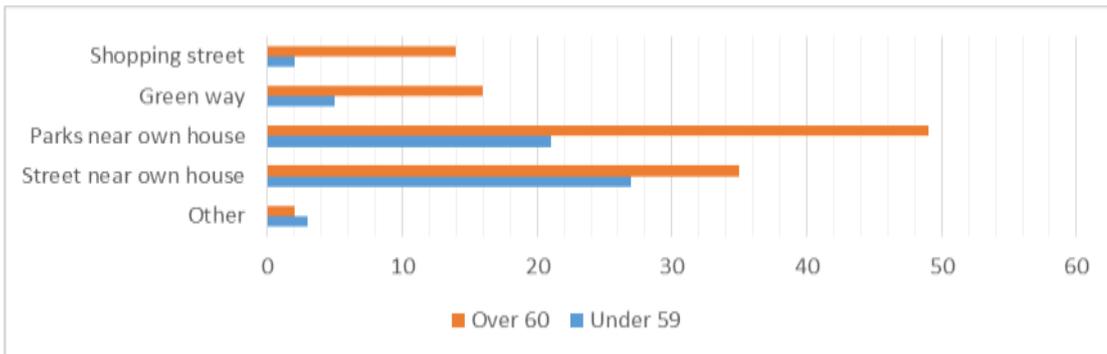


Figure 21 Walking site in New Town area

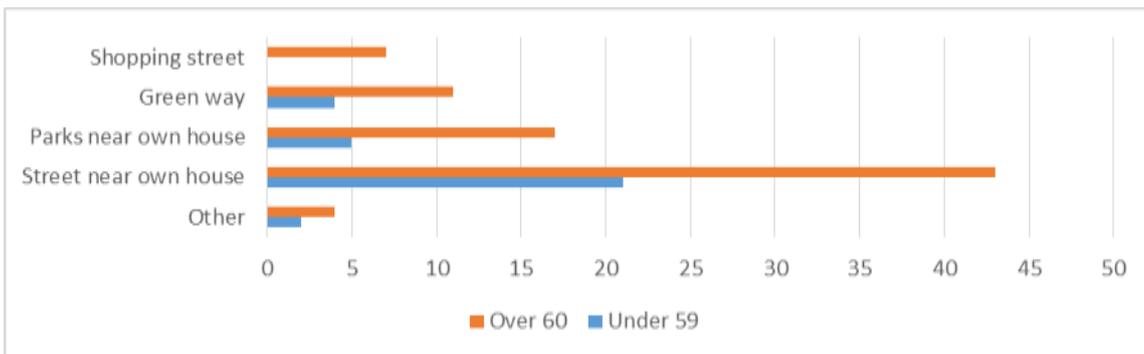


Figure 22 Walking site in Sprawling area

Respondents to the questionnaire were asked to explain their criteria for choosing where they typically walked, and safety was the primary condition.

3.4 Dogs

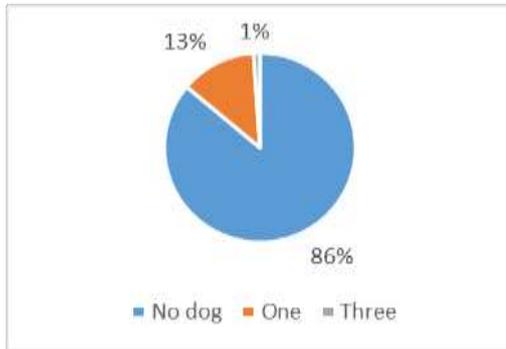


Figure 23 Respondents who keep dogs in New Town area

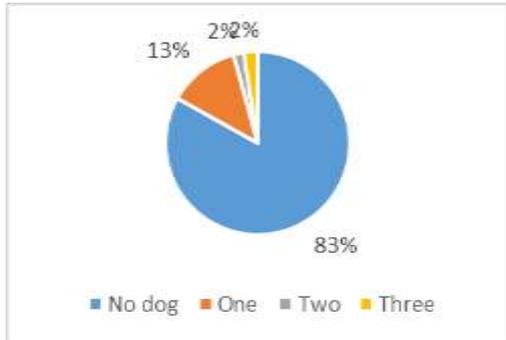


Figure 24 Respondents who keep dogs in the Sprawling area

In the New Town area, 32% of the respondents lived in public housing, which did not allow keeping dogs. However, compared with the Sprawling area residents, the New Town area residents kept more dogs than usual. In the latter area, dog owners lived in their own detached houses or rent detached houses, while in the Sprawling area, dog owners lived in their own detached houses or condominiums or rent condominiums.

The dog owners in the New Town area used streets for walking dogs more than parks. This result was different from the general respondents in the New Town area. The reason is worth examining.

According to questionnaire results, the breeds of dogs kept in the New Town area comprise 77% small-size breed, 15% medium-size breed, and 8% large-size breed whereas in the Sprawling area, it is 56% small-size breed, 37% medium-size breed and 7% large-size breed. Thus, there was a difference in the breeds owned has difference.

Regarding the ownership of cars, 96% of dog owners in the New Town area and 89% of dog owners in the Sprawling area had their own car. The percentages had a substantial difference from the ownership of one’s own car (Figure 15 and 16).

Only few dog owners used dog parks or dog cafes in both areas; and there were no such facilities near each area. To bring the dogs to the vet, it was popular for dog owners to use their own car; they made friends while walking their dogs.

4. COMPARISON OF NEIGHBORHOOD WALKABILITY

WHO’s age-friendly cities guideline provides five criteria for evaluating the physical environment for accessibility:

1. Neighborhood walkability
2. Accessibility of public spaces and buildings
3. Accessibility of public transportation vehicles
4. Accessibility of public transportation stops
5. Affordability of housing

This study addressed “neighborhood walkability,” “accessibility of public spaces,” “accessibility of public transportation vehicles,” and “accessibility of public transportation stops.”

In the questionnaire, “neighborhood walkability,” was linked to shopping, and “accessibility of public spaces” was associated with taking a walk. “Accessibility of public transportation” and “accessibility of public transportation vehicle” were examined using a map. The guideline cites the distance for evaluating “accessibility of public transportation” as 500m.

According to the survey results, respondents went shopping on foot or in their own cars. The reason to choose these two ways should be examined to evaluate whether their living areas were walkable neighborhoods or not. The survey results revealed that public open spaces were rather scarce in the Sprawling area.

Access to public transportation in the New Town area was not so bad considering on the map, although there were many slopes and a probability for these slopes to become a difficulty. Access to the Sprawling area was bad because the train station was located far on the edge of this area and there were only community buses.

5. CONCLUSION

This study revealed that the younger generation undertook trips to pick up their children, although this was not mentioned in the previous studies on elderly people.

In the New Town area, the younger generation has been increasing but because of the development, public open spaces have been decreasing. The shopping center is outdated making it difficult to develop a walkable neighborhood. In the Sprawling area, there are almost no public open spaces, and residents of this area use street without pedestrian for their walking. This area is covered with small detached houses and is undergoing a changes of population balance.

Dog owners comprise a small percentages and it was difficult to extract concrete results; however, there are many points on which precise surveys should be conducted, such whether it is standard for residents to not use parks for walking dogs or whether in general, cars and use them to go somewhere with their dogs as well as have a walkable neighborhood since the population of dog owners is currently increasing in Japan.

This study clarifies many points that require more precise investigation and they are parts to make sustainable community.

ACKNOWLEDGEMENTS

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REFERENCES:

(Suita City, 2015) Suita City "Suita City Master plan 2015 – 2024" Suita City, 2015

(Suita City, 2018) Suita City Web page <http://www.city.suita.osaka.jp/home/soshiki/div-somu/somu/001411/004511/004520.html> (last access April 24, 2018)

1224 ENERGY TRANSITION AND NEOLIBERALISM, AGREEMENT IS POSSIBLE? THE CASE OF GREEN BUILDING IN GURUGRAM, DELHI, INDIA

ABSTRACT

This present proposal discusses how stakeholders understanding energy transition. Energy transition is often reduced to a new political program to develop green energy including economic and social transformation. Thus we interest to focus about energy policies, particularly in a Region engaged in a development of urbanization program included energy transition. India is involved in these issues on the international stage. India government initiatives conducted among other to create “International solar tears”. This program is social implication, build green and develop renewable energy is also a purpose to create job and raise the standard of living. However, the “key economic stakeholders” of those green programs became dominant in the process of negotiation. They are social consequences remote of sustainable approach but relevant neoliberalism process. In the present study, a green building was analysed using the entrepreneurial approach. The result show that energy policies be operatives and challenging economic and social transformation if local stakeholders will be capable in the process of sustainable urbanism. Though economic globalization influenced our capacities to shoulder a regulatory role in “making of the territories”. It is the result of including more and more stakeholders where the active roles are in the hand of few individuals, those dominated other stakeholders and put a spin horizontal governance. Sustainable development was largely broadcast in political discourse since three decades. Gradually this term is substituted in climate change discourses by “energy transition”. In human science, particularly in France (Verdeil E., Jaglin S., 2015; Rocher L., 2015; Burger C.,2014) there is agreement to rethinking what energy transition it means for research. In this paper, we don’t used transition management studies approach because they are don’t care spatial and political aspects (Coutard O., Rutford J., 2014, Bridge G). Our research is aligned with approach that considers energy transition is multiple and are interested in spatial issues. If they are not agreements to know how exactly this term cover, it’s was interesting to analysed how this term is usually used by political stakeholders and how it is field for citizens. This article focuses on the India government’s policy for “new energy paradigm”. In this way, a lot of political programs emerge to “transform” the city. For example, development of green energy (International Solar tears), green construction (GRIHA) and smart cities. Focusing to Gurgaon which is a typical example of new urban planning. The city was built since 1980 by private companies without global plan of urbanization and are is considered as a “modern city” with “innovative program” of development but we assumed that this urbanization is “geomarketing”. Key words: energy transition, neoliberalism, sustainable urbanism, energy policies, greenbuilding.

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SS02.3. Smart Cities Initiatives for the 21st Century: Myth or Reality

1426 ACHIEVEMENTS OF NATIONAL MISSIONS IN DEVELOPING URBAN INFRASTRUCTURE: INTROSPECTION THROUGH RESPONSES OF CITIES TOWARDS SMART CITIES MISSION

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ABSTRACT

An evident reality in the 21st century is the pressure on the infrastructure, created in Indian cities due to the increasing population. In large cities the problem of weak infrastructural situation and its importance in overall development, was highlighted in the Eleventh Plan. The High Powered Expert Committee constituted by Government of India, on urban infrastructure and services was among the first to assess the demands and the immediate attention to be given to the infrastructure deficits and state of poor service delivery. Although there have been various national missions initiated by the Government of India since last ten years focusing on urban infrastructure in India, the latest one is the Smart Cities Mission. However, it is important to examine how this mission is different from other missions and more importantly what is the response from cities. Therefore, the primary objective of this paper is to study the perspective of the national government about infrastructure needs of Indian cities as reflected in general in the National Missions and in specific in smart cities mission. The study also examines the pattern in responses of the cities, in terms of type of projects and scale of investments, as an indicator, which may explain the priority of cities. The guideline of smart cities mission was studied along with other two recent national missions namely JNNURM and AMRUT. The overlaps between three of these missions were observed on the basis of Objectives, Duration, Selection of cities and Coverage, Admissible components and Fund allocation. On the other hand, the responses of nineteen sample cities (selected on basis of their recurrence in the three missions) have been analyzed through the lens of projects with the help of City Development Plans (CDPs) submitted during JNNURM, State Annual Action Plan (SAAP) before AMRUT and the Smart City Proposals submitted during the Stage 2 of the SMART City challenge. Two of these eighteen cities, Ahmedabad and Bhubaneswar were then selected as case cities where all proposed projects were reviewed through data collected from key municipal officials during interview. Major findings of the study are that, although a new strategy was made to make the cities smart, it is evident that national government failed to understand the priority of cities. Almost all mission cities have repeatedly proposed projects related to water supply, sewerage and transportation, during JnNURM, AMRUT and Smart cities mission. It is interesting to note that cities have suitably repackaged the same old project in order to avail the funds.

Keywords: Smart Cities, Urban Infrastructure, National Missions, JnNURM, AMRUT

1 BACKGROUND TO THE STUDY

1.1 Introduction

Each city has its own particular history, culture and character (Agentschap NL, 2015). With the evolving times there is a need to sustain, protect and re-establish the urban texture of these cities. At the rate of 2.47%, India is urbanizing. About 31.3% or 37.71 million of its aggregate is currently urban (Chandramouli, 2011). As indicated by McKinsey Global (2010), by 2025 it will add 215 million to its urban areas which will increase the urban population to 38%. As a result, the key actors of the cities need to operate holistically, using the majority of their assets, to face the difficulties and also handle the potentialities that the city has (ISO/IEC JTC 1, 2014).

The increasing population and its relocation will put enormous weight on its megacities, 7395 towns and 1456 urban agglomeration (according to Census of India, 2011) for enhanced infrastructure and better service delivery. The enormous pressure on civic infrastructure like water supply, drainage, solid waste management etc. has also resulted in inadequate investment for the same or vice-versa. This can have two direct impacts; *firstly*, almost the entire urban poor living in slums and unauthorized colonies in the cities, are deprived of the basic utilities like water, sanitation, education and also health services. *Secondly*, inadequate infrastructure has a negative economic growth rate of India by reducing its Gross Domestic Product (GDP) by 1-2% annually (Rani, 2015).

1.2 Issues faced by ULBs

Lack of critical urban infrastructure being a severe foundational challenge of cities and towns includes inadequate provision and maintenance of infrastructure, lack of finances for the same, uneven development and low quality of infrastructure and most importantly the governance of infrastructure.

Governance of infrastructure primarily depends on the capacity of urban local bodies to raise taxes. Specifically, in India urban local bodies largely depend on grants from government (Kumar, 2017). After the 74th Constitutional Amendment Act³¹⁵, Municipalities have been regarded agencies responsible for provision and maintenance of services. But history says that the ULBs of almost all the cities have been very weak in the efficient collection of revenue and also in imposing

³¹⁵ To make decentralization strong, the 74th Constitutional Amendment Act came into being in June 1993. The main factors of this Act are structure and composition, formation of wards committees, seats reservation, functions and powers, finances, elections and planning committees of district and metropolitan areas. The ULBs will take up responsibilities for urban planning, water supply, social and economic planning, upgradation of slums, public health.

low user charges (Gupta, 2016). Therefore, the consequent shrinkage of local resource base and fiscal incapability has deteriorated the situation of these civic bodies (Kim, 2003). The High Powered Expert Committee (HPEC 2011) on urban infrastructure and services after the Eleventh Plan defined the demands and the immediate attention required to be given to the infrastructure deficits and urban state service delivery. Therefore, the focus of the infrastructural development strategy should be on the accumulation of higher tax and non-tax revenue through internal sources, external borrowing, private-public partnerships, mobilizing funds through bonds and other innovative financial instruments (Kundu, Politics and Economics of Economic Growth, 2011).

1.3 Missions and Programs on Urban Infrastructure in the Last Decade

If an effort is taken to list down the issues from various sources, then there would be broadly three issues with regard to urban infrastructure--- poor governance, low capacity of local bodies, and also financial challenges. In the light of these problems, the Central Government has launched various missions and programs on Urban Infrastructure, the latest being the Smart Cities Mission.

Starting from the year 1979, Integrated Development of Small and Medium Towns (IDSMT) was the first Urban Development Scheme, which continued till 2005, with a time period of 26 years. During this same time period, another program, 'Mega City' started in the year 1993 with duration of 12 years. In the last decade, starting from 2005, the Jawaharlal Nehru National Urban Renewal Mission (JnNURM) continued till 2014 after which in 2015, Atal Mission for Rejuvenation and Urban Transformation (AMRUT) was announced along with The Smart Cities Mission by the present Government.

2 AIM AND RESEARCH OBJECTIVES

Although there have been a lot of Initiatives, Missions and Programs throwing a light on Urban Infrastructure in India, by the Government it is important to see that how Smart Cities Mission being the latest one is important from others and moreover what is the response from the cities. Therefore, this exploratory study leads us to the following aim and research objectives.

2.1 Aim

To understand the responses of the cities towards the National Missions in the Infrastructure Sector

2.2 Research Objectives

- ❖ To study the perspective of the national government about infrastructure need of Indian Cities as it is reflected from the National Missions
- ❖ To explore the pattern in responses of projects and investments in the urban infrastructure sectors as perceived by Indian cities in the context of National Missions

3 SELECTION OF SAMPLE CITIES AND CASE CITIES

To understand the perspective of the National Government in the formulation of guidelines, the three missions (JnNURM, AMRUT and SMART Cities Mission) focusing entirely on urban infrastructure have been studied, to observe the overlaps and differences with the help of their Mission Statement and Guidelines. On the other hand, to understand the pattern of responses of the cities through the lens of project and investments, 19 sample cities and 2 case cities were selected. For the purpose of selection of the sample, the recurrence of the smart cities in the earlier two missions i.e. JnNURM and AMRUT has been selected. It was noticed that 19 out of the 61 Cities (considered till the Second Round of Smart City Challenge for this study³¹⁶- 61 SMART cities out of the total 100) have been selected in all the three missions. Two case cities--Bhubaneswar and Ahmedabad were selected for interviewing the key Municipal Officials on the basis of the above objectives.

Table 1: List Of Complete 100 Smart Cities.

³¹⁶ The complete round of 100 selected Smart Cities has been announced in January 2018, but for this study, only cities declared up to the Second Round have been considered. Also, two case cities out of the 19 Sample Cities had to be selected for Primary interviews with the officials.

FIRST	FAST TRACK	SECOND	THIRD	FOURTH
Bhubaneswar	Lucknow	Amritsar	Thiruvananthapuram	Erode
Pune	Warangal	Kalyan	Naya Rayapur	Saharanpur
Jaipur	Dharamasala	Ujjain	Rajkot	Moradabad
Surat	Chandigarh	Tirupati	Amravati	Bairelly
Kochi	Raipur	Nagpur	Patna	Itanagar
Ahmedabad	New Town	Mangalore	Karimnagar	Silvassa
Jabalpur	Bhagalpur	Vellore	Muzaffarpur	Diu
Visakhapatnam	Panaji	Thane	Puducherry	Kavaratti
Solapur	Port Blair	Gwalior	Gandhinagar	Bihar Sharif
Devnagere	Imphal	Agra	Srinagar	
Indore	Ranchi	Nashik	Tiruchirapalli	
New Delhi	Agartala	Rourkela	Sagar	
Coimbatore	Faridabad	Kanpur	Karnal	
Kakinada		Madurai	Satna	
Belgaum		Tumakuru	Bangalore	
Udaipur		Kota	Shimla	
Guwahati		Thanjavur	Dehradun	
Chennai		Namchi	Tiruppur	
Ludhiana		Jalandhar	Pimpri Chinchwad	
Bhopal		Shimoga	Bilaspur	
		Salem	Pasighat	
		Ajmer	Jhansi	
		Varanasi	Jammu	
		Kohima	Dahod	
		Hubli-Dharwad	Tirunelveli	
		Aurangabad	Thoothukudi	
		Vadodara	Aizawl	
		Srinagar	Allahabad	
			Aligarh	
			Gangtok	
TOTAL:	20	13	28	30
				9

Table 2: 19 Sample Cities Selected On The Basis Of The Recurrence Of The Three Missions

STATES	CITIES	SMART (2015)	AMRUT (2015)	JNNURM (2005-12)	STATES	CITIES	SMART (2015)	AMRUT (2015)	JNNURM (2005-12)
	DELHI				PUNJAB	Jalandhar			
GOA	Panaji					Amritsar			
KERALA	Kochi					Chandigarh			
RAJASTHAN	Jaipur					Ludhiana			
	Udaipur				KARNATAKA	Hubli-Dharwad			
	Kota					Shimoga			
	Ajmer					Tumakuru			
TAMIL NADU	Coimbatore					Mangalore			
	Vellore					Belgaum			
	Madurai					Devanagere			
	Chennai				ANDHRA PRADESH	Tirupati			
	Thanjavur					Kakinada			
	Salem					Visakhapatnam			
MAHARASTRA	Solapur				BIHAR	Bhagalpur			
	Kalyan				ODISHA	Rourkela			
	Nagpur					Bhubaneswar			
	Thane				MADHYA PRADESH	Gwalior			
	Aurangabad					Ujjain			
	Pune					Bhopal			
	Nashik					Indore			
UTTAR PRADESH	Varanasi					Jabalpur			
	Kanpur				WEST BENGAL	New Town			
	Agra				ASSAM	Guwahati			
	Lucknow				TELENGANA	Warangal			
	Faridabad				JHARKHAND	Ranchi			
JAMMU AND KASHMIR	Srinagar				MANIPUR	Imphal			
GUJARAT	Vadodara				HIMACHAL PRADESH	Dharamashala			
	Ahmedabad				SIKKIM	Namchi			
	Surat				CHATTISGARH	Raipur			
NAGALAND	Kohima				ANDAMAN AND NICOBAR	Port Blair			
TRIPURA	Agartala								

	Cities selected under 1 Mission
	Cities selected under 2 Missions
	Cities selected under 3 Missions

4 APPROACH AND METHODOLOGY

In order to fulfill the above two objectives, the following two paragraphs focus on the approach and the detailed methodology adopted for it.

- ❖ **To study the perspective of the national government about infrastructure need of Indian cities as it is reflected from the National Missions**

There were two sub-tasks which had been identified for establishing this particular objective. *Firstly*, the Mission Statement and Guidelines of the three missions (JnNURM, AMRUT and SMART Cities Mission) were reviewed on the basis of four parameters--- i) aim, objectives and duration ii) selection of the cities and coverage iii) focus areas / admissible components and iv) fund allocation. *Secondly*, the common areas on the basis of these four parameters were observed by preparing tables and matrices, in which the overlaps and the differences were highlighted with different shades of color.

- ❖ **To explore the pattern in sectors of urban infrastructure as perceived by Indian cities in the context of National Missions**

For analyzing these missions from the perspective of the Indian cities, two sub tasks had been chalked out in order to understand their responses. *Firstly*, patterns in the projects were tried to be studied in the proposal documents prepared by the 19 sample cities after the announcement of the Missions--- City Development Plans (CDPs) submitted in the JnNURM phase and the Smart City Proposal (SCP) documents submitted by the cities in the Stage 2 of SMART City Challenge. The projects appearing in both the missions were highlighted and a final Matrix has been prepared for the Infrastructure Sectors across Cities and Missions. *Secondly*, the pattern in the investments for these infrastructure projects by the 19 cities were studied similarly by preparing Scatter Diagrams through CDPs in the JnNURM Mission and Bar Graphs for the investments made on the infrastructure projects through SCPs in the SMART City Mission and State Annual Action Plans (SAAPs) submitted by the cities for the AMRUT Mission.

5 INFRASTRUCTURE NEEDS OF CITIES: PERSPECTIVE AND APPROACH OF NATIONAL GOVERNMENT

To understand the perspective of the government, the Mission Statement and Guidelines of the three Missions --- JNNURM, AMRUT and SMART Cities Mission have been studied to observe the overlaps and differences. The following

four parameters have been selected for this purpose and to see how the Smart Cities Mission is different from the other two.

- Aims, Objectives and Duration
- Selection of Cities and Coverage
- Focus Areas / Admissible Components
- Fund Allocation

5.1 Aims Objectives and Duration

All the three missions mentioned above have taken place in the course of ten years but are of varied durations. Starting with the JNNURM Mission, the first large scale mission on urban infrastructure, took place in the year 2005-06 and continued for seven years. After the year 2012, there were 2 more years of extension up to the year of 2014 (MoUD, 2011). In June 2015 two missions on urban infrastructure were announced by the present government--- AMRUT and SMART City Mission having a time duration of five years which means it would continue till 2019-20. However, these missions had a specific aim and a clear set of objectives which are shown in the table according to their Mission Statement and Guidelines.

Table 33: Overlaps For Aim Objectives And Duration Among The Three Missions

Parameters	Missions		
	JnNURM	AMRUT	SMART
Aim	To “encourage reforms and fast track planned development of identified cities. Focus is to be on efficiency in urban infrastructure and service delivery mechanisms , and accountability of ULBs towards citizens.”	“Providing basic services (e.g. water supply, sewerage, urban transport) to households and build amenities in cities which will improve the quality of life for all, especially the poor and the disadvantaged is a national priority.”	
Objectives	a) Integrated development on city infrastructure b) linkages between creation and management of assets c) adequate funds for meeting deficiencies in urban infrastructural services d) Dispersed urban settlements e) To increase the delivery of civic amenities f) More focus on urban renewal programme g) Providing the urban poor with basic services	a) ensuring that every household should have tapped water supply and also a sewerage connection b) Scaling-up the aesthetic and amenity value of cities by developing greenery and properly maintained open spaces c) Decreasing pollution by adopting public transport or constructing facilities for non- motorized transport	To basically promote those cities that would provide the basic infrastructure by giving a decent quality of life to its people, and also a clean and sustainable environment by using ‘Smart’ solutions.
Duration	(2005-12), with 2 years of extension	Financial Year 2015-16 to 2019-20	Financial Year 2015-16 to 2019-20

Source: Author, Data based on Mission Statement and Guidelines of JnNURM (2005), AMRUT (2015) and SMART City Mission (2015)

The above table points at three important observations. *Firstly*, the basic aim of two out of the three missions, focuses on basic civic infrastructure. *Secondly*, the SMART Cities Mission does not have any particular aim mentioned in the Mission Statement and Guidelines, however the objective clearly indicates basic infrastructure. *Thirdly*, if the duration of the missions is considered, then excepting the JNNURM Mission, both AMRUT and SMART are ongoing and they have almost the same time duration.

5.2 Selection of Cities and Coverage:

The cities selected for all the three Missions have a different criterion but the basis is population for both JnNURM and AMRUT Mission. The Selection Process of Smart Cities Mission however was altogether different.

Table 34: Selection Criteria Of Cities Among The Three Missions

JnNURM	AMRUT	SMART
A) Cities/ UAs with 4 million plus population as per 2001 census- 7 B) Cities/ UAs with 1 million plus but less than 4 million populations as per 2001 census- 28	Five hundred cities will be taken up: i. All Cities and Towns with a population of over one lakh with notified Municipalities, including Cantonment Boards (Civilian areas). ii. All Capital Cities/Towns of States/ UTs, not covered in (i) ,	A) Intra-State Competition after letter sent to the State Governments B) On the basis of responses from the states 100 potential smart Cities are announced C) Each potential Smart City prepares its proposal with the help of a Consultant.

JnNURM	AMRUT	SMART
C] Selected Cities/ UAs (State Capitals and other cities/ UA of religious/ historic and tourist importance- 28	iii. All Cities/ Towns classified as Heritage Cities by MoUD under the HRIDAY Scheme , iv. Thirteen Cities and Towns with a population above 75,000 and less than 1 lakh , on the stem of the main rivers v. Ten Cities from hill states, islands and tourist destinations (not more than one from each State)	D] Stage 2 proposals submitted which are evaluated by experts E] Selected Cities declared as Round 1 Smart Cities

Source: Author, Data based on Mission Statement and Guidelines of JnNURM (2005), AMRUT (2015) and SMART City Mission (2015)

To understand the overlaps in the coverage areas, the following table has been prepared for the three missions.

Table 35: Recurrence Among 61 Smart Cities (Declared Upto The Second Round) Across The Three Missions Along With Population And Class Sizes

STATES	CITIES	SMART (2015)	AMRUT (2015)	JNNURM (2005-12)	POPULATION	CLASS SIZE	STATES	CITIES	SMART (2015)	AMRUT (2015)	JNNURM (2005-12)	POPULATION	CLASS SIZE
	DELHI				16787941	I	PUNJAB	Jalandhar				862886	I
GOA	Panaji				114759	I		Amritsar				1132383	I
KERALA	Kochi				595575	I		Chandigarh				1055450	I
RAJASTHAN	Jaipur				3046163	I		Ludhiana				1618879	I
	Udaipur				474531	I	KARNATAKA	Hubli-Dharwad				943857	I
	Kota				1001694	I		Shimoga				322650	I
	Ajmer				542321	I		Tumakuru				302143	I
TAMIL NADU	Coimbatore				1050721	I		Mangalore				623841	I
	Vellore				185803	I		Belgaum				488157	I
	Madurai				1017865	I		Devanagere				434971	I
	Chennai				4646732	I	ANDHRA PRADESH	Tirupati				287482	I
	Thanjavur				222943	I		Kakinada				312538	I
	Salem				829267	I		Visakhapatnam				1728128	I
MAHARASTRA	Solapur				951558	I	BIHAR	Bhagalpur				412209	I
	Kalyan				1247327	I	ODISHA	Rourkela				272721	I
	Nagpur				2405665	I		Bhubaneswar				885363	I
	Thane				1886941	I	MADHYA PRADESH	Gwalior				758244	I
	Aurangabad				1175116	I		Ujjain				515215	I
	Pune				3124458	I		Bhopal				1798218	I
	Nashik				1486973	I		Indore				1964086	I
UTTAR PRADESH	Varanasi				1198491	I		Jabalpur				1055525	I
	Kanpur				2765348	I	WEST BENGAL	New Town				402844	I
	Agra				1585704	I	ASSAM	Guwahati				957352	I
	Lucknow				2817105	I	TELENGANA	Warangal				753438	I
	Faridabad				1414050	I	JHARKHAND	Ranchi				1656918	I
JAMMU AND KASHMIR	Srinagar				1264202	I	MANIPUR	Imphal				277196	I
GUJARAT	Vadodara				1670806	I	HIMACHAL PRADESH	Dharamashala				30764	III
	Ahmedabad				5577940	I	SIKKIM	Namchi				12190	IV
	Surat				4467797	I	CHATTISGARH	Raipur				1123558	I
NAGALAND	Kohima				267988	I	ANDAMAN AND NICOBAR	Port Blair				108058	I
TRIPURA	Agartala				400004	I							
	Cities selected under 1 Mission												
	Cities selected under 2 Missions												
	Cities selected under 3 Missions												

Source: Author, Data Based On Mission Statement and Guidelines of Jnnurm (2005), AMRUT (2015) And SMART City Mission (2015), Population Records from Census of India, 2011

From the above table 19 out of 61 cities have a recurrence of all the three missions, 27 out of 61 cities show a recurrence of two missions and the remaining i.e. 15 cities have appeared only as Smart Cities. Population along with class sizes (according to Census of India, 2011) have also been shown for all the 61 cities in order to understand that almost all are of Class I Size.

5.3 Focus Areas / Admissible Components

The table below shows the mission components in brief, with the idea that the overlapped components and Focus Areas can be observed. It is seen that Water Supply, Sewerage and Sanitation, Solid Waste Management, Urban Transport are actually the focus areas of all the three missions. Similarly, Storm Water Drainage and Slums are also important as they have been the admissible components in two missions. In the JnNURM Mission, heritage areas development has also been

one of the Admissible Components. Focus on IT Connectivity and Digitalization is the most unique component in the Smart City Mission.

Table 6: Comparison Of The Three Mission Components

JNNURM	AMRUT	SMART
Water Supply & Sanitation	Water supply	Adequate water supply
Sewerage & SWM	Sewerage facilities and septage management	Sanitation including Solid Waste Management
Storm water drainage	Storm water drains to reduce flooding	
Urban Transport	Pedestrian, non-motorized and public transport facilities, parking spaces, creating and upgrading green spaces, parks and recreation centers, especially for children.	Efficient urban mobility and transport
Parking Lots on PPP Basis		
Development of heritage areas		Safety and Security of Citizens
Prevention & rehabilitation of soil erosion/landslide areas		Sustainable environment
Preservation of water bodies		
Basic Services for Urban Poor (BSUP)		Affordable housing, especially for the poor
Redevelopment of inner city areas		Assured electric supply
		Robust IT Connectivity and digitalisation
		Health and education

	1 Mission
	2 Missions
	3 Missions

SOURCE: Author, Data Based On Mission Statement and Guidelines of JnNURM (2005), AMRUT (2015) And SMART City Mission (2015)

5.4 Fund Allocation

For getting an idea about the proportion of funds for each mission under each head, the guidelines of the three missions have been referred. The structure of JNNURM fund allocation was somewhat different therefore a separate table has been analyzed for it.

Table 8: Comparison of The Three Mission Components

MISSIONS	PROJECT FUNDS	A & OE	A & OE (MoUD)	REFORMS
AMRUT	93	5	2	
SMART	80	8	2	10

Category of Cities/Towns/UAs	Grant		ULB or Para-State Share/Loan from Financial Institutions
	Centre	State	
Cities/UAs with 4 million plus population as per 2001 census	35 %	15 %	50 %
Cities/UAs with million plus but less than 4 million population as per 2001 census	50%	20%	30%
Cities/towns/UAs in North Eastern States and Jammu & Kashmir	90%	10%	-
Cities/UAs other than those mentioned above	80%	10%	10%
For setting up de-salination plants within 20 Kms. from sea-shore and other urban areas predominantly facing water scarcity due to brackish water and non-availability of surface source.	80%	10%	10%

Source: Author, Data Based On Mission Statement and Guidelines of JnNURM (2005), AMRUT (2015) And SMART City Mission (2015)

The proportion of Funds are different for AMRUT and SMART City Mission but the heads under which funds are allocated, are the same.

6 PERSPECTIVE AND RESPONSE FROM CITIES TOWARDS NATIONAL GOVERNMENT

6.1 Concept of Sectors

Before getting into the actual scenario of the cities a National Assessment tool was required to study, to understand the investment requirements due to the construction of projects in the past years. There are mainly four broad sectors which the HPEC Committee had recognized (HPEC, 2011).

- ❖ Water Supply
- ❖ Sewerage and Sanitation
- ❖ Solid Waste Management

❖ Urban Transport and Roads

Figure 1: Capital Expenditure Of The Sectors Of Urban Infrastructure

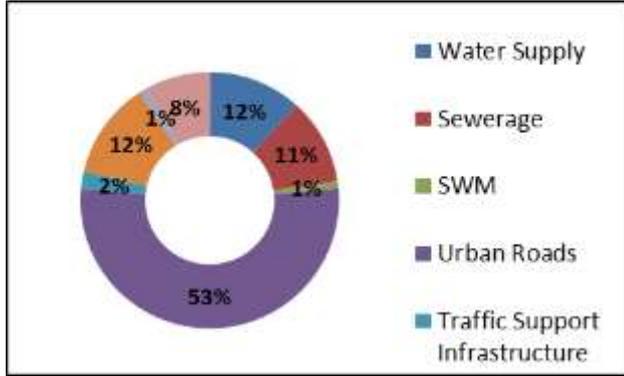
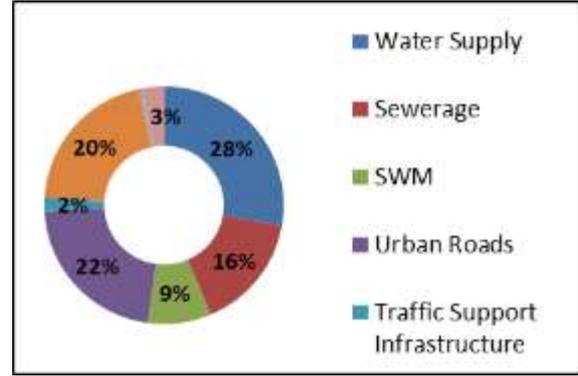


Figure 2: Operation Expenditure Of The Sectors Of Urban Infrastructure



Source: HPEC Report, 2011

It is seen that the maximum capex is allocated for urban transport which is 53%. If the sectors of water supply, sewerage and Sanitation and SWM can be clubbed, then it can be observed that the second in position would be the sector of Water Supply and Sanitation. However, in the case of Opex it is the reverse. Water Supply and Sanitation has the maximum investment allocated for it and second in position is urban transport.

6.2 Analyzing City Responses through Projects and Investments

To understand the responses of the Cities, the development proposals submitted during the three missions were studied through the lens of Projects and Investments. In this case, CDPs (City Development Plans) and SMART City proposals have been taken into consideration as in the State Annual Action Plans (SAAPs) of AMRUT Projects do not have the detailed projects but the costing per sector is there which will be used in analysis of investments later.

6.2.1 Water Supply

From the CDPs and SMART Proposals the list of projects can be categorized into the above heads. If the projects of JNNURM are considered first, then it is observed that the project of Augmentation has got the maximum importance, as it has got multiple sub- projects under it.

Table 9: Comparison of Water Supply Projects Through CDPs & Smart City Proposals

CITIES	JNNURM							SMART					
	AUGMENTATION	METERING	WTP/UGROHT & TUBEWELLS	MONITORING/ MANAGEMENT	RAINWATER HARVESTING	GIS	CAPACITY BUILDING	SMART METERING	AUGMENTATION	ASSURED WATER SUPPLY	MANAGEMENT	IUWM	RAINWATER HARVESTING
AJMER	✓ 5	✓	✓ 4		✓			✓		✓			✓
BHUBANESWAR	✓ 5										✓		✓
IMPHAL	✓ 2	✓	✓ 2				✓						
KOCHI	✓ 3		✓ 2								✓		
KOHIMA	✓ 5	✓	✓ 2										✓
PANAJI	✓			✓ 5			✓	✓					✓
UJJAIN	✓ 2								✓				
AGRA	✓ 2		✓										
CHANDIGARH	✓		✓					✓	✓	✓			✓
AMRITSAR	✓ 2	✓ 3	✓ 2	✓									
JASALPUR	✓ 2												
KANPUR	✓ 2	✓ 2											
MADURAI	✓ 2		✓ 5						✓		✓		
NAGPUR	✓									✓			
RABPUR	✓ 3		✓							✓			
VADODARA	✓ 4	✓						✓				✓	✓
VARANASI	✓ 6				✓		✓	✓					✓
AHMEDABAD	✓ 2		✓ 2				✓		✓			✓	✓
DELHI	✓		✓	✓ 2							✓		✓

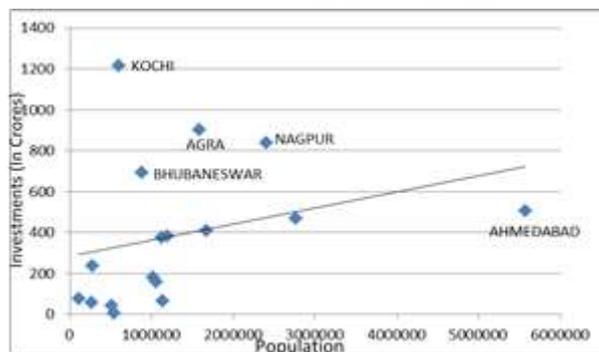
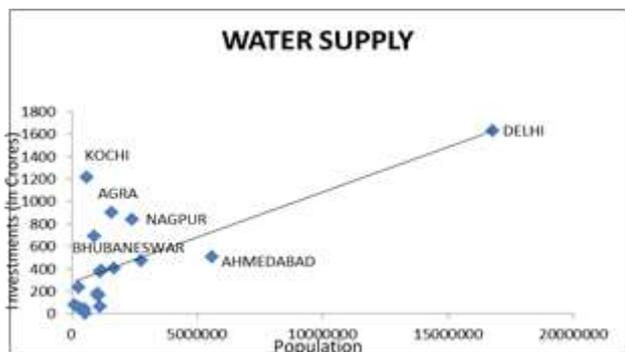
Source: Author, Data from CDPs and SMART City Proposals

Looking into the SMART City proposals, the project of Augmentation has been repeated. And Madurai and Ahmedabad are unique cases, as in spite of having 2 projects in JNNURM, it again has projects of similar nature in the SMART City Proposals. Similarly, is the case of the projects of Monitoring / Management and also Rainwater Harvesting as both have got priorities. Metering has however been named as 'Smart Metering' in the SMART City Proposals. However, as discussed in the literature review section, the concept of 'smartness' is not defined. If we look into the projects of the SMART Cities Mission--- IUWM and Assured Water Supply have been the new type of projects which can be included as smart solutions but has been implemented in only fewer cities.

Investment pattern for the water supply projects has also been studied, in which in this case scatter diagrams have been made from CDPs. Investment figures of CDPs have only been taken into account as it is the only completed mission. A relation is tried to be established between population numbers of the 19 sample cities and their investment figures.

Figure 3: Investment by Cities on Water Supply for JnNURM

Figure 4: Investment by Cities on Water Supply for JnNURM by excluding Delhi



Source: Author, Data from CDPs

As evident from the scatter diagram, there is a positive relationship between the two which means as the population rises, investments should also be higher. However, some cities like Kochi and Bhubaneswar not follow this relation. If their population figures are considered, it is seen that in comparison to the other cities, the investments for the water supply projects are extremely high. Agra and Nagpur can also be marked, but they have a comparatively higher population than Kochi and Bhubaneswar. In all the scatter diagrams, Delhi is being kept out of consideration because it has a population incomparable to the 19 other sample cities, being the national capital.

6.2.2 Sewerage and Sanitation

It is interesting to see that in this sector of sewerage and sanitation, which is one of the most important basic civic services, there is no smart element in the projects of the SMART Cities Mission if compared with the JNNURM Mission.

Table 36: Comparison Of Sewerage And Sanitation Projects Through CDPs & Smart City Proposals

CITIES	JNNURM						SMART						
	AUGMENTATION	STP/PUMPING STATIONS/ OXIDATION PONDS	PUBLIC TOILETS	DISPOSAL	MANAGE MENT	GIS	CAPACITY BUILDING	AUGMENTATION	SMART UTILITY DUCT	STP/PUMPING STATIONS	PUBLIC TOILETS	MANAGE MENT	TERTIARY WATER
AJMER	✓ 3	✓ 2	✓ 2										
BHUBANESWAR		✓			✓ 2					✓			
IMPHAL	✓												
KOCHI	✓												
KOHIMA	✓ 2	✓											
PANAJI	✓ 2			✓ 2	✓	✓							
UJJAIN	✓ 2										✓		
AGRA	✓	✓	✓	✓									
AMRITSAR	✓ 4	✓ 6			✓								
CHANDIGARH	✓	✓		✓								✓	✓
JABALPUR	✓			✓ 2									
KANPUR	✓ 2	✓			✓								
MADURAI	✓ 2	✓ 3											
HAAGPUR	✓			✓				✓	✓				
RAIPUR	✓ 2	✓									✓		
VADODARA	✓ 2	✓ 3											
VARANASI	✓ 3			✓			✓				✓	✓	✓
AHMEDABAD	✓ 2	✓ 2						✓					
DELHI	✓	✓							✓		✓		

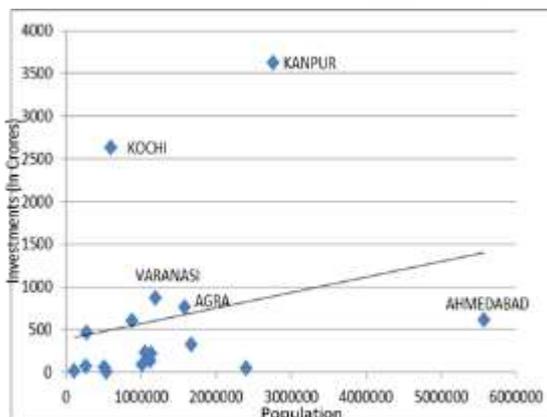
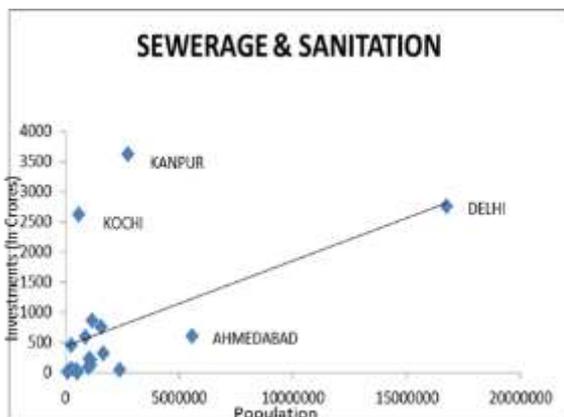
Source: Author, Data from CDPs, SMART City Proposals

If observed, the projects in both the missions are exactly similar in nature which question’s the meaning of the phrase ‘Smart Solutions’. If we just look at the JNNURM Proposals, the project of Augmentation has the maximum amount of projects and Ahmedabad is a unique case as in spite of having two projects in JNNURM, it was repeated in SMART City Proposals too.

From the scatter diagram, it is evident that although there is a positive relationship between the two variables, Kochi and Kanpur has an incomparable investment with respect to the other cities. However, Kanpur can still be justified as it has a very high population (third highest among the sample cities).

Figure 5: Investment by Cities on Sewerage and Sanitation for JnNURM

Figure 6: Investment by Cities on Sewerage and Sanitation for JnNURM by excluding Delhi



Source: Author, Data from CDPs

Among the low population cities, Kochi had extreme high the highest investment. As a matter of fact, Delhi which has a population of more than 1.5 Cr, has spent an almost equal amount in the same type of projects.

6.2.3 Solid Waste Management

In general, the basic projects of Solid Waste Management are almost similar for both the missions except the concept of RFID Bins, GIS Sensor Vehicles and the Management part

Table 37: Comparison Of Solid Waste Management Projects Through CDPs & Smart City Proposals

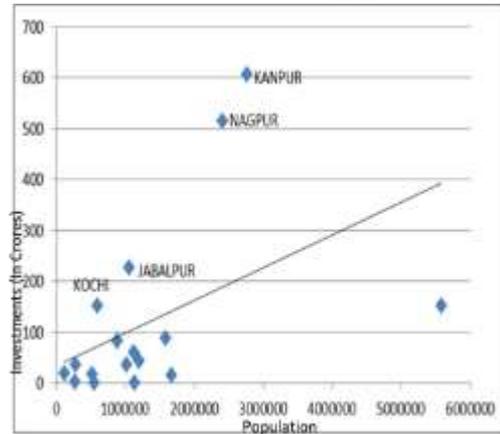
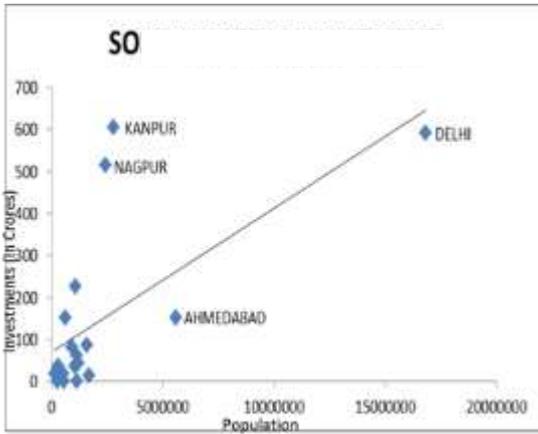
CITIES	JNNURM								SMART				
	SEGREGATION	COLLECTION	TRANSPORTATION	PROCESSING	DISPOSAL & LANDFILL	EQUIPMENTS	CAPACITY BUILDING	MANAGEMENT	GIS/RFID BINS/VEHICLES	MANAGEMENT	TRANSPORTATION	PROCESSING	DISPOSAL
AJMER				✓		✓		✓	✓ 3	✓			
BHUBANESWAR	✓	✓	✓ 2	✓	✓	✓						✓	
IMPHAL								✓				✓	
KOCHI	✓	✓		✓ 2	✓			✓					
KOHIMA		✓	✓ 2	✓	✓			✓					
PANAJI				✓				✓ 2	✓	✓			
UJJAIN				✓		✓		✓ 2	✓ 2		✓ 2		✓
AGRA								✓		✓			
AMRITSAR								✓	✓	✓			
CHANDIGARH		✓		✓	✓				✓				
JABALPUR									✓				
KANPUR				✓				✓ 2					
MADURAI		✓			✓					✓			
NAGPUR	✓	✓	✓ 2		✓ 2				✓			✓ 2	
RAIPUR	✓	✓	✓	✓	✓ 2					✓			
VADODARA		✓	✓	✓	✓				✓	✓		✓ 2	
VARANASI				✓	✓	✓ 5	✓	✓		✓			
AHMEDABAD		✓	✓		✓	✓ 2				✓			
DELHI				✓ 2	✓					✓		✓	

Source: Author, Data from CDPs, SMART City Proposals

where there is an intervention of some smart techniques. From the highlighted areas, it is seen that four projects in JNNURM--- Transportation, Processing, Disposal and landfill and Management has been of similar nature in the SMART City Proposals. Delhi, Panaji and Vadodara are unique cases, as for Delhi having 2 projects in JNNURM under processing got repeated in the SMART Cities Mission. In the SMART City Mission there are 2 projects in processing, in spite of having a project in JNNURM.

Figure 7: Investment by Cities on Solid Waste Management for JnNURM

Figure 8: Investment by Cities on Solid Waste Management for JnNURM by excluding Delhi



Source: Author, Data from CDPs

Even if Kanpur and Nagpur has a very high population, their investments had been very high as compared to the other cities of medium range population class cities. This is the reason, in the scatter diagram that Kanpur and Nagpur are extremely deviating from the trend line. Kochi and Jabalpur can also be considered as exceptions, as compared to the other cities in their respective classes, but their deviation is less from the trend line. This indicates that they do not show much an abnormality as the amount invested was almost at par with the demands of these cities.

6.2.4 Drainage

Excepting re-use of storm water, the projects of augmentation and construction of drains are absolutely similar if SMART City projects are compared with those in the JnNURM Projects.

Table 38: Comparison Of Drainage Projects Through CDPs & Smart City Proposals

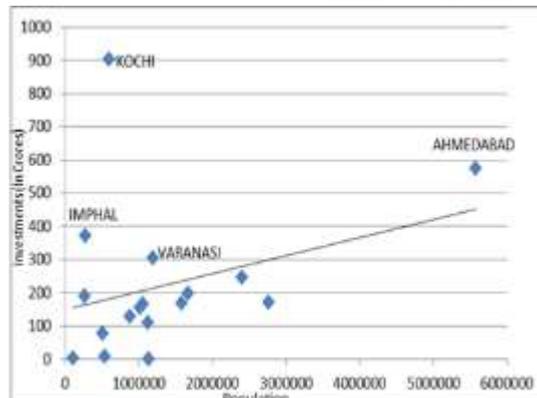
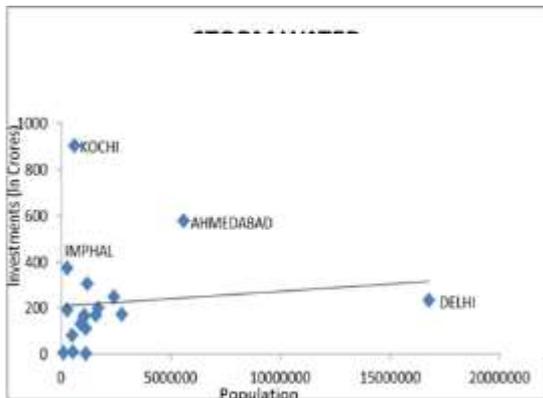
CITIES	JnNURM						SMART		
	AUGMENTATION	RIVER	DRAINS	O&M-MANAGEMENT	PUMPING STATION/OXIDATION PONDS	EQUIPMENTS	AUGMENTATION	DRAINS	RE-USE
AJMER	✓		✓ 3		✓	✓			
BHUBANESWAR			✓ 5						
IMPHAL		✓							
KOCHI	✓	✓			✓ 2				
KOHIMA	✓	✓							
PANAJI	✓			✓ 2					
UJJAIN			✓ 2				✓		
AGRA	✓					✓			
AMRITSAR	✓						✓		
CHANDIGARH	✓		✓						✓
JABALPUR			✓ 2						
KANPUR									
MADURAI	✓ 2				✓				
NAGPUR	✓		✓					✓	
RAIPUR			✓ 2						✓
VADODARA	✓		✓ 3						
VARANASI	✓		✓ 2	✓ 2	✓	✓			
AHMEDABAD	✓	✓ 2							
DELHI	✓								

Source: Author, Data from CDPs, SMART City Proposals

Although Re-use of Storm water is a novel project it has been used only in two cities, Nagpur and Amritsar. However, there are no unique cities where more than one project has been repeated under a project head.

Figure 9: Investment by Cities on Storm Water Drainage for JnNURM

Figure 10: Investment by Cities on Storm Water Drainage for JnNURM by excluding Delhi



Source: Author, Data from CDPs

In this case the trend line is almost constant in the first scatter diagram which means that there is a very weak relationship between the two variables. This is somewhat not possible, so the zoomed image of the scatters on the right image shows that. A positive relationship can be somewhat established in this image between the two variables. Excepting for Kochi, Ahmedabad, Imphal and Varanasi, where there is no positive relationship. It is more abnormal for Kochi and Imphal as they have less population falling in the small sized cities. Although Ahmedabad has very high population, it is showing as an exception because compared to the other cities in this sector, its investment for storm water drainage had been very high. If it can be compared to Delhi, which has a much higher population than Ahmedabad, the investment was much lesser.

6.2.5 Urban Transport

The sector of Urban Transport is perhaps the most interesting sector, as all the project heads in the JNNURM Mission has been repeated in the SMART City Mission. If only the JNNURM Mission is considered, construction of roads had the maximum amount of projects and has the similar projects in SMART Mission. Bhubaneswar, Imphal, Jabalpur, Kanpur, Madurai, Nagpur and Raipur are unique cases here as there is more than one project in JNNURM for these cities and they have been again taken up in SMART. Bhubaneswar and Panaji are two other unique cities as not only the construction of roads have been taken up twice, but along with it more project heads like monitoring, motorized and parking have also been repeated.

Table 39: Comparison Of Urban Transport Projects Through CDPs & Smart City Proposals

CITIES	JNNURM						SMART					
	MOTORIZED	NON-MOTORIZED	PARKING	MONITORING MANAGEMENT	ROADS	FLYOVERS/STB/WAYS BUS TERMINUS	URBAN MOBILITY & PARKING	GIS/MANA GEMENT	SSIT & PEDEST PLAN	MOTORIZED	ROADS	FOOTPATHS/FLYOVERS/ BUS TERMINUS
AJMER			✓		✓ 2	✓	✓	✓	✓			
BHUBANESWAR				✓	✓ 3	✓	✓	✓ 3	✓		✓	
IMPHAL				✓ 2	✓ 5	✓ 5	✓				✓	
KOCHI	✓ 4		✓	✓ 2	✓ 3		✓	✓				
KOHIMA					✓ 3	✓ 2	✓ 2	✓ 5				✓
PANAJI	✓	✓	✓ 3	✓	✓		✓		✓	✓ 2		
ULJAIN					✓ 2					✓		
AGRA	✓	✓			✓ 5	✓ 4	✓	✓ 2				
AMBITSAR	✓				✓ 2		✓		✓			
CHANDIGARH					✓	✓			✓	✓	✓	✓
JABALPUR					✓ 2					✓	✓ 3	
KANPUR	✓	✓	✓	✓	✓ 3				✓	✓	✓ 3	
MADURAI				✓	✓ 3	✓ 2	✓	✓ 3	✓	✓	✓	
NAGPUR	✓				✓ 3		✓			✓		✓ 2
RAIPUR	✓				✓ 5		✓ 2		✓	✓	✓	✓
VADODARA					✓	✓ 2			✓			
VARANASI	✓			✓	✓ 6	✓ 4	✓	✓	✓			
AHMEDABAD	✓ 2				✓	✓	✓		✓		✓	
DELHI	✓ 2		✓		✓	✓	✓ 2					

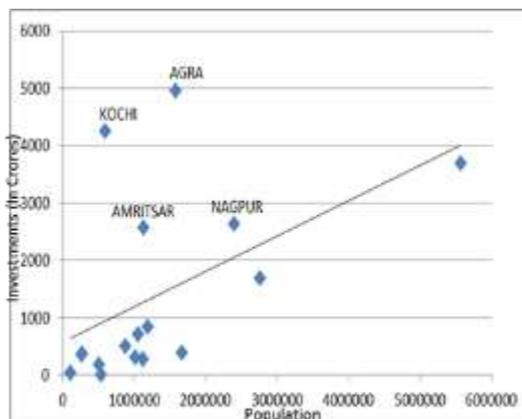
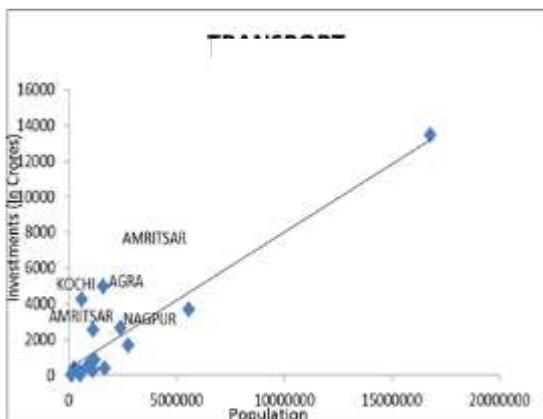
Source: Author, Data from CDPs, SMART City Proposals

8 out of 19 cities have repetition of the project--- roads, signifying that accessibility network within the cities are the real needs of the people. Traffic Management has been the priority project for four cities which highlights the fact of proper managerial expertise of the city. It is very shocking to city that only one city has taken the project of NMT as priority, wherein the country is trying to promote pollution-free transport.

The first scatter diagram on the left shows a perfectly positive relation between the two variables.

Figure 10: Investment by Cities on Urban Transport for JnNURM

Figure 11: Investment by Cities on Urban Transport for JnNURM by excluding Delhi



Source: Author, Data from CDPs

In the enlarged scatter diagram, there are distinctly four cities which can be seen as an exception. At least Kochi and Agra can be considered, as their investments are comparatively higher. Kochi can be a specific case, as it has less population and demand should be less. In the case of Agra and Nagpur, their population is on the higher side, which can still be considered. Out of the 19 cities, Delhi has the maximum investment, which is justifiable as its population is highest as compared to the others. In general, looking at the cost figures, it can be said that almost all the cities have tried to focus on roads and public transport, considering accessibility as a very important parameter in improving the quality of life.

Table 40: Comparison Of Slum And Related Projects Through CDPs & Smart City Proposals

CITIES	JNNURM							SMART					
	PHY INFRA	SOCIAL INFRA	NIGHT SHELTERS	HOUSING	REFORMS	EMPLOYMENT GENERATION	REDEVELOPMENT	PHY INFRA	SOCIAL INFRA	EMPLOYMENT GENERATION	NIGHT SHELTERS	HOUSING	REDEVELOPMENT
AJMER	✓			✓									
BHUBANESWAR				✓	✓							✓	
IMPHAL		✓ 3		✓	✓								
KOCHI	✓ 3	✓ 2						✓	✓	✓	✓		✓
KOHIMA	✓ 3											✓	
PANAJI				✓ 2				✓ 2					
UJJAIN													
AGRA	✓			✓	✓ 2	✓		✓				✓	
AMRITSAR	✓			✓									
CHANDIGARH													
JABALPUR	✓	✓ 3		✓									✓ 2
KANPUR	✓	✓		✓									
MADURAI	✓ 6												
NAGPUR	✓	✓		✓ 2									
RAIPUR	✓			✓			✓					✓	
VADODARA	✓ 3												
VARANASI	✓ 8	✓ 2											
AHMEDABAD					✓ 2			✓	✓ 4			✓	
DELHI	✓		✓	✓			✓ 2						

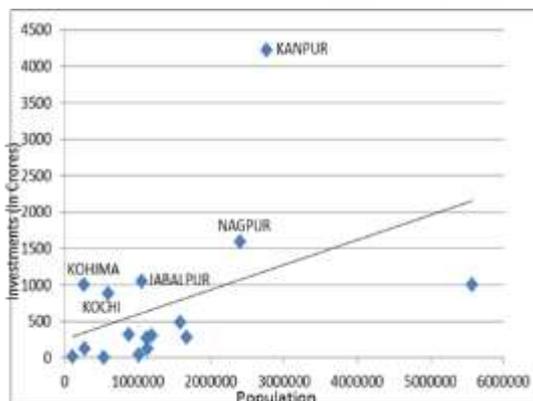
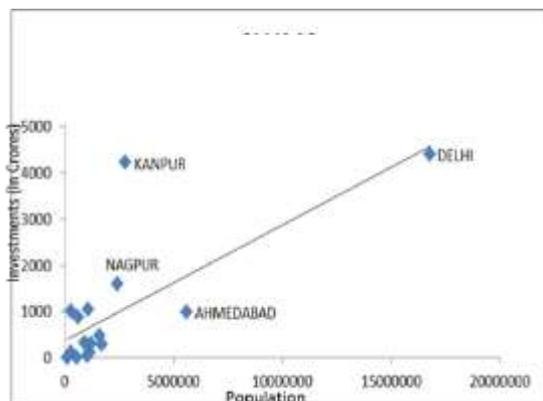
Source: Author, Data from CDPs, SMART City Proposals

6.2.6 Slums and Related Projects

In the JnNURM Mission there was a separate program for the LIG (Low Income Group) section known as Basic Services for Urban Poor (BSUP) which aimed at providing the basic infrastructure for the slums. However, in the SMART Cities Mission there was no separate program but one of the mission components was affordable housing for the poor. It is surprising to notice that if we look into the category of projects, for both the missions, then there is absolutely no difference in them. The projects for JNNURM have been repeated in the SMART Cities Mission and the major focus is on basic services for both the missions which encompassed physical and Social Infrastructure for the JNNURM Mission. Kochi is a unique case here as there is more than one project in both physical and social infrastructures in the JNNURM Mission, which has been again taken up in the SMART Cities. On the contrary, Ujjain and Chandigarh are also unique as they have not focused on slums in any of the missions.

Figure 12: Investment by Cities on Slums for JnNURM

Figure 13: Investment by Cities on Slums for JnNURM by excluding Delhi



Source: Author, Data from CDPs

There is a strongly positive relationship as in the scatter diagram, the points are extremely clustered towards the left. Kanpur and Nagpur had invested much in housing for the weaker sections. Although they have population on the higher side, but the costing for slums have been quite high as compared to the medium class sized cities. However, in the case of Jabalpur, Kohima and Kochi, their exceptionality is not much as they are closer to the trend line, and their margin is quite lower from that of Nagpur and Kanpur. If Delhi’s population is compared to Kanpur, then it is much higher, but their investment figures in slums have been equal.

6.3 City wise Priority of Sectors across the Missions on the basis of Projects:

If all the sectors are tried to be combined, with all the nineteen cities in one matrix across the three sectors, then the priority of the cities would look like the above matrix. The cities with their population and ranks have also been indicated so that it is easier to understand which population range class size city has focused on which sector. If it is looked at holistically, then Ajmer is the only city which has focused on four sectors. Bhubaneswar, Nagpur and Ahmedabad shows a priority in three sectors.

Table 41: Final Matrix Showing The Priority Sectors Of The Cities

Cities	Population	Urban Transport	SWM	Water Supply	Sewerage & Sanitation	Storm Water Drains	Slums
PANAJI	114759						
KOHIMA	267988						
IMPHAL	277196						
UJJAIN	515215						
AJMER	542321						
KOCHI	595575						
BHUBANESWAR	885363						
MADURAI	1017865						
CHANDIGARH	1055450						
JABALPUR	1055525						
RAIPUR	1123558						
AMRITSAR	1132383						
VARANASI	1198491						
AGRA	1585704						
VADODARA	1670806						
NAGPUR	2405665						
KANPUR	2765348						
AHMEDABAD	5577940						
DELHI	16787941						

	WATER
	SEWERAGE
	SWM
	STORM WATER
	URBAN TRANSPORT
	SLUMS

Source: Author

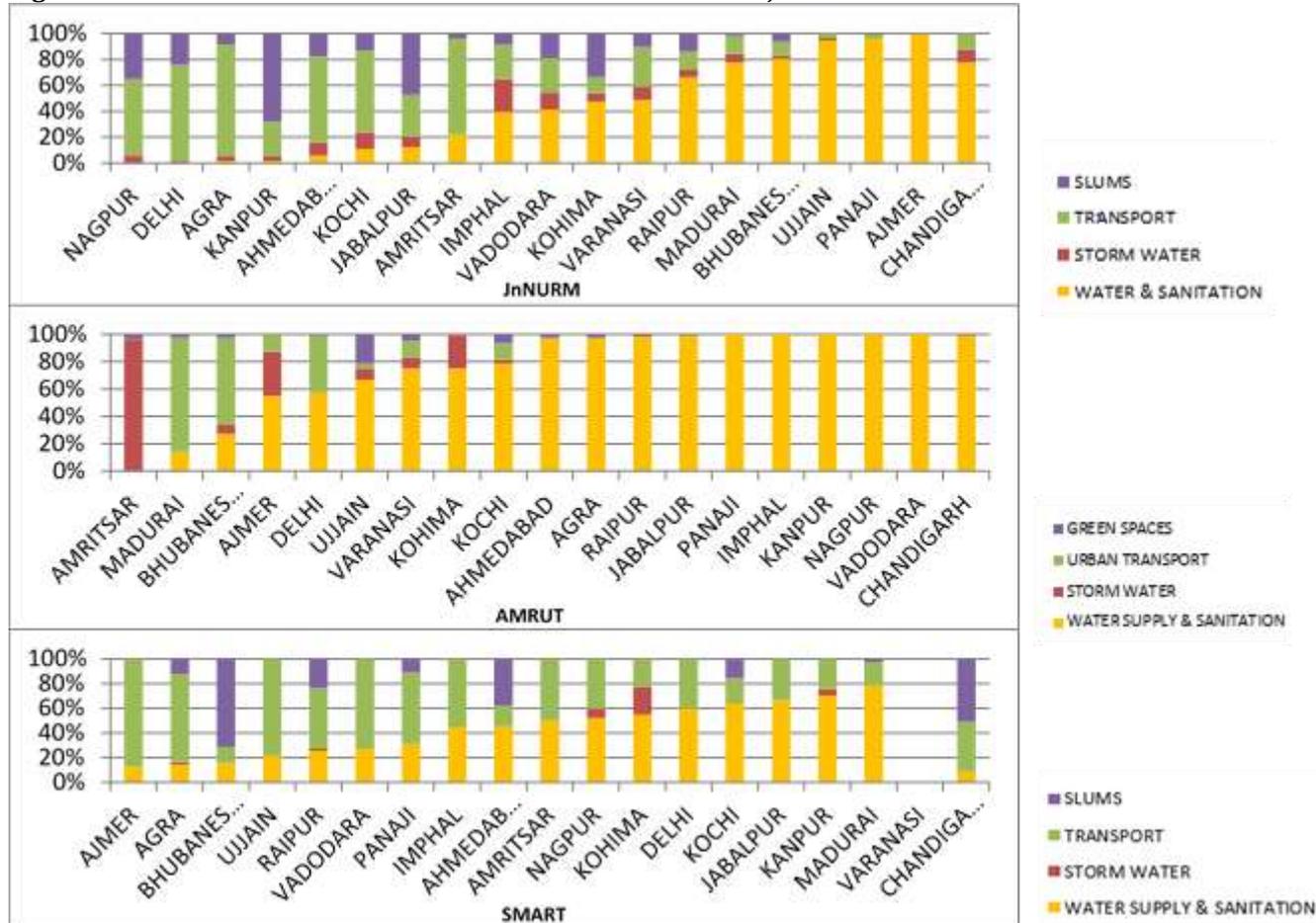
If the sectors are looked at as a whole, then it is seen that urban transport is the most important sector having the maximum requirement of investments due to the construction of projects, second in position is Solid waste management followed by water supply sector and then sewerage and sanitation. However, if all these sectors are combined into one, as water supply and sanitation, then it is seen that it falls into the second position requiring investments. Therefore, if

the HPEC Report can be compared with the scenario observed from these planning documents of the cities, then Water Supply and Sanitation along with Urban Transport seem to be still the priority sectors of all the Indian cities.

6.3 City wise Priority of Sectors across the Missions on the basis of Investments:

As seen from the three graphs, the yellow and green color signifies water supply and sanitation and urban transport respectively, across all the three missions. Firstly, if the yellow color is observed, an increasing trend is noticed as one comes down the graphs. This means in JNNURM, there was the least amount of cities taking water supply and sanitation as their projects.

Figure 14: Trend of Investments Seen for Urban Infrastructure Projects Across the Three Missions



Source: Author

However, in SMART Cities Mission the color looks more distributed. If the maximum priority of water supply and sanitation as a sector in the cities is considered, then it is observed that the AMRUT Mission has the highest number of cities taking it as their priority. Secondly, there is a clear trade-off between the sectors of water supply and sanitation (clubbed together) and urban transport. The cities having the less amount of yellow color has more amount of green color. This means wherever water supply and sanitation is not taken up as a priority in the cities, urban transport is taken as a priority, excepting a few in which slums is seen as a priority. Therefore, the fact, that urban transport and water supply and sanitation, can be considered the two most significant sectors of urban infrastructure becomes evident once again.

7 CONCLUSIONS DRAWN FROM THE STUDY

If the two objectives of this study are considered, then there are some interesting observations which can be noted and summarized. Looking from the perspective of the National Government, it is important to note that how are the Mission Statement and Guidelines of each Program / Mission / Policy different from each other or they have a similar approach and outlook behind the framing of the same. In this study, the basic aim and objective of all the three missions are, providing basic infrastructure in the cities with a duration of five years for two missions. Even if the Selection Criteria of the cities have been different in the three Missions, population has been the most important basis behind the same for all the three. 19 out of 61 Cities have occurred repeatedly in all the three Missions. The basis Focus Areas and Admissible Components for all the three Missions is Water Supply, Sewerage and Sanitation, Solid Waste Management and Urban Transport. In terms of Fund Allocation, the mechanism was different for only the JnNURM Mission but have absolutely the same heads for AMRUT and the Smart City Mission.

If the responses of the Cities are tried to be understood then it is seen that across all the three Missions the Cities have mainly tried to focus on Water Supply, Sewerage and Sanitation, Solid Waste Management and Urban Transport. This

means before upgrading the basic Civic Services, the nineteen Cities have competed for the Smart Cities Mission just in order to utilize the funds before analyzing their priority Sectors. As seen in the earlier section, through the comparisons of the City Development Plans (CDPs) and the Smart City Proposals, the cities have suitably repackaged the same old Projects in order to utilize the funds. The Smart Cities Mission therefore, remains a mere myth if both the perspectives are looked into.

Primary informal interviews and discussions have also been conducted with the key city officials of Bhubaneswar and Ahmedabad in order to validate this study. Their responses indicate that before knowing the proper basis and understanding of the Smart Cities Mission, both the cities had simply oriented their proposals according to the admissible components in order to win the Second Stage of the Smart City Challenge.

LIST OF REFERENCES:

- Agentschap NL, M. v. (2015). *Smart Cities in India*. Germany: Agentschap NL.
- Chandramouli, C. (2011). Rural Urban Distribution of Population. Census of India.
- ISO/IEC JTC 1, I. T. (2014). Smart Cities, Preliminary Report 2014. Switzerland: ISO.
- Kim, Y. H. (2003). Local Government Finance and Bond Markets. Manila: Asian Development Bank.
- Kumar, A. (2017). Can the Smart City Allure Meet the Challenges of Indian Urbanization? *Sustainable Smart Cities in India*, 17-39.
- Kundu, A. (2011). Politics and Economics of Economic Growth. *Economic and Political Weekly*, 10-12.
- Rani, D. J. (2015). Smart Cities & Challenges in India - A Vision. *International Journal of Innovations in Engineering and Technology (IJJET)*, 61-70.
- MOUD. (2015). AMRUT- Mission Statements and Guidelines. New Delhi: Government of India.
- MOUD. (2011). Jawaharlal Nehru Urban Renewal Mission (JNNURM), Revised Guidelines. New Delhi: Ministry of Urban Development, Government of India.
- Smart City, M. T.-N. (2015). Mission Statement and Guidelines. New Delhi: Government of India, Ministry of Urban Development.

1484 E-GOVERNANCE, AN INITIATIVE TOWARDS BETTER GOVERNANCE: A CASE STUDY OF DURGAPUR MUNICIPAL CORPORATION

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ABSTRACT

E-governance or electronic governance is basically associated with carrying out the functions and achieving the results of governance through the utilization of Information and Communication Technology (ICT). ICT provides efficient storing and retrieval of data, instantaneous transmission of information, processing information and data faster than the earlier manual systems, speeding up governmental processes, taking decisions expeditiously and judiciously, increasing transparency and enforcing accountability. It helps in increasing the reach of government- both geographically and demographically. National E-governance Plan (NeGP) has been formulated by the Department of Administrative Reforms and Public Grievances (DARPG) in 2006. The NeGP aims at improving delivery of Government services to citizens and businesses. E-governance in Municipalities is one of the most important Mission Mode Projects and a unique initiative of the Government of India conceptualized under the umbrella of the overall National e-Governance Plan (NeGP) and the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) aimed at improving operational efficiencies within Urban Local Bodies (ULB's). Local governments serve as the first interface between the citizen and the government. E-governance in these institutions will cater to the needs of the citizens by bringing in efficiency, transparency, and improvement in service delivery. The hassles of standing in a queue for payment of property taxes, issue, and renewal of trade license etc can be avoided and the same services can be obtained by just a click of a mouse, at any time, anywhere. The implementation of e-governance requires capacity building of the ULB's as well as creation of awareness among the citizens about the process and benefits of e-governance. Durgapur Municipal Corporation with an area of 154.20 square kilometres and a population of 566937 persons as per Census 2011 is the second largest Municipal Corporation in West Bengal in terms of its area after Kolkata Municipal Corporation (187.33 square kilometres) and ranks third in terms of its population after Kolkata (44,86,679 persons) and Howrah Municipal Corporation (10,72,161 persons). The status of Durgapur has changed over the years from a police station under Asansol sub-division in 1961 to a Notified Area Authority in 1962 to Municipal Corporation in 1996. As an initiative towards e-governance, the website of Durgapur Municipal Corporation has been launched recently. Only a few services are being provided online such as birth and death registration, trade license, social welfare schemes etc. The other services are soon to be provided online. In this paper, an attempt has been made to analyse the initiatives of the Urban Local Body in introducing E-governance. Since citizens are the consumer of these services provided by the Urban Local Body, their perception of the effects of e-governance has been taken into consideration.

Keywords: Urban E-Governance, People's participation and perception

INTRODUCTION

Urbanisation results in increasing concentration of people in the urban areas. This increasing population exerts a tremendous pressure on the infrastructure of the urban areas leading to increasing complexities in the city life and deterioration of the urban environment. Among the urban areas, the Class I cities are in an alarming situation as they growing faster than the other categories of urban areas. These cities offer several pull factors in the form of employment opportunities, educational opportunities etc due to which people are attracted to these cities. These cities often attract people far in excess of their capacity. The cities are contributors to Gross Domestic Product (GDP) so they assume great importance. Their importance has increased enormously after globalisation. The cities have become hub of economic activities. The management of the huge population compounded by the increasing importance of the urban areas necessitate an effective system of governance and thus governance of urban areas has gained importance. Durgapur is a Class I city with a population of 566937 persons in 2011. Population has increased steadily from 41696 persons in 1961 to 566937 persons in 2011. Governance of Durgapur thus assumes importance. The 74th Constitutional Amendment Act, 1992 has recognised the urban local bodies as the third tier of government. The urban local bodies are entrusted with the responsibility of provision of various services. Introduction of e-governance is also one of the important responsibilities of the urban local bodies This introduction of the system of e-governance is one of the 23 reforms of Jawaharlal Nehru National Urban Renewal Mission (JNNURM). E-governance tends to bring the government closer to the people through easy access to and fast and efficient delivery of services.

GOVERNANCE

The concept of governance denotes the use of political authority and exercise of control in a society in relation to the management of its resources for social and economic development (*Organization for Economic Cooperation and Development, 1995, n.pg.*). According to United Nations Development Programme, 1997, "Governance is viewed as the exercise of economic, political and administrative authority to manage a country's affairs at all levels. It comprises mechanisms, processes and institutions, through which citizens and groups articulate their interests exercise their legal rights, meet their obligations and mediate their differences" (*Human Development Report, 1999, 29*). In other words, it denotes the process of administration of an area.

E-GOVERNANCE

E-governance or electronic governance is basically associated with carrying out the functions and achieving the results of governance through the utilization of Information and Communication Technology (ICT). E-governance is the use of ICT by government to provide easy and improved service to the citizens. According to UNESCO E-governance is "Governance refers to the exercise of political, economic and administrative authority in the management of a country's affairs, including citizens articulation of their interests and exercise of their legal rights and obligations. E-governance may be understood as the performance of this governance via the electronic medium in order to facilitate an efficient, speedy and transparent process of disseminating information to the public and other agencies and for performing government administration activities" (*Gandhi and Kumbharana, 2017,122*).

One of the 23 reforms which form part of the reform agenda of the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) was the introduction of a system of e-governance using IT applications like GIS and MIS for various services provided by Urban Local Bodies (ULBs)/parastatals. National E-Governance Plan (NeGP) intends to institute and enable mechanisms to improve the system of governance and thus provide better services to citizens by effective use of ICT. E-governance in municipalities is one of the Mission Mode projects under NeGP, which is expected to result in improved service delivery by local governments for the citizen.

THE STUDY AREA

Durgapur is one of the six Municipal Corporations in the district of Paschim Barddhaman, in the state of West Bengal. It is located between 87°13'E to 87°22'E longitude and 23°28'N to 23°36'N latitude. It is situated on the banks of river Damodar at a distance of about 160 kilometres from Kolkata. It is bounded by Community Development Blocks, Kanksa on the east, Faridpur-Durgapur on the north, Andal and Pandabeswar on the west and river Damodar forms its southern boundary. Durgapur, a post-independent industrial new town was constituted as a Notified Area Authority in 1962 and was upgraded to the status of a Municipal Corporation in 1996. The total area (154.20 square kilometres) of Durgapur Municipal Corporation is divided into forty-three wards and five boroughs. As per Census 2011 it is the second largest Municipal Corporation in terms of its area after Kolkata Municipal Corporation and ranks third in terms of its population after Kolkata and Howrah Municipal Corporation.

OBJECTIVES OF STUDY

- To study the growth and development of Durgapur.
- To study the evolution of governance in Durgapur.
- To study the initiatives of the Urban Local Body in introducing e-governance
- To study the perception of the people with regard to awareness about the process of e-governance and its implementation.

METHODOLOGY

The study is based on both primary and secondary data. The primary data has been collected through household survey carried out in the sample wards of Durgapur Municipal Corporation. The wards have been chosen keeping in mind their location in the Municipal Corporation. Ward Nos. 1 and 22 have been selected for the study. Ward No. 1 is a peripheral ward and Ward No. 22 is a centrally located ward forming the City Centre. The survey has been conducted with the help of a structured questionnaire.

EVOLUTION OF DURGAPUR

Durgapur has grown out of an area which was under forest cover. The first nucleus for urban development came into existence in the year 1854 when East Indian Railway (now Eastern Railway) passed through this area on its way to Raniganj coalfields (*Singh, A.K., 1990*). In 1955 the barrage across the Damodar River at Durgapur was constructed. Due to its locational advantage it was an ideal choice for locating a major Industrial Complex. Durgapur is situated on the fringe of coal fields, which is West Bengal's chief source of energy but was itself outside the coal belt. It also did not encroach on the agriculturally rich alluvial plains of West Bengal toward its southeast. Due to the presence of the barrage, water was also available to support industry and urbanisation. The factors which influenced the government's decision to locate industries here were nearness to the source of raw material particularly iron ore, coal and limestone, good transportation facilities to transport the finished products to the large wholesale

markets at Calcutta and labour supply from the neighbouring states. Due to these advantages a major programme of industrial promotion was undertaken by the Government of West Bengal. Several industries were developed such as steel plants, mining machinery plant, power stations and a complex of coke ovens, by products and intermediate chemicals. Due to the location of the major steel industry Durgapur came to be recognised as the single largest concentration of heavy industry in the country and West Bengal.

At present Durgapur is a Municipal Corporation beside its distinctive status of being an Industrial Complex. It is an "Urban Industrial Complex." Industrialisation has been the causative factor behind its urbanisation.

EVOLUTION OF GOVERNANCE IN DURGAPUR

The advantageous location of Durgapur made it an ideal choice for locating a major Industrial Complex. It was State Governments' decision of setting up of industries in Durgapur during the Second Five Year Plan (1956-61). It was a post-independent industrial town. It was developed with an aim to promote the growth and development of the surrounding

regions. The first industry to be set up here was the Cove Oven Plant, followed by the Durgapur Steel Plant. Two townships were established to accommodate the workers of both the plants. The two industrial townships - the Steel Township (63.67 square kilometres) and Coke Oven Plant Township (10.02 square kilometres) were spatially separated from each other by the G.T. road (now NH 2) with a total area of 73.69 square kilometres as per the 1961 Census. Durgapur had no distinct boundary at that time and consisted of the two townships. The 1961 Census mentions Durgapur to be a Non-Municipality included under Asansol Sub-Division as a Police Station. These two walled townships of their respective plants were provided with all kinds of urban amenities. The intermediate and surrounding non-company areas were deprived of services. The first form of evolution of urban government took place in 1958 when Durgapur Development Authority (DDA) was formed. It was formed to initiate and coordinate the development works for Durgapur and provide amenities and public utility services to the non-township people. Durgapur was constituted as a Notified Area Authority on 1st October 1962. The administration was then headed by a chairman who was generally an Indian Administrative Service (IAS) officer. Under him was a vice chairman who was nominated by the State Government. The boundary of Durgapur Notified Area Authority (DNAA) was formed at this time which included 3 police stations with their 40 mouzas along with the two plant townships. After the delineation of the DNAA boundary it encompassed an area of 154.20 square kilometres. The West Bengal Town and Country (Planning and Development) Act 1979 amalgamated the Asansol Planning Organization (APO, established in 1964) and Durgapur Development Authority (DDA, established in 1958) to form a new Development Authority namely Asansol Durgapur Development Authority (ADDA) in 1980. Durgapur Notified Area Authority was upgraded to the status of a Municipal Corporation on 7th October 1996. The total area of 154.20 square kilometres however remained same and was divided into 43 wards and 5 boroughs.

The Corporation functions under the Mayor-in-Council system which has eight members excluding the Mayor. They are responsible for various services such as water supply, solid waste management, education, health service, electricity etc. After the formation of Municipal Corporation in 1996 the first municipal elections took place in 1997 and after that municipal elections are held regularly at an interval of five years i.e. in 2002, 2007, 2012 and in 2017.

The total area of Durgapur Municipal Corporation is divided into forty-three wards and five boroughs. Ward is the smallest administrative unit in a Municipal Corporation. A borough is above the ward and is formed by a group of wards. Ward Committees have been constituted in all the 43 wards. Apart from the ward committees, borough committees have also been formed. Ward committees are headed by a councillor and borough committees are headed by a chairman. Ward committees supervise and monitor the development works at the ward level and borough committees supervise the conservancy services of the wards under them. Borough committees mainly supervise and monitor the overall services and developmental works of the wards grouped under them.

The management of cities is not an exclusive responsibility of municipal governments; parastatal is also responsible for it. Parastatals are interdisciplinary bodies responsible for planning; coordinating, implementing, funding and supervising urban development works (*Mukhopadhyay, 1999*). Parastatals/Development Authorities are nominated by the state governments, bureaucratic in composition and unaccountable to the local people while the Municipal Corporations are elected bodies, accountable to the people. These bodies play an important part in urban governance but they are far away from people's participation and response. Their functioning is insulated from local politics but are heavily influenced by the state level politics. They function in an authoritarian manner while making decisions on capital budgeting (*Mathur, 1999*). The 74th Constitution Amendment Act, 1992 provides constitutional status to the urban local bodies but does not specify the role of the development authorities. The development authorities are concerned with development and capital works, while the municipal bodies are responsible for operation and maintenance of services. Asansol Durgapur Development Authority is the development authority set up for planned and scientific management of growth of the planning area. It is responsible for spearheading the cause of industrial, infrastructural and other development activities in the area under its jurisdiction which extends from Panagarh to Barakar with a total area of 1615.90 square kilometres covering about 30 lakhs of both rural and urban population. Its planning area includes two Municipal Corporations - Asansol and Durgapur and three Municipalities - Raniganj, Jamuria and Kulti. Among the two Municipal Corporations, Asansol Municipal Corporation is the older one formed in 1994.

E-GOVERNANCE INITIATIVES IN DURGAPUR MUNICIPAL CORPORATION

As a pan-city initiative, DMC has a plan to introduce crowd mapping. It is an alternative civic engagement strategy which is not bound by time and location and can be performed on the web, mobile phones or other media. Crowd mapping has the following advantages:

- It builds real-time social change network and an online community to address city's needs.
- City centric problems can be posted by citizens
- It provides citizens useful information on various issues- public works, maintenance, traffic, events etc
- It records complaints posted with a unique number and sends grievance redressal send to the concerned authority.
- Application of GIS technology to locate the exact point of issue
- It is a mobile sms and app-based platform reaching out to larger number of citizens.

The crowd mapping data can be accessed through various means, one such means is websites.

The website of Durgapur Municipal Corporation has been launched. It has been designed by West Bengal Electronic Industry Development Corporation Limited (Webel) Technology Limited. On-line Trade license, Social Beneficiary

Scheme and Birth and Death Registration services are available online. Other services like Building Plan, Property Tax, Water Tax etc would soon be made on-line. The City Development Plan (CDP) prepared by ADDA envisages to implement e-governance in the ULBs under its jurisdiction. It plans at computerisation of entire systems and records. Thus, DMC is in the initial stage of introduction of E-Governance measures. It has only made its web presence.

Durgapur is one of the cities in West Bengal included under the 'Green City Mission'. It is a project of Urban Development and Municipal Affairs, Government of West Bengal. Durgapur Municipal Corporation and Asansol Durgapur Development Authority are entrusted with the responsibility of execution of the project. Different works are included under the mission such as urban afforestation, conservation of water bodies, improvement of solid waste management, installation of solar panels etc. Making the city technologically efficient is also one of the important programme under the 'Green City Mission'

SOCIO-ECONOMIC SCENARIO OF DURGAPUR

Social and economic scenario of the study area has been taken into consideration to provide an idea of the population of the same who are affected by the process of governance. They are one of the stakeholders in the governance process. Census data has been considered to study the socio-economic profile of Durgapur. Population of Durgapur has increased steadily increased from 41696 persons in 1961 to 566937 persons in 2011. The growth rate of population has decreased from 395.58 per cent during 1961-1971 to 14.90 per cent during 2001-2011. The maximum increase of population has taken place between 1961 and 1971. In 1971 the boundary of Durgapur Notified Area Authority was delineated which included population of 3 police stations of 40 mouzas along with the two townships. The number of households has also increased from 10401 in 1961 to 163916 in 2011. This indicates the pressure on the infrastructure or services provided by the urban local body. Population density has also increased from 566 persons per square kilometres in 1961 to 3677 persons per square kilometres in 2011. Literacy rate has also increased from 64.03 per cent in 1961 to 80.01 per cent in 2011. Sex ratio has increased constantly from 338 in 1961 to 926 in 2011. Work participation has declined from 62.48 per cent in 1961 to 35.13 per cent in 2011. Non-workers has increased from 37.52 per cent in 1961 to 64.87 per cent in 2011.

PEOPLE’S PARTICIPATION

Effective and successful implementation of any system lies on the receptivity of those for whom it is being implemented. E-governance aims to bring the government closer to the people. The receptors of the advantages of e-governance is the people. To have an idea about the recipients of e-governance services, household survey has been carried out in two wards i.e. 1 and 22 keeping in view their location within Durgapur Municipal Corporation. Ward No. 22 is a centrally located ward, the City Centre, and Ward No. 1 is a peripheral ward.

AGE STRUCTURE OF THE SAMPLE POPULATION

Age structure has a bearing on the perception and participation of the people in the process of urban e-governance. It is assumed that perception and participation of people about e-governance varies among different age groups. To have an idea of the people residing in the sample wards, age of the household population has been taken into consideration. The age has been grouped into the categories, 0 to 30 years, 30 to 60 years, and 60 years and above. The age group of 0 to 30 years includes the mobile and young population who have little time and experience to involve in decision making. The age group of 30 to 60 years includes the mature population who have the capacity to actively participate in the decision-making process and the age group of 60 years and above includes the elderly and experienced population who can devote most of their time in the same.

Ward No. 1 is a peripheral ward and Ward No. 22 is the City Centre. In Ward No. 1, 51.52 per cent of the sample population belong to the age group of 0-30 years, 41.52 per cent of the sample population belong to the age group of 30-60 years and 6.97 per cent of the sample population belong to the age group of 60 years and above. In Ward No.22, 41.20 per cent of the sample population belong to the age group of 30-60 years, 30.81 per cent of the sample population belong to the age group of 0-30 years and 27.99 per cent of the sample population belong to the age group of 60 years and above (Table No.1)

Table No.1: Age Groups (Figures are in percentage)

Sample ward no.	0-30	30-60	60 and above
1	51.52	41.52	6.97
22	30.81	41.20	27.99

Source: Field Survey, December 2017.

MALE-FEMALE RATIO

Male female ratio indicates the status of women residing in an area. It is also an indicator of the level of social development of the area. Gender effects the adoption and use of e-government. Generally, knowledge of computers is more among males than females. In Ward Nos. 1 and 22 males outnumber females as shown in Table No 2.

Table No. 2: Male-Female Ratio (Figures are in percentage)

Sample ward no.	Male	Female
1	52.12	47.88
22	51.58	48.42

Source: Field Survey, December 2017.

LITERACY RATE

Literacy is an important indicator of the level of development of an area. Literacy rate of Durgapur Municipal Corporation is 80.01 per cent as per Census 2011. It can be seen that 85.06 per cent and 91.14 per cent of the sample population are literates in Ward No. 1 and 22 respectively. In Ward No. 1 and 22, 14.94 per cent and 8.86 per cent of the sample population are illiterates respectively.

Table No.3: Literate-Illiterate (Figures are in percentage)

Sample ward no.	Literate	Illiterate
1	85.06	14.94
22	91.14	8.86

Source: Field Survey, December 2017.

LEVEL OF EDUCATION

Perception and participation of the people in the process of urban e-governance depends on their level of education. Adoption of new technologies is dependent upon the level of education. The level of education of the sample population in the selected wards has been grouped into primary, secondary, higher secondary, graduation, post- graduation, above post-graduation and technical. Primary education indicates education up to class five, secondary education indicates education from class six to class ten, higher secondary indicates the plus two level, graduation indicates the three- year degree course, - graduation includes only the general post graduate courses, above post graduate level indicates persons pursuing research on any field after post -graduation. In Ward No.1, 60.31 per cent of the sample population belong to the secondary level of education, 20.23 per cent of the sample population are educated up to the primary level. Only a meagre per cent i.e. 0.38 have technical education. In Ward No.22, 39.84 per cent and 15.43 per cent of the sample population are graduates and belong to the secondary level of education respectively. About 12.89 per cent of the sample population have technical education.

Table No.4: Level of Education (Figures are in percentages)

Sample ward no.	Primary	Secondary	Higher Secondary	Graduation	Post Graduation	Above Post Graduation	Technical
1	20.23	60.31	9.54	8.78	0.76	0	0.38
22	10.74	15.43	9.57	39.84	10.55	0.98	12.89

Source: Field Survey, December 2017.

OCCUPATIONAL PATTERN

Occupational pattern helps to understand the employment opportunities generated by the urban local body. Perception and participation of the people in the process of e-governance depends on the type of occupation. Generally, people engaged in the public sector are satisfied with the government services than those working in the private sector. The household survey (Table No.5) reveals that in Ward No.1, 33.17 per cent of the sample population are workers and 66.83 per cent are non-workers. In Ward No. 22, 28.57 per cent and 71.43 per cent of the sample population are workers and non-workers respectively. Table No. 6 shows the occupational pattern of the sample population. The survey reveals that in Ward No. 1, 29.41 per cent of the working population are engaged in service, 19.61 per cent are engaged in business, 11.76 per cent are agricultural worker and 39.22 per cent are non-agricultural workers. In Ward No.22, 69.38 per cent of the working population are engaged in service, 10 per cent are engaged in business and 20.63 per cent are non-agricultural workers.

Table No.5: Work Participation (Figures are in percentages)

Sample ward no.	Worker	Non-Worker
1	33.17	66.83
22	28.57	71.43

Source: Field Survey, December 2017.

Table No.6: Occupational Pattern (Figures are in percentages)

Sample ward no.	Service	Business	Agricultural Worker	Non-Agricultural Worker
1	29.41	19.61	11.76	39.22
22	69.38	10	0	20.63

Source: Field Survey, December 2017.

PEOPLE'S PERCEPTION

Perception of the people are most important for judging the quality of service being provided by the municipal administration as they are the consumer of such services. Thus, people's perception on two important aspects of e-

governance; e-openness and e-participation (Rahim Alaa-Aldin Abdul and A. Al Athmay, 2015) been taken into consideration.

E-OPENNESS

It means the ease with which information on the government website can be obtained. It helps the people to know about the activities undertaken by the ULB. The respondents were enquired about their opinion on e-openness. The study reveals that in Ward Nos. 1 and 22, 27.03 per cent and 35.90 per cent of the respondents respectively are satisfied with the information provided on the website. About 20.27 per cent and 28.85 per cent of the respondents respectively in Ward Nos. 1 and 2 are not satisfied with the same. About 47.30 per cent and 12.82 per cent of the respondents in Ward Nos. 1 and 2 are not aware of e-governance. The category NA (Not Applicable) includes rented households. About 5.41 per cent of the respondents live in rented houses in Ward No.1 and 22.44 per cent of the respondents live in rented houses and office quarters.

Table No.7: People's Perception on E-Openness (Figures are in percentage)

Sample ward no.	Satisfactory	Not satisfactory	Not Aware	NA
1	27.03	20.27	47.30	5.41
22	35.90	28.85	12.82	22.44

Source: Field Survey, December 2017.

E-PARTICIPATION

It means the use of internet technology by the citizens to access the services provided by the urban local body. Citizens participation in policy and decision-making processes forms the core of electronic participation. E-participation increases citizens involvement with the government. The study reveals that in Ward No. 1, 37.84 per cent of the respondents uses e-services, 9.46 per cent follow traditional methods and 47.30 per cent are not aware about e-services. In Ward No.22, 48.72 per cent of the respondents uses e-services, 16.03 per cent do not use e-services and 12.82 per cent are not aware about the same.

Table No.8: People's Perception on E-Participation (Figures are in percentage)

Sample ward no.	E-services	Traditional Methods	Not Aware	NA
1	37.84	9.46	47.30	5.41
22	48.72	16.03	12.82	22.44

Source: Field Survey, December 2017.

CONCLUSION

Durgapur Municipal Corporation is in the initial stage of the introduction of e-governance measures. The website has been launched. Only a few services are being provided on-line. The study reveals that the citizens are also not aware about the e-services. They mostly prefer the traditional methods of accessing the services provided by the urban local body. Awareness about e-services are more in the centrally located ward than in the peripheral ward. Infrastructure must be developed to make the services easily available to the citizens. Thus DMC has to go a long way for introduction and effective implementation of e-governance measures.

REFERENCES

- . "Demographic Factors as Determinants of E-Governance' Adoption: A Field Study in the United Arab Emirates (UAE)." *Working Paper Series in Business Studies*. 1 (2015): 1-31. Web. 14 Feb. 2018.
- Alshehri, Mohammed, Steve Drew, and Rayel AlGhamdi. "Analysis of Citizens Acceptance for E-government Services: Applying the UTAUT Model." IADIS International Conferences Theory and Practice in Modern Computing and Internet Applications and Research 2012,n.p., n.d., 69-76.PDF.
- Asansol Durgapur Development Authority. *City Development Plan*, Asansol
- Gandhi, Vaibhav, and C K Kumbharana. "E governance in Local Bodies in India." *International Journal of Scientific and Research Publications*. 7.2 (2017): 122-7. Web. 19 Dec. 2017.
- Human Development in South Asia 1999, The Crisis of Governance*. Oxford
- India Publication: New Delhi, 1990. Print.
- Kumar, Vinod T.M, ed. *Advances in 21st Century Human Settlements E-Governance for Smart Cities*. Springer. New Delhi, 2015. Print.
- Mathur, O.P. *India the challenge of urban governance*. National Institute of Public Finance and Policy: New Delhi, 1999. Print.
- Mukhopadhyay, A. "Politics and Bureaucracy in Urban Governance: The Indian Experience." *India the challenge of urban governance*. Ed. O.P. Mathur. National Institute of Public Finance and Policy: New Delhi, 1999. 121- 2. Print.
- Patodia, Abhay. "Issues in E-Governance in Urban & Local Bodies in India." 196-200. Web. 19 Dec. 2017.
- Rahim Alaa-Aldin Abdul and A. Al Athmay. "Citizens' Perceptions towards e-Governance: Field Study." *World Academy of Science, Engineering and Technology International Journal of Humanities and Social Sciences*. 7.9 (2013): 2576-2584. Web. 14 Feb. 2018.
- Reynoso Juan Manuel Gomez, and Rodrigo Sandoval Almazan. "The Adoption of e-Government Services in Mexico: A Citizens' Perception Analysis." *American Journal of Industrial and Business Management*. 3 (2013): 12- 22. Web. 14 Feb. 2018.
- Singh, A.K. *Urbanization and Administration of Urban Infrastructure*, Inter-
- Suri, P.K. and Sushil. "Measuring E-Governance Performance." *Strategic Planning and Implementation of E-Governance (Flexible Systems Management)*. Springer Science: Singapore,2017. 25-39. PDF.
- United States Agency for International Development. *Designing E-Governance for Municipalities in India Executive Summary: Final Report*. N.p.: n.p., 2005. Print.
- University Press: Karachi. Print.
- Urban Area, ADDA, 2006. Print.

1566 EVALUATION OF SERVICE IMPROVEMENT MEASURES ON MASS TRANSIT MODAL SHARE**Eeshan Bhaduri ^{a*}, Dipanjan Nag ^b, Dr. Arkopal Kishore Goswami ^c**^a M. Tech Student, Ranbir & Chitra Gupta School of Infrastructure Design & Management, Indian Institute of Technology Kharagpur^b Research Scholar, Ranbir & Chitra Gupta School of Infrastructure Design & Management, Indian Institute of Technology Kharagpur^c Assistant Professor, Ranbir & Chitra Gupta School of Infrastructure Design & Management, Indian Institute of Technology Kharagpur

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Email address: eeshanbhaduri@gmail.com**ABSTRACT**

In modern world transport researchers are vehemently emphasizing the use of mass transits over other modes for their distinct advantages in various aspects, from congestion reduction to being environment friendly. This paper discusses about the probability of modal shift to bus mode from non-mass transit modes on introduction of different service improvement measures applicable to Indian road condition. A multinomial logit mode choice model is developed based on revealed preference dataset consisting peoples travel behaviour in existing traffic scenario where three mass transit modes – train, subway & bus and one intermediate public transit mode – auto-rickshaw is available. Further the model is used to predict policy impacts, broadly considering two service improvement domains (a) travel time and (b) frequency & reliability, attainable through three major strategies (1) network improvement facilities (2) lane management and (3) introduction of bus rapid transit system. Finally, the probability of modal shift is assessed to evaluate the best potential strategy for mass transit sustainability. These results can be used as a policy making tool by the concerned authorities for future smart cities.

Keywords: modal shift, logit, alternative, policy, transit**1 INTRODUCTION****1.1 Present scenario**

Indian cities have been traditionally dependent on buses as dominant mode of transport because of its advantages to carry more people at a time and being economical as well. Unfortunately though, the bus fleet size is degrading fast (20%-40% drop from 2000-2008) even in big metros like Delhi, Mumbai, Kolkata (Ministry of Urban Development, Handbook of Urban Statistics, 2016) whereas the private vehicle (PV) and intermediate public transport (IPT) is increasing to fill the void. However, existing performance evaluation reports of traffic condition done by Indian Government itself clearly shows a huge gap in 'mass transport' (MT) infrastructure, plagued by inadequate capacity and financial reasons, specifically in Kolkata which includes (a) Depleting fleet size of MT (b) Unreliable service of most MT services, and (c) Less or no coordination between different MT modes (National Transport Development Policy Committee, 2014). The poor state of MT modes in cities like Kolkata have been further magnified by IPT modes which act as a competitor rather being an ideal feeder service which perhaps could be a solution to last mile connectivity problem. In the absence of adequate provision of MT infrastructure especially in cities like Kolkata, including public transport, congestion diseconomies outweigh the benefits of agglomeration forcing people to switch to PV and IPT like auto-rickshaw. The goal is therefore to build a sustainable MT system to solve the fundamental issues like congestion, pollution, high energy demand etc. as it has been predicted that in a do-nothing scenario MT share will drop by 50% whereas PV & IPT share increases by almost equivalent proportion in the period 2007-2031 (Ministry of Urban Development, Handbook of Urban Statistics, 2016).

One approach to achieve this goal is to enhance the level of service (LOS) for bus mode to attract captive IPT users back to MT. This study is intended to estimate the probable shift from IPT modes to bus mode using an appropriate modeling technique. At the same time assessment of different MT service improvement measures has been done based on the modal shift those can incur considering Indian traffic condition.

2 REVIEW OF THE PREVIOUS STUDIES

As this study focuses on modal shift from IPT to bus mode, the review of literature presented here considers the choice behaviour of urban commuters where more than two modes are available as well as different types of transportation policies related to bus LOS improvement. Alvinsyah *et al.* (2005) developed a binomial logit model based on Stated Preference (SP) data, to study the response of the travellers in using the proposed Jakarta bus-way system. Travel time and travel cost were considered as the main variables to develop utility functions. Chakrabarti (2017) shows that any major strategy to attract discretionary PV users to MT should include three service measures i.e. Speed, Frequency and Reliability. Fatima & Kumar (2014) further explains the impact of BRTS in million plus cities in India in terms of speed and travel time but the discussion strictly considers only BRTS option. Anwar and Yang (2017) show with help of binary logistics model that a direct bus service with hourly interval is more efficient strategy compared to Park & Ride service, causing approximately five times higher modal shift to MT.

All of these studies, in summary, are focused towards identifying factors that influence the way individuals decide to choose their modes of travel and their ability to respond to shift to buses. At the same time, it can be argued that there are very few studies which clearly deal with multiple MT modes and multiple policies, which resembles better with our actual mode choice behaviour. This study attempts to fulfil this need.

3 Methodology

As different literature suggests, there are predominantly two approaches to analyse modal shift – (1) revealed preference (RP) approach and (2) stated preference (SP) approach. Here RP approach has been followed as it is based on actual mode choice behaviour which suits better for building a mode choice model and thereafter one or two key variables were changed to estimate peoples’ response to bus LOS improvement. The aim of the study is to analyse how modal shift occurs to bus from IPT as well as other MT modes simultaneously, based on introduction of different transit development measures. Hence a multinomial logit model (MNL) was mostly used along with incremental logit model (ILM) in some specific cases considering the fact that logit model is easily interpretable than probit model.

In the second stage, development of scenarios was done through transit speed which was in turn used as an input to calculate transit capacity in the study stretch. The factors those were used and altered as well to build up different scenarios were – mean dwell time, dwell time variability, average stop spacing, average dwell time, scheduled number of buses at critical stop, traffic signal phasing and bus facility type (Kittelsohn & Associates, Inc.; Parsons Brinckerhoff; KFH Group, Inc; Texas A&M Transportation Institute; ARUP, 2013).

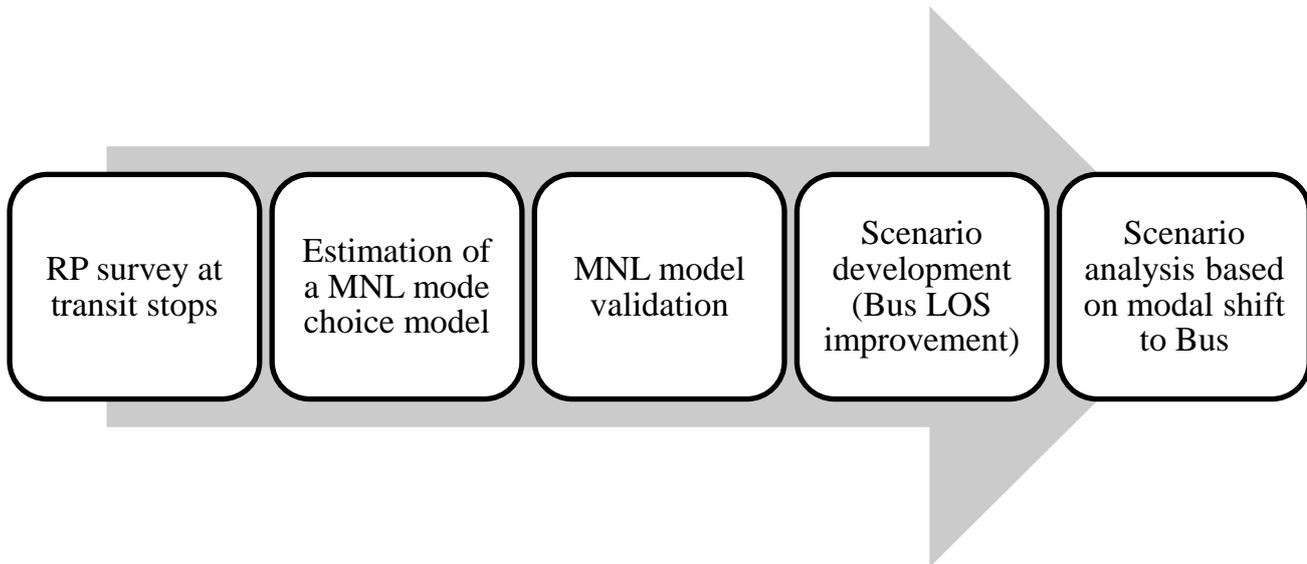


Figure 107: Flow chart of methodology

4 SURVEY DESIGN AND ANALYSIS

Study area

In this study survey data was used to build a valid mode choice model. To identify the mode choice factors for urban commuters, a RP questionnaire was prepared. All those data were collected through bus station survey, conducted along a particular stretch (Tollygunje to Kalighat metro/ Rashbehari crossing) on a three-lane busy arterial road (Deshapran Sasmal Road) in Kolkata, India where reasonable accessibility to all four modes (train, subway, bus and auto-rickshaw) is co-exist.

Survey dataset (Response elicitation)

During the survey the respondents were asked to base their response on the trips they were making or about to make. The questionnaire had two major sections –

General data – (a) socio-economic data and (b) household data

Travel data – (a) trip related information

In the same line of explanation, the explanatory variables can also be subdivided in three categories –

- (1) Individual specific variables (age, gender, occupation etc.)
- (2) Journey specific variables (origin-destination, trip purposes, time of day etc.)
- (3) Transport facility specific variables (travel time, travel cost etc.)

A total two hundred and eleven (211) trips with detailed information about trip legs were extracted from the available survey dataset out of which seven (7) nos. of trip records were neglected for errors or insufficient data.

5 MODEL DEVELOPMENT

Model specification

The correlation between different variables are analysed in R-Studio to identify the variables in the mode choice equation. The correlation threshold has been set as 0.5 to consider highly correlated variables. It’s also worth noting that there are no such variables in the final mode choice model which are correlated by any manner. and Table 1 provides descriptions about the variables considered for modeling.

Table 42: Variable correlation square plot

I d	Variables	Variables with high correlation (>0.50)	Remarks
1	Age		'age' has been grouped into 4 categories - (1) 0 - <20 years, (2) 20 - 35 years, (3) 35 - 60 years and (4) >60 years based on in general education and retirement age. The variable will be assigned value 1, if it's in one category and 0, otherwise.
2	Gender		The variable will be assigned value 1, if male and 0, if Female.
3	income_class		Individual income has been considered instead of household which gives a wrong interpretation of those who can afford high travel cost despite earning less.
4	hh_size		Number of people in a single household.
5	whh_size		Number of earning member in a single household.
6	veh_ownership		Vehicle ownership = Number of household vehicles (2 wheelers + 4 wheelers) / Number of household members possessing driver's license
7	peak_hr		Trips made in time groups 08:00 to 11:00 Hrs and 17:00 to 20:00 Hrs were marked as peak-hour trips, represented by 1, and trips made during 14:00 to 17:00 Hrs was marked 0.
8	trip_purpose		A binary variable where there are three types of trip purposes considered (1) Home based work (HBW), (2) Home based education (HBE) and (3) Home based other (HBO). If the person has made the trip in one of the mentioned purposes then it is coded as 1 otherwise as 0.
9	trip_length	tcost TT_hr	Total distance travelled in kilometres adding up individual trip leg distances.
10	n_transfer	tcost TT_hr	Number of transfer = Total number of trip legs - 1
11	TT_time_hr	tcost n_transfer trip_length	Total travel time in hours adding up individual trip leg travel time.
12	Tcost	TT_hr n_transfer trip_length	Total travel cost in rupees adding up individual trip leg travel cost.

Model estimation

The variables, selected for the final mode choice model, are not at all correlated because such correlated variables do not augment well for MNL model. The model was estimated by maximum-likelihood estimation using Newton-Raphson method as it picks the values of model parameter which make the observed data more likely to occur than any other values. For model estimation statistical software platform 'R-Studio' was used.

The variables those are in the final mode choice equation are shown in table 2 along with their statistical significance and coefficients. It is worth mentioning that auto-rickshaw has been considered as the base mode i.e. auto-rickshaw has a zero intercept value. As the full dataset size was considerably small compared to dataset size used in similar research work, 100% of it was taken for estimation purpose. Simultaneously some variables (eg. trip_HBW) come to be statistically significant only for selected alternatives (mode) out of four modes in consideration for the logit model. Those are represented as (mode_i * variable_k).

However, one should be careful about the fact that the model does not consider 'Car' mode although one's general intuition indicates that 'Bus' mode will only attract more ridership from 'Car' with further improvement in service quality. The estimation results are shown in table 2.

Table 43: MNL estimation results (R - 'mlogit' package)

Variable(s)	Estimate	Pr(>|t|)	Significance
bus:(intercept)	2.61449	5.87e-07	***
subway:(intercept)	-1.01066	0.13611	
train:(intercept)	-2.24903	2.70e-09	***
TT_hr	-6.93211	< 2.2e-16	***
bus * peak_hr	-0.95616	0.08372	.
subway * peak_hr	-1.04916	0.0667	.
subway * (veh_ownership)^2	-1.06393	0.20352	
bus * age_2	0.9606	0.06526	.
subway * age_2	1.17498	0.04921	*
subway * trip_HBW	-1.14735	0.03807	*

There are mainly two ways to judge the explanatory ability of the mode choice model in the development stage. First of those are the value of McFadden R²(similar to normal R²) and second one is Log-likelihood value.³¹⁷

The goodness-of-fit measure for the model during model development stage can be assessed by likelihood ratio index, $(\rho^2) = [LL(0) - LL(P)] / LL(0)$

Where, LL(P) = Log-likelihood of estimated model; LL(0) = Log-likelihood of zero-coefficient model. The summary of the model estimation is shown in table 3.

The value of (ρ^2) index varies between 0 (no fit) and 1 (perfect fit) in order to compare alternative models. Although its meaning is clear in the limits (0 and 1), values around 0.4 are usually considered excellent fits (Ortúzar & Willumsen, 2011). It can be observed from different literatures that the value of McFadden R² also varies from 0.30 - 0.50 in similar mode choice models (Anwar & Yang, 2017) (Chakrabarti, 2017) (Alvinsyah, Soehodho, & Nainggolan, 2005). Hence it can be claimed that the model performs considerably good with respect to both of these index (Log-likelihood & McFadden R²).

Table 44: Statistical summary of the MNL estimation (R - 'mlogit' package)

No. of Observations	211
No. of iterations	6
Log-Likelihood:	-134.19
McFadden R ² :	0.39928
Likelihood ratio index (ρ^2)	0.39927

Model validation

Re-estimation of model

As already mentioned, due to less number of data it was not possible to set aside a certain number of the data for validation purpose. Although to gain confidence in the signs and magnitudes of constant as well as variables those were selected in the mode choice model, built based on the full dataset (211 nos. data), an attempt was taken to re-estimate 20 times, as shown in table 3 (first 10 attempts shown), with same variables for 80% of full dataset size (169 nos. out of 211 data). In each of the attempts the survey records were selected randomly with help of MS-excel random number generation.

Table 45: Re-estimation with first 10 random set comprising 80% of full dataset

Model run id	R ²	Log-Likelihood	Intercept/Constant			Alt. specific coeff.	Individual specific coefficient		Trip specific coefficient	
			bus	subway	train	Total Travel time (TT_hr)	Age (age_2)	Vehicle Occupancy (veh_occupancy^2)	Peak Hour (peak_hr)	Trip purpose (trip_HBW)
						Coeff. = Negative	Coeff. = Positive		Coeff. = Negative	
						all modes	bus	subway	bus	subway
1	0.384	-107.95	2.89	-1.7	-2.34					
2	0.388	-105.65	2.38	-1.52	-2.75					
3	0.390	-113.51	2.51	-0.91	-2.26					
4	0.383	-113.06	2.53	-0.6	-2.07					
5	0.397	-106.12	2.71	-0.94	-2.21					
6	0.393	-106.01	2.51	-1.14	-2.22					
7	0.411	-105.03	2.54	-1.21	-2.48					
8	0.391	-110.8	2.83	-0.32	-1.97					
9	0.361	-116.82	2.41	-0.85	-2.1					
10	0.428	-92.838	2.59	-1.35	-2.71					

Table 46: MNL estimation results for all (20) attempts (R - 'mlogit' package)

Pr(>|t|)<0.25	Frequency for high sig.	20	17	15	6	14	11	15
Pr(>|t|)<0.10	Frequency for medium sig.	0	2	3	10	6	7	3
Pr(>|t|)=Insignificant	Insignificance	0	1	2	4	0	2	2

It was found that in each case, the signs and the mean value is consistent with the full dataset model. Simultaneously the choice of the variables set in the full model can be justified through analysing all the attempts by the frequency of variables in terms of statistical significance. For this purpose, three different significance threshold level as shown in Table 5 are used instead of general levels as suggested by default in R statistical software because of small dataset size. As it is found 'Travel time' is highly significant and all other variables is significant combined high and medium threshold for at least 80% of times. This underlines the fact that the choice of variable set in full model dataset is not random in nature rather consistent enough.

Validation by trip length fit approach

The number of trips per mode per distance is aggregated in 5 km distance brackets, up to maximum 25 km. The predicted modal shares are graphed against the observed modal shares.

317 *** 99.9% significance level, ** 99% significance level, * 95% significance level, . 90% significance level

Figure 2 indicates that the predicted modal shares grossly follow the overall pattern of the observed modal shares (*observed mode share of train, subway, bus and auto-rickshaw are 6.16%, 15.16%, 61.61% and 18% respectively whereas predicted mode share are 4.51%, 19.11%, 58.95% and 17.39%*), especially for shorter distances and for all the modes. The pattern is not so closely matched at longer distances specifically between the modes 'Subway' and 'Train' because there are very few actual trips made at such distances. That is why most of the 'Train' trips are misclassified as 'Subway' trips. It should be taken into consideration that most trips are short to medium-distance 'Bus' trips, and the model captures that behaviour well.

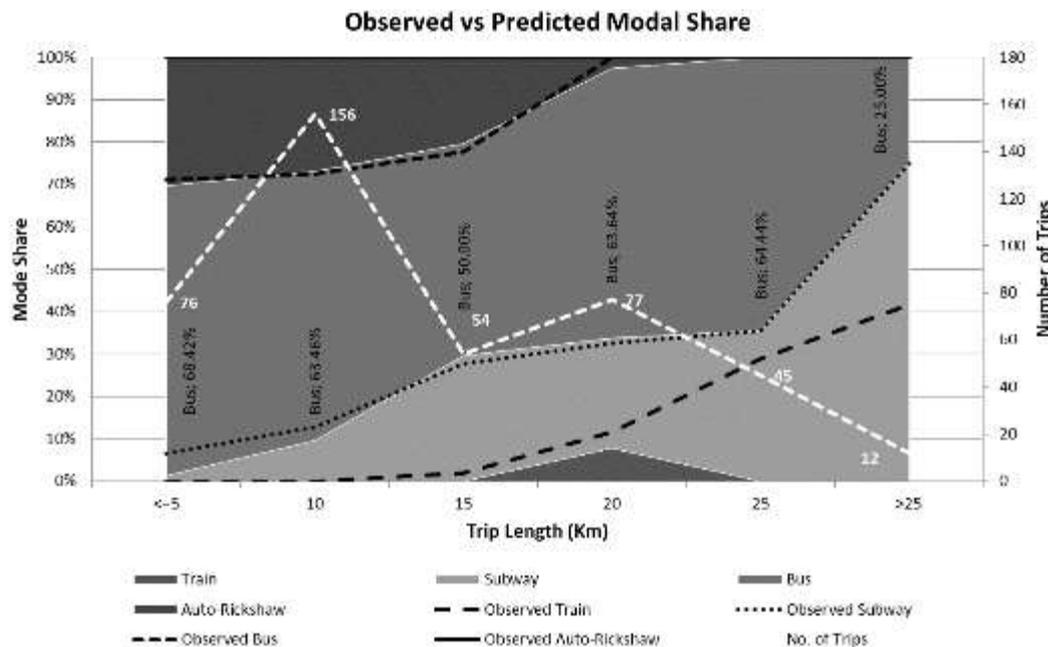


Figure 2: Distribution of modal share by trip length (observed vs. predicted)

6 SCENARIO ANALYSIS

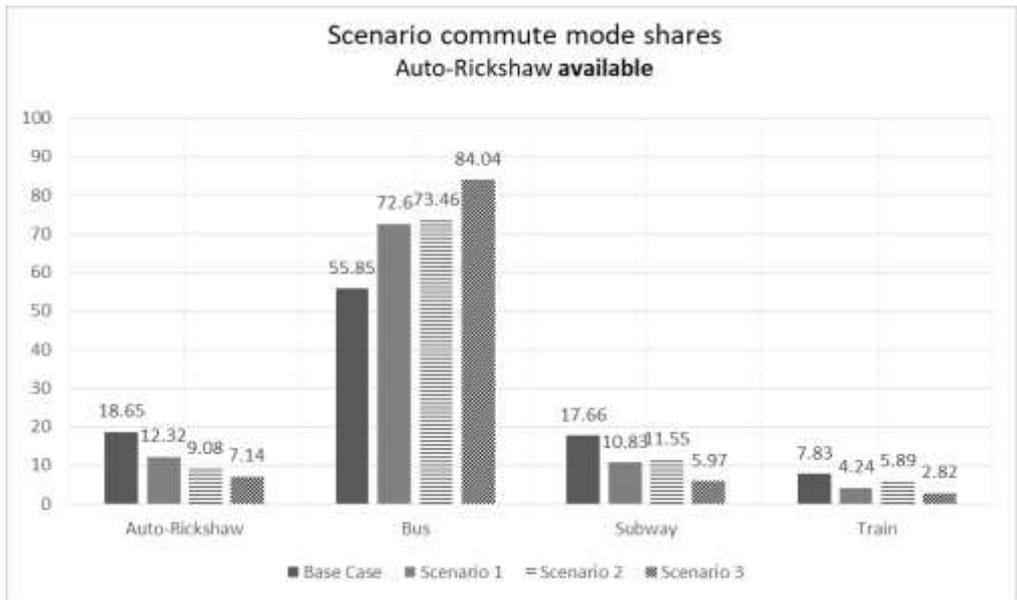
6.1 Scenario development

To build up different scenarios and to find out which variables could be changed to alter the travel speed a detailed literature study was done which resulted in estimation of transit capacity and speed in the study corridor separately based on the methods published in the reports by Transportation Research Board. As an output of this the scenarios were broadly classified into three categories –

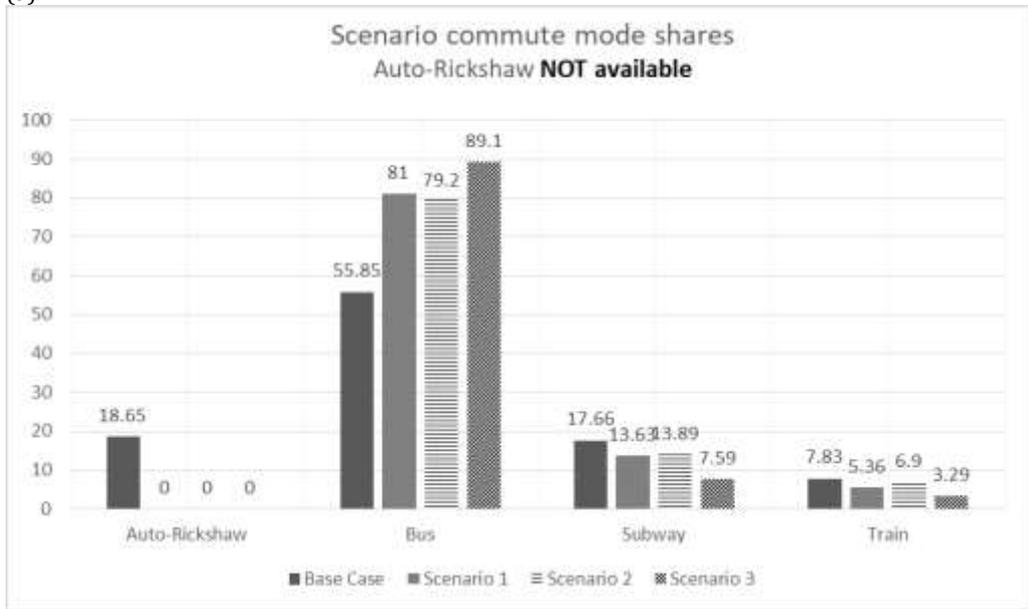
- 1) Scenario 1 - Network characteristics improvement (capacity and speed constraints)
- 2) Scenario 2 - Improvement in lane management & operational hours
- 3) Scenario 3 - Introduction of a new BRTS service

Analysis of scenarios

Here the prediction results are analysed to find out the impact of availability of auto-rickshaw on mass transit commuter mode share as well as to assess the impact of three major service improvement strategies.



(a)



(b)

Figure 3: Mode share predicted for scenarios (a) auto-rickshaw available and (b) auto-rickshaw not available

As a output of this scenario analysis, scenario 3- introduction of BRTS is found to be most influential strategy causing highest modal shift to bus mode. It is an expected result as grade separated bus way leads to maximum amount of travel time saving out of proposed three scenarios. Interestingly there are couple of more points which can also be inferred from figure 2 (a) and (b) – (i) increase in mode choice through simple speed & capacity improvement techniques (scenario 1) are almost equal or even greater than comparatively cost & time intensive lane management techniques (scenario 2) and (ii) removal of auto-rickshaw from the arterial lane to feeder network increases significantly mode share for ‘bus’ across all the scenarios (scenario 1, 2 and 3).

The model being a multinomial logit model suffers from red bus-blue bus syndrome, drawing share proportionate to the original mode share whereas originally increasing utility of bus will be drawing more share from auto-rickshaw compared to other MT modes and the model also does not consider car mode. So, in reality the modal shift will be better than this model could represent and we should also consider that the model is not based on city wide survey therefore the modal shift may be somewhat exaggerated.

7 CONCLUSIONS

This study focuses on the rationality of huge investment on high yielding ‘transit improvement strategies’ whereas we often overlook fundamental ones. The model results, in terms of modal shift each category of strategy incurs, can be used as a planning tool for policy formulation as the categories are divided in an increasing order of time and cost budget. It clearly suggests that fundamental improvements in transit service e.g. planned stop spacing, uniformity in dwell time, schedule reliability, skip-stop operation, bus priority signalling, bus preferential intersection etc. can act as quite impactful strategies for facilitating higher modal share for ‘bus’.

The result gives an indication to travellers' sensitivity or response to system changes. Considering the modal shift shown in section 0 upon implementing scenario 1, 2, 3), some major inferences can be drawn upon:

- i. For scenario 1, it can be observed that there is a modal shift to bus by 16.75% when auto-rickshaw is allowed on the arterial street and an equivalent modal shift by 17.61% for scenario 2. Similarly, comparable modal shifts are seen for Scenario 1 and 2 (25.15% and 23.35% modal shift respectively) when auto-rickshaw is not allowed on the arterial street. Network improvement measures (scenario 1) require less time and cost compared to scenario 2 and 3. Whereas scenario 2 is more time complicated in implementation when compared to 1. Thus we can infer that scenario 1 could be a better strategy than 2.
- ii. For BRTS strategy (scenario 3), it can be observed that there is a modal shift to bus by 28.19% when auto-rickshaw is allowed on the arterial street and a modal shift by 16.75% for scenario 1. Similarly, the modal shares are found to be 33.25% and 25.15% respectively for Scenario 3 and 1 when auto-rickshaw is not allowed on the arterial street. Scenario 3 proves to be the most effective strategy of the lot but the modal shift incurred by it does not differ largely from the modal shift caused by network improvement measures (scenario 1) Thus, evaluation of the trade-off between time, cost and ease of implementation is of great importance to the policy makers while selecting such strategies.
- iii. Auto-rickshaw removal from arterial streets can prove to be more advantageous strategy in case of scenario 1 compared to scenario 2 and scenario 3 which anyway frees up exclusive lane (space) for 'bus'. The modal share difference are 8.4%, 5.74% and 5.06% between situations when auto-rickshaw is available or not respectively for scenario 1, 2 and 3.

Moreover, the research work also helps to identify the causal factors e.g. 'travel time', 'age', 'gender' etc. which play important role in modal shift behaviour of urban commuter to bus consequent on the bus LOS improvement under Indian traffic scenario.

At the same time, this shows us an alternative way to work with relatively small dataset. It can be observed that the model, in spite of being based on small number of records, performs average to well in re-estimation and somewhat in validation too. A certain level of confidence on the model can be built upon based on iterative (10 times in this case) re-estimation exercise as well as validation attempts can also be done on various aspects to evaluate model performance.

8 RECOMMENDATIONS

As the traffic characteristics has been already analysed in section 0 and modal shift in section 0 acts as an indicator for policy making with respect to the study corridor the policies that could be formulated are as follows:

1. Use of site specific bus preferential treatments (capacity constraints improvements) like queue jumps and curb extension can be very much effective when applied to major junctions in the corridor.
2. Use of auto-rickshaw as a feeder network rather than a competitor for 'bus' on arterial street seems to be a better effective strategy than parking removal from streets.
3. Proper scheduling of bus routes through discontinuation of overlapping routes and parallel introduction of skip-stop service causes significant rise in 'bus' attractiveness. Total 11 no. of stops can be planned as per travel demand analysis, in this study 6 major stops selected.
4. Bus priority signalling should be introduced in all stops for better transit service rather than using it only for major intersections.
5. Instead of full-fledged BRTS, express Bus (lane reservation) along with improved 'bus' service seems to be an ideal combination.

REFERENCES

- Alvinsyah, Soehodho, S., & Nainggolan, P. J. (2005). Public transport user attitude based on choice model parameter characteristics (a case of Jakarta busway system). *Journal of the Eastern Asia Society for Transportation Studies*, 480-491.
- Anwar, A. M., & Yang, J. (2017). Examining the effects of transport policy on modal shift from private car to public bus. *ScienceDirect*, 1413-1422.
- Ben-Akiva, M., & Lerman, S. R. (1985). *Discrete Choice Analysis: Theory and Application to Travel Demand*. Massachusetts: MIT Press.
- Chakrabarti, S. (2017). How can public transit get people out of their cars? An analysis of transit mode choice for commute trips in Los Angeles. *Transport Policy*, 80-89.
- Fatima, E., & Kumar, R. (2014). Introduction of public bus transit in Indian cities. *International Journal of Sustainable Built Environment*, 27-34.
- Kawabata, M., & Shen, Q. (August 1, 2007). Commuting Inequality between Cars and Public Transit: The Case of the San Francisco Bay Area, 1990-2000. *Sage Journals Urban studies*, Vol 44; Issue 9; 1759-1780.
- Kittelson & Associates, Inc.; Parsons Brinckerhoff; KFH Group, Inc; Texas A&M Transportation Institute; ARUP. (2013). *TCRP Report 165 - Transit Capacity and Quality of Service Manual*. Washington, DC: Transportation Research Board.
- Ministry of Urban Development, G. o. (2016). *Handbook of Urban Statistics*. New Delhi: Government of India Press.
- National Transport Development Policy Committee, G. o. (2014). *India Transport Report*. New Delhi: Routledge.
- Ortúzar, J. d., & Willumsen, L. G. (2011). *Modeling Transport 4th Edition*. Wiley.

SS02.4. Smart Cities Initiatives for the 21st Century: Myth or Reality

1571 SMART INITIATIVES FOR SMART LIVING - SHOWCASING BENGALURU'S EXPERIENCES

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ABSTRACT

Rapid growth of urbanization is expected to increase further and it is estimated that by the year 2025, 34 cities worldwide will have a population of more than 10 million people. At present, 54 per cent of the world's population live in urban areas and expected to augment to 66 per cent by 2050. Urban population has increased from 746 million in 1950 to 3.9 billion in 2014. Asia accounts for 53 per cent of the world's population. World Urbanization prospects by UN DESA's (2014) Population Division has pointed that most urbanization will happen in India, China and Nigeria.

Cities demands and pressures on resources like energy, water, housing, and transportation will increase further. All linked infrastructure to sustain these services will have to be met with enormous infrastructure costs in addition to maintaining adequate, timely and quality services. The quality of life will depend on the quality of air, access to clean drinking water and sanitation facilities, reliability of power supply and other services like education and health. Thus, 21st century faces one of the critical development challenges of governing urban areas.

Cities are working to get smart all over the world and adopt various ways to achieve it. Internet of Things (IoT) is one of the significant approaches which focus on intelligence to help cities use resources more efficiently holistically by improving water use, transportation, energy, air quality, energy and communication systems, thus aiding in changing the overall quality of life of the populace.

Although such initiatives are yet to take off in a holistic way in Indian cities, there are several initiatives taken up towards understanding challenges in cities like Bengaluru and making Cities smarter in managing their resources and improving the quality of life. Bengaluru is the IT hub/capital of India and one of the fastest growing cities of the 21st century. It is referred to as the 'million plus city' with its population growing at an enormous rate. Bengaluru witnesses several pressures and challenges in providing a good quality of life to its citizens.

However, it is important to highlight the smart initiatives that have led to positive changes in the city environs. It matters most to find pathways to upscale these initiatives by and make them work in an effective way with suitable modifications in other cities as well. The current paper is based on a review and some research studies that have used technology to change Bengaluru city. Urban resilience through improving urban governance and resources management in the city has showcased interesting initiatives that needs appreciation. Some of the popular smart solution initiatives may be broadly categorised into – (i) IT based solutions for improving governance (ii) Technology based solutions for improving resources management. These cases will be discussed in detail in the paper.

INTRODUCTION

The continuing growth of urbanization is expected to increase further and it is estimated that by the year 2025, 34 cities worldwide will have a population of more than 10 million people. Currently, 54 per cent of the world's population lives in urban areas and expected to increase to 66 per cent by 2050. Urban population has increased from 746 million in 1950 to 3.9 billion in 2014. Asia alone accounts for 53 per cent of the world's world population. United Nations report projects that urbanization and population growth together would contribute to further add 2.5 billion people to urban population by 2050 and 90 per cent of the concentration would be in Asia and Africa. World Urbanization prospects by UN DESA's (2014) Population Division indicate that most urbanization will take place in India, China and Nigeria. It is projected that India will add 404 million urban dwellers, China 292 million and Nigeria 212 million by 2050. Among the UNs ranking of most populous cities, Delhi and Mumbai are listed.

Cities consume majority of the resources and the demands and pressures on energy, water, housing, transportation are bound to increase. Associated infrastructure to support these services will have to be met with huge infrastructure costs besides maintaining quality of providing these services through timely access and adequacy. The quality of life will depend on the quality of air, access to clean drinking water and sanitation facilities, reliability of power supply and other services like education and health. Given this situation, 21st century faces one of the most important development challenges of managing urban areas. According to John Wilmoth, Director of UN DESA's Population Division, "Our success or failure in building sustainable cities will be a major factor in the success of the post 2015 UN development agenda".

Cities have to work towards getting smarter and there are several approaches adopted towards achieving smartness in city management around the world. One of them is the Internet of Things (IoT) wherein smart cities technology aids in cutting edge intelligence to help cities use resources more efficiently wherein it improves and takes care of all aspects-improving water use, transportation, energy, air quality, energy and communication systems. This would help in transforming the quality of life of citizens. The US will be investing around \$ 41trillion over the coming 20 years to upgrade their infrastructure in line with IoT. In this regard, Intel and the City of San Jose, CA are working on a public-private partnership project which aims to provide an Intel's IoT Smart City Demonstration Platform to further improve the city's Green Vision initiative. Their aim is to provide 25,000 Clean Tech jobs, create environmental sustainability and enhance the quality of life for its citizens. Installations of network on Air quality Sound and Micro Climate sensors will be creating a 'sustainability lens' for the city. The sustainability lens would use IoT technology to measure characteristics

such as noise pollution levels, traffic flows wherein the city management will later use the information/ data to improve air quality, transport efficiency etc.

Although such initiatives are yet to take off in a holistic way in Indian cities, there are several initiatives taken up towards understanding challenges in cities like Bengaluru and making Cities smarter in managing their resources and improving the quality of life. Bengaluru is the IT hub/capital of India and one of the fastest growing cities of the 21st century and has witnessed significant expansion spatially and has grown more than 10 times since 1949. It is referred to as the 'million plus city' with its population growing at an enormous rate. Bengaluru witnesses several pressures and challenges in providing a good quality of life to its citizens. To describe a few implications, Bengaluru is ranked as one the most highly polluted cities according to a report by the Centre for Science and Environment. Based on the air quality analysis data of the Karnataka State Pollution Control Board, Bengaluru has been identified as one of the 14 cities that have high levels of particulate matter, increase in benzene levels, increasing nitrogen dioxide levels entering the dangerous zone (The Hindu, March 23, 2013), garbage menace and conflict which brought the world's attention in 2012, still remains unresolved although Rs. 405 crores are spent only on disposing garbage by the Municipal Corporation. Dumping unsegregated garbage into landfills would mean disaster in the long run. The landfill areas around Bengaluru have shown high ground water and air contamination making villagers the victims (Deccan Herald, 25th May 2015).

However, it would still be interesting to showcase some of the positive inventiveness that highlight the various smart initiatives undertaken in the city. It is a matter of finding ways and ascertaining processes about how we upscale these smart solutions and work towards making Bengaluru a smart city in the true sense. Some of the popular smart solution initiatives include – (i) IT based solutions for improving Governance (ii) Technology based solutions for improving resources management, etc.

SMART LAND GOVERNANCE

It requires an accurate and efficient maintenance of the land record system in order to carry out any land related transactions in a hassle free environment. Increased urbanization has created complex land transactions associated issues like- an aberrant increase in the demand for urban property, creation of bogus documents, 'benami' and deceptive land transactions, coupled with inadequate checks/control at various levels for monitoring irregularities taking place - all these serve to increase public insecurity. Given this situation, the initiative of the 'Urban Property Ownership Records' (UPOR) intends to ensure transparency in land administration procedures, simplify the process of registration, provide greater access to information, centralize land records data and thereby improve accountability. Thus, the core objective of UPOR is to issue ownership title to urban households and the creation of a fresh data base for urban mapping. It is expected that UPOR will result in the elimination of corruption and middlemen in the process and promote good governance. One of the primary aims of UPOR is also to create an approved land record system of documents by a statutory authority in order to enable the other stakeholders to make use of this database.

A robust system of UPOR is created for every property with a view to documenting accurately both spatial characteristics of properties and record of rights data in respect of (i) land parcels (ii) structures /buildings (iii) roads etc. This property record will serve as a trusted record for all land related transactions. The property card thus, created under UPOR would serve as evidence for property ownership for regulatory and legal purposes. The property card issued will continue to remain valid and will not become obsolete or inaccurate. All the property record related transactions and services are intended to be fulfilled through this project (UPOR webpage)³¹⁸. The project is to be launched in 50 of the 198 wards in Bengaluru by the Survey Settlement and Land Records Department in the first phase and is under process (Manasi, et.al 2013).

SMART CITIZEN SERVICE CENTRES – 'BENGALURU ONE'

'Bangalore One' or B1 is based on PPP and aims at delivering citizen-centric services to common people. It is a 'One-Stop-Shop' for all C2G (Citizen to Government) facility to ensure accountability, convenience, certainty and speed through easy access to a chain of computerized Integrated Citizen Service Centres and also multiple delivery channels like Electronic Kiosks, mobile phones and the Internet. B1 also aims to provide cost-effective methods of service provision to the department/agencies and efficient and real time MIS and EIS to the departments which would enable them to work on core functions and free them from routine operations.

'Bangalore One' is being implemented in a phased manner. The estimated number of these Centres required is about 100 G2B (Government to Business), G2C (Government to Citizens) and G2C (Business to Citizens) services in the city. Government of Karnataka has decided to establish 15 service centres and 24 basic services of 9 Government Departments in the B1 project. Eventually, they plan to bring all the G2C and G2B services within the purview of B1 project to see that citizens and business people could avail all services at the centres except for specialized services. Currently, there are 23 B1 centres and 82 Mini B1 centres. Services offered by B1 centres include both B2C (telephone bill payments, insurance premiums payments, government job notifications etc), G2C (Bengaluru Electricity Supply Company- BESCO, Bruhat Bengaluru Mahanagara Palike (BBMP), Bengaluru Police Service (BPS), Regional Transport Office (RTO) etc) have integrated with the B1 centres to provide various services to the citizens. B1 project will also be evaluated periodically through independent agencies to ensure its efficiency in attaining the set objectives.

MANAGING TRAFFIC SMARTLY

³¹⁸UPOR objectives are listed out in City Survey Department-UPOR webpage www.upor.karnataka.gov.in.

Bengaluru's vehicular population has grown immensely resulting in traffic congestion and reducing the average speed as low as 10 kmph during peak hours. 'Bengaluru Traffic Improvement Project'- B-TRAC 2010 was initiated to improve the traffic management systems with the aim to reduce traffic congestion by 30 per cent in central area, accidents by 30 per cent, pollution levels and improve compliance of Traffic laws and rules and set up an effective Trauma Care System. Many components are being incorporated in the plan like road markings, signage, enforcement cameras, surveillance cameras, upgradation of signals including vehicle actuation and will be integrated into the Interim Traffic Management Centre. The information from traffic signal system, signal timings and traffic flow data will be real time data that will be processed instantly to ensure harmonized results.

Bengaluru Police has provided 612 Blackberry phones and wireless printers to traffic sub-inspectors and inspectors to levy on-spot fine collection and receipt. For those who cannot pay the fines on-spot, details are provided and will be put on the server. The system also aids in booking cases and is storing in the server the cases of repeated offenders. Registration data base from the transport department is linked up to Automated Enforcement Centre. Currently, there are 175 surveillance cameras watching violation of various traffic rules. Besides this, the traffic violations have been recognized by the interceptor effectively. Interceptors are used for deployment of traffic violations by surprise since it is not possible to install enforcement/surveillance cameras at all junctions. For instance in 2014 the total number of cases recorded were 1,34,835 collecting a fine of Rs.3,72,11,600.

SMART WAYS IN TRANSPORT SERVICES

Private transport services are working towards providing good service to citizens of Bengaluru. Taxi services in Bengaluru city are aiming at ensuring services by incorporating smart devices to guarantee accuracy in billing and safety features. Several taxi companies come with a tablet and a smart blue tooth enabled digital meter to ensure that the fare is calculated with accuracy and providing an e-receipt that would be e-mailed to the user of the cab, thus enabling them to pay the prescribed fare structure. Other innovative services that are making women feel safe while travel are launch of the SMS based trip tracker service by Meru Cabs where women can designate a family member to receive SMS alerts about the location of their journey throughout their travel in the taxi till they reach the destination. The updates are sent at fifteen minutes interval. There are several taxi companies that have equipped their vehicles with tracking devices. The cab is connected with a 5000 smart phone that acts as a GPS locator and the driver has to keep it on since that is the only way that he can undertake business. Recording of bookings are also done which doubly ensures safety. Some companies also have plans to add video surveillance to scale up security measures.

SMART ENERGY CONSERVATION

Given the importance of reducing the usage of fossil fuels and increasing the use of natural resources, the efforts in the recent times towards the application of the eventual renewable resource, the solar energy assumes greater significance particularly in the context of climate change concerns. Energy efficient technology based initiatives by the BESCOCOM has worked towards several programmes to reduce power consumption and usage of renewable energy options, specifically solar energy. Under the BESCOCOM Efficient Lighting Programme (BELP), Government of Karnataka has made it mandatory for use of Solar Water Heaters for buildings constructed in sites measuring more than 600 sq ft and above for residential buildings and sites measuring 1200 sq ft area and above within the limits of Municipalities/Corporations and Bengaluru Development Authority sectors. It details about the users – Industries where hot water is required for processing, Hospitals and Nursing homes, Jail Barracks, Canteens, Universities, Training Institutions, Housing complexes and positions field officers to create awareness in the area. Approved source for supply and installation of solar water heating systems is assigned to Aditya Solar shop of Karnataka Renewable Energy Development Limited to ensure installation of optimally designated quality systems. Besides, it also directs all the Departments like Urban Development Department, Public Works Department, Housing Department etc. to amend their rules to make use of the solar water heating systems as mandatory.

Another initiative has been the mandatory use of Compact Florescent Lamp (CFL) in government buildings and aided institutions/Boards/Corporations. BESCOCOM has also included the promotion of energy efficient buildings to be constructed by the government. The number of solar water heating systems installed in BESCOCOM have increased from 6187 in 2008-09 to 1,20,791 in 2013. BESCOCOM's initiative of replacement of existing copper chokes in fluorescent tube light fittings of BESCOCOM buildings by energy efficient electronic ballast has resulted in saving of energy of about 0.35 million units annually. Bengaluru is one of largest usage of rooftop solar water heaters in India. These heaters generate energy equivalent to 200 MW every day. Bengaluru is also the first city in the country to have introduced an incentive mechanism by providing a rebate of 50 paise per unit of electricity consumed for residents who have rooftop thermal systems installed. These systems have been made mandatory for all new structures. In respect of bulk Solar Water Heater installations, solar rebates are extended to each of the individual installations, provided, the minimum capacity of a Solar Water Heater is 100lt per household. Similarly, the Bengaluru Metropolitan Transport Corporation has taken the initiative of using bio- fuel from pongamiapinnata seeds in 25 buses of its fleet. In addition to this, the Doddaballapur Depot of KSRTC operates 81buses on a 90:10 ratio mix of diesel and pongamia oil. Bengaluru Metro Rail reduces energy consumption through traffic decongestion and fuel savings in the city of Bengaluru.

SMART 'E- TOILETS'

In view of the increasing demand and need for public toilets in Bengaluru, BBMP's initiative on installing e-toilets is welcome. Thee-toilets are designed state-of-the-art toilets; the striking feature of thee-toilet is that it flushes

automatically even if a person fails to flush and after five uses, the unit automatically cleans up the entire toilet. Intelligent fans and lights turn on and off with the entry and exit of the user. E-toilets are unique as it does not require manpower to maintain the toilets as the in-built technology takes care of it. To prevent damage and encroachment of public toilets, the e-Toilets are equipped with GPRS devices to alert the officials concerned in case of theft or trespassing. It is equipped with a Bio Membrane Reactor that helps recycle the water and reuse it for flushing and cleaning. Solar panels are available for alternate energy needs. In the areas where drainage tank facility is not available 'Delight' a Green Eco Friendly solution is provided to manage the waste and its disposal like the Bio Membrane tank system and the Water recycling unit.

In 2013, three e-toilets were launched in the city on a pilot basis and the BBMP plans to expand the services to other locations. BBMP is funding the project with a total cost of Rs. 4 crores and has engaged Eram Scientific Solutions Pvt Ltd, a Kerala based company to install e-toilets at 75 major locations of the city. Each e-toilet including civil works like sewage, water and power costs Rs. 5.0 lakhs. E-toilets are popular and are used by large number of users-street vendors, auto drivers and customers.

RAIN WATER HARVESTING INITIATIVE – A SMART INITIATIVE

Smart assets management will help address obstacles in the way to conserve and protect water. One such initiative is the RWH that has been made mandatory for households in Bengaluru city. The amended Act made rainwater harvesting compulsory for home and offices with an area of more than 2,400 sq. ft. in the heart of Bengaluru. The Bangalore Water Supply and Sewerage Board (BWSSB) (Amendment) Act passed in August 2009, states that every owner or occupier of a building having an area of 2,400 sq. ft. and above, or every owner who proposes to construct a building on an area of 1,200 sq. ft. and above, should install rainwater harvesting structures. So far, of the 60,000 buildings there with BWSSB water connections, more than 43,000 have adopted harvesting techniques (BWSSB 2013). Theme park, information and research centre on RWH have been established in co-ordination with BWSSB and KSCST which showcases RWH models. Major benefits include a compliance with the law, recharge of the aquifer and prevention of urban flooding (Manasi, Umamani, 2013).

Bengaluru's water demand from the river Cauvery located about 100 km away and 500 mts below, incurring huge financial costs has remained unfulfilled and the city still faces an acute shortage of water supply. Other ways to meet water demands especially from ground water sources also cannot fulfill the city's demand leaving the water sources depleted or polluted. Increasing bore wells both private and public have resulted in overexploitation of ground water. Besides, encroachments of tanks have affected the city's drainage system making urban flooding a serious concern. Bengaluru gets about 70 rainy days spread over the year and the drainage system can handle only 30mm of rainfall in one hour.

WASTE MANAGEMENT – SMART ECO INNOVATION

The problem of solid waste management in Bengaluru continues to grow exponentially. The production of solid waste is growing enormously and the Corporation's capacity to transport, dispose and treat waste has become a challenging task. Only a part of the ordinary solid waste is removed and treated completely. 'Daily Dump' is green entrepreneurship initiative that works towards managing compost locally at the household level. They design earthen pots to compost waste which can be used in gardening. Daily dump provides the technology, advice and service for households/institutions. Daily Dump provides business opportunities to people to network and contribute at various levels. Daily Dump customers keep away 14,589 kgs waste away from landfills turning it into valuable compost each day. This can be an interesting option for responsible citizenship and managing our city environs.

Toxic wastes are also a matter of serious concern in Bengaluru. Increased E-Waste, one of the recent outcomes of the IT boom, is seen as a major threat to the already deteriorating environment in Bengaluru. E- Waste pollution is one of the most serious management challenges in the recent times. As estimated by E-Parisara, Bengaluru generates 12,000 tonnes of E-waste per year. E-Parisara, the first formal e-waste recycling unit in India is spread over an area of 1.5 acre and established with a capital cost of 2.5 crores in 2005. E-waste at E-Parisara is derived from different kinds of electronic materials, especially computer components. Approximately 194 companies and three government sector firms have registered with E-Parisara. Once registered with E-Parisara, the institutions have to abide by certain terms and conditions. Its main aim is to work towards maximum material recovery, non-incineration, minimum power and water use and also minimum landfill (E-Parisara, 2014). There are more than 16 formal e-waste recycling units which are processing waste scientifically, however at various levels of expertise and registered with the Karnataka State Pollution Control Board. Still, there is a long way to go to ensure efficient management of e-waste scientifically.

GREEN BUILDINGS – SMART LIVING

Green Buildings are getting popular in Bengaluru with several projects initiated in the city with more than 15 residential projects and 14 commercial projects by reputed builders. They are eco-friendly structures that consume less energy during and post construction. Green buildings utilize less water, optimize energy efficiency, preserve natural resources, produce less waste and offer healthier spaces for occupants in contrast to conventional buildings. The building is assessed based on its predicted performance over its entire lifecycle. The Leadership in Energy and Environmental Design (LEED India) Green Building Rating System is a nationally and internationally accepted benchmark for the design, construction and operation of high performance green buildings. In India, Indian Green Building Council Green Homes is the first rating

programme developed exclusively for the residential sector. GRIHA- Green Rating for Integrated Habitat Assessment is another popular system for evaluation of green buildings.

CONCLUSION

Besides these various interesting initiatives taken up in Bengaluru city, it is important that the data be effectively converted to information that can aid further decision making processes to fine-tune the system. Some of the initiatives are yet to achieve its desired potential. Smart information and understanding will offer structures and tools to moderate situations that utilities have struggled to proactively address in the past. All these initiatives can bestow benefits that can be translated into economic benefits besides providing opportunities for green jobs in cities. There is a large scope for further learning from experiences of other cities within and outside India and to localise it to the city context.

REFERENCES

<http://www.hindu.com/pp/2007/06/02/stories/2007060252080500.htm>)

<http://mashable.com/2012/12/26/urban-tech-wish-list/>

<http://smartamerica.org/teams/smart-cities-usa/>

<http://timesofindia.indiatimes.com/city/bengaluru/Green-buildings-a-growing-trend-in-Bengaluru/articleshow/18659479.cms>

http://www.Bengalurutrafficpolice.gov.in/index.php?option=com_content&view=article&id=48&btp=48

<http://www.deccanherald.com/content/200995/science-city-needs-scientific-ways.html>

<http://www.dnaindia.com/Bengaluru/report-Bengaluru-offers-safer-cabs-for-women-1823532>

<http://www.un.org/en/development/desa/news/population/world-urbanization-prospects-2014.html>

<https://tech.economictimes.indiatimes.com/news/technology/bbmp-puts-technology-at-work-finally/57846797>

Manasi. S, (2013) Emerging Trends in E-Waste Management – Status and Issues – A Case Study of Bangalore City, ISEC Working Paper, 297.

Manasi. S, K.C. Smitha, R.G. Nadadur, N. Sivanna, P.G. Chengappa, Urban Property Ownership Records (UPOR) in Karnataka- (2013) Computerized Land Registration System for Urban Properties, ISEC Working Paper, 308.

S. Manasi with K.S. Umamani, (2013), Water Conservation in Urban Areas- A Case of Rain Water Harvesting Initiative in Bangalore city, In: Nautiyal, S. et al., (Eds.), Knowledge Systems of Societies for Adaptation and Mitigation of Impacts of Climate Change, Springer-Verlag Berlin Heidelberg, Germany

1618 THE MOTIVATIONS OF SMART CITY PROJECTS

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ABSTRACT

Smart city initiatives, plans, missions have mushroomed in every continent in recent years. These projects want to apply the information technology for improving the efficiency and quality of local services and for providing new services for the inhabitants, visitors and the entrepreneurs of the settlements, or more safety, leisure and less pollution. Areas of applications are manifold, such as transportation (vehicle routing, road pricing, parking systems, traffic patterns, congestion reduction, smart traffic lights and so on), mobile workforce enablement (city surveyors, park maintenance, inspectors, health and social services), energy (street lighting, building control, demand for electricity, energy theft detection), utilities (smart meters, field service, customer service, maintenance optimization and so on), healthcare (reduction of waiting times, forecast of visit and admission rates, real-time alerting, telemedicine and so on), education, security and others.

These projects have mainly positive impact from technological point of view (for example, more information, quality improvement, more safety is engendered). However, in the evaluation of the projects, the cost benefit analysis, the comparison of implementation and maintenance costs and the realization of benefits is either missing or use doubtful, questionable nonmonetary categories for benefits. Moreover, it typically neglects the displacement effect and opportunity costs, therefore systematically biased toward greater positive impacts. The dominant rhetoric and propaganda is strongly influenced by the big information technology companies, which set its sights on local governments as a huge, untapped market.

The paper deals with the reason and consequences of this situation, presenting some real and controversial cost benefit analysis and smart city projects. The main source of enthusiastic literature is the affected institution, company (in information technology industry), which is active in smart city and big data business and therefore interested to demonstrate large positive effects. Beside some useful and effective projects, there are smart city initiatives motivated by the self-advertisement of settlements, and/or by the biased proposals of big IT companies. The danger of this type of projects are the implementation of wasteful, low impact, costly, spectacular, prestige projects, which represent a form of detrimental rent seeking and income transfer instead of a real improvement in the quality of life. Only the minority of the local government can be supported by central governments in the frame of pilot projects grants, but the majority cannot, which system is equal with a spatial tax redistribution mechanism among local governments.

Keywords: smart city, cost benefit analysis, rent seeking, information technology

INTRODUCTION

Smart city became a key term or rather a buzzword in the city planning and city strategy literature, sometimes used parallel with digital city or intelligent city, in the same or similar meaning. Plethora of other phrases emphasize the technological side of the concept: telecity, urban cybernetics, informational city, knowledge-based city, wired city, virtual city, metered city, real-time city, smart urbanism and others. These terms, but most frequently the term smart city, are used by the researchers, planners, technocrats, public media, government administrators, politicians and IT (information technology) companies. In every continent, in every settlement size category, from the very small towns to the global megacities, more and more participants want to use more and more information technology and digital solutions, preferably not by the expense of their own budget, but by the expense of some outer sources, for example, grants and supports of the central governments.

Smart city projects became popular research topics, supported by both the interested cities and IT companies. The proportion of corporate research is unusually high in the area. Company materials, published not only in company propaganda materials (biased, subjective product descriptions by the IBM, Cisco, SAP, Intel, ABB, Siemens, Ericsson, Dunlop, Fujitsu, Google, Huawei, Hitachi, Microsoft, Oracle, General Electric for example), but in academical journals too, is quite common. Similarly, biased governmental marketing materials are also very frequent. These self-congratulatory materials focus mainly only to the technological side of the projects, without mentioning such issues as costs and economic efficiency, sustainability of developments, uneven spatial development, unfairness and injustice of high tech islands.

I think, an important element in the success and rapid spread of smart city programs is that policy makers and practitioners could create new jobs for themselves as a service class for implementing smart city projects. The risk of the projects is low: there are some improvement in something, which can be demonstrated, with forgetting to mention the costs and the possible alternative use of resources. The aim of this paper is to call attention to the neglected cost-benefit analysis of the smart city projects. While lots of complex indicators were suggested for the measuring of smartness of the cities (see for example Giffinger et al., 2007; Zygiaris, 2013; Lazaroiu-Roscia, 2012; Lombardi et al., 2012; Carli et al., 2013), the true efficiency measures, assessment of costs and benefits is not typical.

In ideal situation, every smart city projects, as public projects financed by the taxpayers, would have a public and accessible cost-benefit analysis. In this case the task of a researcher would be easy, just a meta-analysis should be conducted, demonstrating which type of projects are the most successful and efficient. Maybe, determining success and efficiency would be hard and problematic due to the character of this project, but at least there would be some results.

However, in the reality, the source of the problem is that only the very general and mostly technical features of the projects are publicly available, the most interesting and detailed cost elements are treated as business secrets. The only possible way to analyse of efficiency is the unique data gathering about the individual projects, which is often impossible due to the privacy matters. Therefore, this paper discusses mostly the conceptual problems of cost-benefit analysis of smart city projects.

TERMINOLOGY AND TYPICAL APPROACHES TO SMART CITY

The term smart city has been variously defined within the literature, but can broadly be divided into two distinct but related understandings as to what makes a city smart. The first approach stresses on the technological elements: sensors, cameras, digitalisation, big data, wireless technologies, applications, grids, buildings, infrastructures, networks system integration and so on. The second approach has an emphasis on the knowledge economy aspects, innovation and creativity. Local democracy, participation of citizens, quality of life plays also an important role in these definitions. The mix of the two approaches is also frequent, the stressing on synergies between new technology and social structure. These concepts are mainly positive, desirable, attractive. As many authors point out, the term is brilliant from the marketing point of view: smartness is a more user-friendly, positive term than the more elitist term intelligent (Nam-Pardo, 2011),

I do not want to give a new definition. Instead of this I collected some definitions, organized into Table 1, which shows the huge diversity. Most of the papers deal in the beginnings with the problem of the definition, moreover, there are papers, which deal only with this conceptual problem; see for example Allwinkle–Cruickshank, 2011; Albino et al, 2015; Mora et al, 2017.

Table 1 Definitions of smart city

Definition	Author(s)	Year
We believe a city to be smart when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance.	Caragliu, A.; De Bo, C.; Nijkamp, P.	2011
A smart city infuses information into its physical infrastructure to improve conveniences, facilitate mobility, add efficiencies, conserve energy, improve the quality of air and water, identify problems and fix them quickly, recover rapidly from disasters, collect data to make better decisions, deploy resources effectively, and share data to enable collaboration across entities and domains.	Nam, T.; Pardo, T. A.	2011
A smart city is a well-defined geographical area, in which high technologies such as ICT, logistic, energy production, and so on, cooperate to create benefits for citizens in terms of well-being, inclusion and participation, environmental quality, intelligent development; it is governed by a well-defined pool of subjects, able to state the rules and policy for the city government and development.	Dameri, R. P.	2013
Smart cities are presented as the object of a wide range of technologically mediated practices of management at a distance, based on orchestrated assemblages of computerised systems that act as conduits for multiple crosscutting forms of data collection, transfer, and analysis. At their core, efforts towards smart cities thus imply a world of optimised ordering and regulation that relies fundamentally on the coding of social life into software	Klauser, F.; Paasche, T.; Söderström, O.	2012
Smart City is the product of Digital City combined with the Internet of Things.	Su, K.; Li, J.; Fu, H.	2011
A city that monitors and integrates conditions of all of its critical infrastructures, including roads, bridges, tunnels, rails, subways, airports, seaports, communications, water, power, even major buildings, can better optimize its resources, plan its preventive maintenance activities, and monitor security aspects while maximizing services to its citizens	Hall, P.	2000
Two main streams of research ideas: 1) smart cities should do everything related to governance and economy using new thinking paradigms and 2) smart cities are all about networks of sensors, smart devices, real-time data, and ICT integration in every aspect of human life.	Cretu, G. L.	2012
A Smart City is a city well performing in a forward-looking way in [...] six characteristics [...], built on the smart combination of endowments and activities of self-decisive, independent and aware citizens.	Giffinger, R.	2007
'Smart city' seems like a textbook example of an 'empty signifier' in urban planning; that is, a concept virtually void of any substantive meaning.	Haarstad, H.	2017

From technological point of view, the approach toward smart cities lies on a scale of which one endpoint is the technoutopian vision, the optimistic view of future, where all problems are solved by the help of technology. Sustainability, energy efficiency, infrastructure optimization, quality of life, social initiatives, e-government safety, security, intelligence, citizens are keywords in this enthusiastic literature. The other extremists have an anti-technology attitude, Smart city for them is equal with control of the society by the authorities and greedy corporations (Greenfield, 2013; Krivy, 2018). The starting point of both supporters and critics is often not the normal experiences of “ordinary” towns and cities, but the planned or semi-finished greenfield megaprojects of IT multinationals financed by the government (see some of them in Table 2), or the high-tech islands of megacities (such as Sao Paulo, Kuala Lumpur, Singapore).

Table 2 Planned or semi-finished megaprojects, smart city islands

City	Country
Songdo	South Korea
Masdar	United Arab Emirates
Living PlanIT	Portugal
Konza Technology City	Kenya
Cyberjaya	Malaysia
Putrajaya	Malaysia
Palava	India
Smart City Kochi	India
Wave Smart City	India
Meixi	China
SmartCity Malta	Malta

TYPES OF SMART CITY PROJECTS FROM ECONOMIC POINT OF VIEW

Different typologies exist about the areas of smart city projects. The following list shows the wide array of categories:

- Transportation (vehicle routing, road pricing, parking systems, traffic patterns, congestion reduction, smart traffic lights and so on)
- Mobile workforce enablement (city surveyors, park maintenance, inspectors, health and social services)
- Energy (street lighting, building control, demand for electricity, energy theft detection)
- Utilities (smart meters, field service, customer service, maintenance optimization and so on)
- Healthcare (reduction of waiting times, forecast of visit and admission rates, real-time alerting, telemedicine and so on)
- Education, smart people
- Living lab
- Environment (environmental protection)
- Security
- Living conditions (cultural facilities, housing quality, touristic attractiveness)
- Governance (participation in decision making, transparency)

From the economic point of view, it is crucial, what is the cost and revenue impact of the project on the budget of the city. The wrong side of the projects, that each has some initial investment costs; the worse side, that almost every project has significant maintenance costs too. On the good side one can find rarely plus revenue. There can be new or better services, more safety, less pollution, energy saving, better process of urban governance. Cost restructuring can be dramatical: cost of information technology and the dependence of the city from IT company became much larger. The common features of these projects, that they are not profitable. It is not like Amazon, Uber or Airbnb, users of new technologies, which as profit oriented companies cannot be operated without revenues. Smart city projects can be maintained only by the support of local or central government.

The typical smart city project is financed by grants, supports of non-local authorities: regional government, central government, international government. For example, India's 100 Smart Cities Mission was prepared by the Government of India, Ministry of Urban Development in an amount US\$15 billion; Chinese National New-type Urbanisation plan, 2016-2020; The European Innovation Partnership on Smart Cities and Communities (EIP-SCC); JESSICA (Joint European Support for Sustainable Investment in City Areas) (European Commission); SMART (Singapore - MIT Alliance for Research and Technology); The White House Smart Cities Initiative; Smart Cities Plan of Australia, and others.

FINANCING OF THE SMART CITY PROJECTS

According to an estimation, the global market size of Smart city projects was USD 425 Billion in 2016 and is expected to grow to USD 1202 Billion by 2022 (marketsandmarkets.com). The exact market size cannot be given, but the important thing is that this is a huge and rapidly growing market for the IT companies. Therefore, IT companies have a vigorous lobby activity toward (local and central) government for projects, programs, and special privileges, grants, supports, benefits. This is a form of bad rents according to Tullock's terminology. Some local government is supported by central government, but the vast majority of them cannot, which means an unfair spatial tax redistribution among local governments. Thanks to these projects a new form of spatial inequality is created, not by the market mechanism, but by the forced spatial redistribution of incomes by the state.

As I already mentioned, it is very hard to find cost-benefit analysis of concrete project, and virtually impossible to find or get a detailed one. Of course, originally I wanted to present different real cost-benefit analyses, assumed that there are a lot of successful projects and some pointless prestige investments too. My data and information request to the public authorities was not successful until now. Informally I was enlightened that this is a sensitive area. Therefore I can present only partial examples with not too much information, published in business journals.

According to the president of General Electric and many other experts, streetlights will be the network for the future of connected cities. By connecting streetlights to the internet and embedding sensors in them, GE is working with cities to gain loads of new data on vehicle and pedestrian traffic along their roadways. Smart LED street lights are equipped with video monitors. The city can use the video monitors to track parking spaces in the city, and can launch new mobile app for residents to find the nearest parking spaces. Data from the video monitors is sent back to GE's Predix cloud platform, which applies detection algorithms that tell when a car parks in a space and when it leaves. GE has invested more than

USD\$1 billion in the platform, and is looking to open it up to developers to create new apps for smart city solutions (businessinsider.com). GE had two pilot projects, one in San Diego (California), the other in Jacksonville (Florida). San Diego has already deployed 4,000 smart LED street lights equipped with video monitors. The smart LED streetlights also provide better energy efficiency, the 4,000 deployed in San Diego are saving the city USD 250,000 annually on electricity. However, the investment cost of the project was USD 30 million; yearly maintenance cost was not publicized. Investment cost shows, that the project can never be profitable in economic terms. In Jacksonville the cost of intelligent LED conversion would be USD 50.1 million. However, before the realization of the project, in March 2017, the city abandoned the projects. The cost of standard LED conversion (which is also energy saving) is just USD 1.4 million – huge differences. “It is not clear exactly what discouraged Jacksonville from proceeding. The spokesperson declined to elaborate when LEDs asked if costs or operability stymied the smart lighting project, or whether Jacksonville was concerned with things like data protection, data ownership, privacy, and security. The spokesperson would only say that the city pulled the plug in early 2016 because it ‘had other priorities that took precedence.’ That’s hardly how Mayor Brown characterized the project at its kickoff, when he enthused, ‘This technology has the potential to transform how our city solves problems by allowing us to use the power of data to drive outcomes that give us flexibility, efficiency, and new, creative actions to enhance life in our city.’” (ledsmagazine.com)

CONCLUSION

The whole discussion about smart city projects has a very serious deficit, the almost total absence of economic reasoning. The biased rhetoric is shaped by the interested multinational information technology companies and government technocrats. Information technology solutions are treated almost as a free goods, investment and maintenance cost plays an unimportant element. As there will be more and more experiences about the success or failures of pilot projects, the problems of maintenance, the situation must be changed. The changing emphasis from technological to economical side would be favourable the sooner the better.

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REFERENCES

- Albino, V., – Berardi, U. – Dangelico, R. M. (2015) Smart Cities: Definitions, Dimensions, Performance, and Initiatives. *Journal of Urban Technology*, 22, 1, 3–21.
- Allwinkle, S. – Cruickshank, P. (2011) Creating smart-er cities: an overview. *Journal of Urban Technology*, 18, 2, 1-16
- Caragliu, A. – De Bo, C. – Nijkamp, P. (2011) Smart cities in Europe. *Journal of Urban Technology*, 18, 2, 65-82.
- Carli, R. – Dotoli, M. – Pellegrino, R. – Ranieri, L. (2013) Measuring and Managing the Smartness of Cities: A Framework for Classifying Performance Indicators. *Proceedings of IEEE Systems, Man, and Cybernetics*, 2013.
- Cretu, G. L. (2012) Smart Cities Design Using Event-driven Paradigm and Semantic Web. *Informatica Economica*, 16, 4, 57–67
- Dameri, R. P. (2013) Searching for Smart City definition: a comprehensive proposal. *International Journal of Computers & Technology*, 11, 5, 2544-2551
- Giffinger, R. (2007) *Smart Cities: Ranking of European medium-sized cities*. Centre of Regional Science, Vienna
- Greenfield, A. (2013) *Against the Smart City*. New York: Do Projects.
- Haarstad, H. (2017) Constructing the sustainable city: examining the role of sustainability in the smart city discourse. *Journal of Environmental Policy & Planning*, 19, 4, 423-437
- Hall, P. (2000) Creative cities and economic development. *Urban Studies*, 37, 4, 633-649.
- Halper, M. (2017) EXCLUSIVE: Jacksonville jilts GE intelligent street lighting. LEDs Magazine, March 21
- Klauser, F. – Paasche, T. – Söderström, O. (2014) Michel Foucault and the smart city: power dynamics inherent in contemporary governing through code. *Environment and Planning D: Society and Space*, 32, 869-885
- Krivy, M. (2018) Towards a critique of cybernetic urbanism: The smart city and the society of control. *Planning Theory*, 17, 1, 8-30
- Lazaroiu, G.C. – Roscia, M. (2012) Definition Methodology for the Smart Cities Model. *Energy*, 47, 1, 326–332.
- Lombardi, P. – Giordano, S. – Farouh, H. – Yousef, W. (2012) Modelling the Smart City Performance. *Innovation: The European Journal of Social Science Research*, 25, 2, 137–149.
- Mora, L. – Bolici, R. – Deakin, M. (2017) The first two decades of smart-city research: a bibliometric analysis. *Journal of Urban Technology*, 24, 1, 2-27.
- Nam, T. – Pardo, T. A. (2011) Conceptualizing Smart City with Dimensions of Technology, People, and Institutions. *Proc. 12th Conference on Digital Government Research*, College Park, MD, June 12-15, 2011
- Su, K. – Li, J. – Fu, H. (2011) Smart City and the applications. *IEEE International Conference on Electronics, Communications and Control (ICECC)*, 1028-1031.
- Zygiaris, S. (2013) Smart City Reference Model: Assisting Planners to Conceptualize the Building of Smart City Innovation Ecosystems. *Journal of the Knowledge Economy*, 4, 2, 217–231.
- Business Magazines:
- <https://www.bizjournals.com/jacksonville/news/2016/05/12/remember-those-smart-streetlights-ge-announced.html>
- <http://fortune.com/2017/02/22/san-diego-ge-intel-att/>
- <https://www.sandiego.gov/sites/default/files/legacy/mayor/pdf/newsreleases/2015/news150209.pdf>
- <https://www.marketsandmarkets.com/PressReleases/smart-cities.asp>
- <http://www.businessinsider.com/how-ge-is-building-the-connected-city-2015-5>
- www.ledsmagazine.com/articles/2017/03/exclusive-jacksonville-jilts-ge-intelligent-street-lighting.html

1158 IMPACTS OF MULTI-FUNCTIONALITY OF URBAN AGRICULTURE ON THE CREATIVE CLASSES IN GLOBAL MEGA CITIES: FOCUSING ON SHANGHAI MEGA REGION IN CHINA

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ABSTRACT

the purpose of this study is to clarify the relationship between multi-functionality of urban agriculture (MFUA) and the creative classes (CCs) through examining Shanghai mega region in China. Based on the existing researches in the fields of the CCs, MFA and social capital, we will firstly introduce spatial econometrics analysis on published statistical data of the cities in the Yangtze River Delta Economic Zone to clarify the effects of MFA on the utility of the CCs in these cities. Secondly, we will conduct structural equation modeling (SEM) based on the results from authors' original questionnaire survey targeting at the residents in Shanghai City to identify the perception formation process of the CCs (including those who are thinking creatively) towards MFA and lifestyle. Finally, policy implication for the sustainable development of cities by enhancing the impacts of multi-functionality of urban agriculture on the CCs will be derived from the analytical results.

Keywords: Multi-functionality of agriculture (MFA), Creative Class (CC), Social Capital (SC), Shanghai

1. INTRODUCTION

China's cities have enjoyed several decades of explosive growth. The country passed the 50% urbanization threshold in 2010, and the urbanization rate had already exceeded 54% by 2014. However, cross-national comparisons suggest that when countries pass a level of urbanization of around 50%, the relationship between urbanization and economic growth becomes less automatic and depends critically on how urbanization processes are managed.

Nowadays, creativity is considered to be one of the most important driving forces for the development of cities in so called "knowledge-based economy", although the global creativity index (GCI) for China was 0.462 (14th for technology; 87th for talent; 96th for tolerance) ranked as 62th among 139 countries and regions in the world (Florida et al., 2015). and Shanghai was ranked as the 74th among the 100 global sustainable cities³¹⁹ scored highest among all the mainland China cities on the people sub-index ranking in 2016.

On the other hand, multi-functionality of agriculture (MFA) composed of economic, environmental, and social aspects supplies not only food but also service such as environmental conservation, good scenery and farm experience etc. can also be one of the factors attract the creative classes (CCs) to reside in the region. However, these functions and relationships might have specific characteristics according to the context of countries and regions (cities), and might be changing in the processes of development of cities under the urban policy and planning such as the land taxation and zoning system. Although some researchers have started to pay attention to the relationship between regional factors attracting the CCs and multi-functionality of urban agriculture (Kiminami et al, 2018), they are far from sufficient, especially researches on the impacts of multi-functionality of urban agriculture on the creative classes in global mega cities are scarce.

Therefore, the purpose of this study is to clarify the relationship between multi-functionality of urban agriculture (MFUA) and the creative classes (CCs) through examining Shanghai mega region in China. Based on the existing researches in the fields of the CCs, MFA and social capital, we will firstly introduce spatial econometrics analysis on published statistical data of the cities in the Yangtze River Delta Economic Zone to clarify the effects of MFA on the utility of the CCs in these cities. Secondly, we will conduct structural equation modeling (SEM) based on the results from authors' original questionnaire survey targeting at the residents in Shanghai City to identify the perception formation process of the CCs (including those who are thinking creatively) towards MFA and lifestyle. Finally, policy implication for the sustainable development of cities by enhancing the impacts of multi-functionality of urban agriculture on the CCs will be derived from the analytical results.

2. A SELECTIVE LITERATURE REVIEW

2.1 Creative occupation or creative thinking?

Since focused by Florida (2002), the CCs who are engaged in the work of "creating meaningful new forms" classified into "super creative core" (the likes of scientists, technicians, university professors, poets, novelists, artists, entertainers, actors, designers and architects) and "creative professionals" (the likes of tech or finance workers, lawyers, doctors, managers and so forth) has been thought to be a key driving force for economic growth in the deindustrialized cities through innovation (Batabyal and Nijkamp, 2013).

However, the occupation classification on the CCs is not fixed, while Schoales (2006) included clothing and jewelry industry employees, Westlund and Calidoni (2014) used "High-Tech" industry employees. On the other hand, McGranahan and Wojan (2007) showed that some occupations in Florida's creative class don't have high creativity using

³¹⁹ See "Sustainable Cities Index 2016: Putting people at the heart of city sustainability", Arcadis.

“thinking creatively” element of 2004 O*NET content model. Moreover Kiminami et al. (2018) clarified that although a stronger positive correlation between thinking creatively and creative occupations comparing to other occupations was testified, “thinking creatively” was also found to be important in other occupations³²⁰. Therefore, it is thought to be necessary to grasp the creative class both from the views of “creative occupation” and “thinking creatively”.

On the other hand, studies on the CCs in large cities (Florida et al. 2008; Boschma and Fritsch 2009) clarified that the CCs were attracted by tolerance, university, consumer services, and openness of the regions. However, Marlet and van Woerkens (2005) argued that urban amenities, job opportunities and esthetics of cities attracted the CCs, but tolerance didn't do it in Netherland. Furthermore, the research on Hong Kong creative workers in Shanghai and Beijing by Chow (2017) clarified that the possibility of creating a job or project determined where they went implied that Florida's ideas on city attractiveness predominantly situated in the cities in Europe, the United States and Australia should be reserved critically as a reminder to policy-makers and urban planners in the Asian cities, particularly in Chinese cities (He et al. 2018). Nevertheless, researches on the CCs in China were generally followed with Florida's creative occupation so far (Rao and Dai, 2017).

2.2 Whether the CCs prefer multi-functionality of agriculture in mega cities?

Although many studies have pointed out the benefits of urban agriculture, including increased food access, job creation, educational opportunities, and green space, a focus on its social benefits has fed an association of urban agriculture with social justice. Reynolds (2015) argues that a failure to examine urban agriculture's role in either supporting or dismantling unjust structures may perpetuate an inequitable system based on the findings from a 2-year study of urban agriculture in New York City, which found race-and class-based disparities among practitioners citywide. Clearly, arguments for and against urban agriculture will always have a strong element of context specificity. However, in response to the massive population growth in developing world, new cities are being planned and built and existing cities drastically be modified, so the opportunity exists for urban agriculture to be included in food systems in an organized rather than reactionary manner (Hamilton et al. 2014).

The results from Kiminami and Kiminami (2006, 2007) on the awareness of urban residents regarding urban agriculture in Tokyo and Shanghai showed that residents' subjective impressions towards urban agriculture influence their consciousness of settlement in large cities. The study evaluated the multi-functionality of urban agriculture by showing that it enhances the quality of urban life and settlement of its residents. Furthermore, by using the authors' original questionnaire survey targeting at the residents in Tokyo, Kiminami et al. (2018) clarified that multi-functionality of urban agriculture was more preferred by the CCs, especially those who are thinking creatively across occupations have higher preference than others in the mega city.

2.3 Whether social capital (SC) matters for the CCs?

Which theory has stronger explanatory power among social capital (SC), human capital (HC) and creative class (CC) on regional economic development has been discussed for some years (Florida 2003; Hoyman and Faricy 2009), despite the debates on the question of how to define the core of these factors. Especially, there are arguments both for and against the role of Bonding SC in the regional economic development. Although Westlund and Calidoni (2014) could not find a clear impact of civil society on regional development from the empirical study on the relationship between the CCs and social capital in Japan, Rich (2012) pointed out that small cities attempting to achieve economic growth and population stability should focus on their strengths: city livability and the thick social ties that maintain communities. Furthermore, based on the questionnaire survey targeting at the residents in Tokyo, Kiminami et al. (2018) clarified that among the CCs who are “thinking creatively” also have a high level of social capital and are favorable to diversified lifestyles that is thought to contribute to the development of cities.

On the other hand, by using the data of 16,253 participants from 29 provinces/municipalities in China based on Labor-force Dynamics Survey (CLDS), Li (2017)'s results showed that the positive role of generalized trust in promoting success was less sensitive to the influence of societal residential mobility. In this study, we would like to testify the relationships among multi-functionality of urban agriculture (MFA), the CCs and social capital (SC) in Shanghai to make contributions to the debates on the issues.

3. THEORETICAL MODEL AND HYPOTHESES

In accordance with Kiminami and Kiminami (2006) and Kiminami et al. (2018), the multi-functionality of urban agriculture can be regarded as supply of private goods and public goods with externality. And, the utility function of the residents can be expressed as follows.

$$U = U(C, N, A, G, MFA) \cdot \cdot \cdot (1)$$

Here, U is the utility function of residents; C is consumer goods; N is housing service; A is pure amenity; G is public goods; MFA is multi-functionality of Urban Agriculture.

If the multi-functionality of urban agriculture is classified into three categories of economic function (EC), environmental function (EN) and social function (SO), the equation (1) can be expressed as follows.

³²⁰ See Table 3 in Kiminami et al. (2018) for detail.

$$U = U \{ C, N, A, G, MFA (EC, EN, SO) \} \dots (2)$$

When the utility functions of the CC (creative class) and non-CC are UC and UN respectively, and the multi-functionality of urban agriculture has a positive influence on the utility of residents, we obtain the following conditional expression.

$$\partial UC / \partial MFA > 0 \dots (3a)$$

$$\partial UN / \partial MFA > 0 \dots (3b)$$

Population growth rate will increase in the areas where the level of multi-functionality of urban agriculture demanded by residents is high under the assumption that the mobility cost among regions is zero. Furthermore, if the CCs prefer multi-functionality of agriculture more than non-CC, we obtain the following formula from the utility function.

$$\partial UC / \partial MFA > \partial UN / \partial MFA \dots (4)$$

Then the increase rate of CC is higher than that of non-CC in the region where the level of multi-functionality of urban agriculture demanded by residents is high.

To clarify the relationship between the multi-functionality of urban agriculture and the CCs in the development of cities, the analytical framework of our research is shown in Figure 1 and the following hypotheses are put forth.

H1: Multi-functionality of urban agriculture (MFA) has a positive influence on the utility of the CCs.

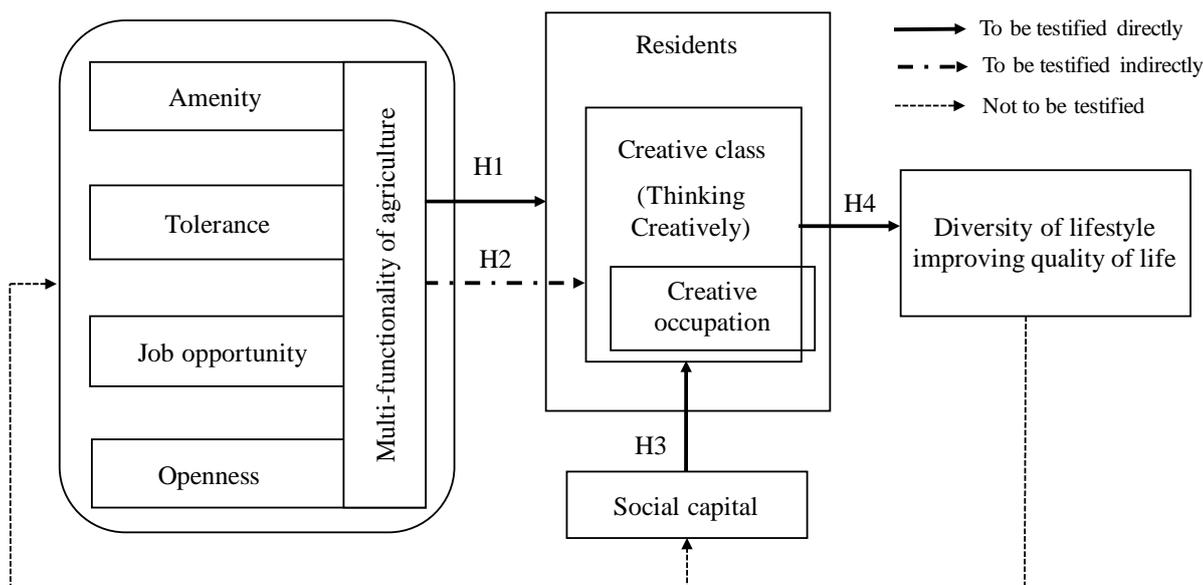
H2: The CCs prefer MFA more than that of non-CC.

Furthermore, based on the discussion on the relationship between CC and SC in the regional development in the previous section and Kiminami et al. (2018), we add the following hypotheses to make contribution to this issue.

H3: The CCs have a high level of social capital as well.

H4: The CCs prefer diversified lifestyles and contribute to the development of cities.

In the following, we will firstly verify the hypothesis H1 through space metric analysis on published statistical data of the cities in the Yangtze River Delta Economic Zone, and next verify the hypotheses H2, H3 and H4 through the analysis on the results from questionnaire survey targeting at the residents of Shanghai in Section 4.



Source: Partially modified of Fig.3 in Kiminami et al. (2018)

Figure 1. Analytical framework of this study

4. EMPIRICAL ANALYSIS

4.1 Target areas

The target areas in the analysis are centered on Shanghai mega region. The cities in the Yangtze River Delta Economic Zone (Figure 2) including Shanghai City, Jiangsu province, Zhejiang province and Anhui province accounts for 16.1% of China's total population and 22.6% of GDP in 2010. In the economic zone, the mega city Shanghai is the largest city and its population growth rate and CC growth rate are the highest from 2000 to 2010, and its CC rate in 2010 is also the second highest after Beijing City in the whole country. Therefore, the mega city Shanghai and the its enlarged Yangtze River Delta Economic Zone (YRDEZ) is one of the most dynamic regions in the country.

Growth rate of population CC (2010)	GP	Growth rate of total population (%)	PC	
	CC2010	Ratio of CC in total number of employed person (%) in 2010	PC	
Independent variables				
Urbanization	Population Density	PD	Population density (person / km ²)	PC
Amenity	Nature	PPAGREEN	Area of park green space per person (m ² /person)	CSY
	Culture	PTHEATER	The number of theater and cinema per population (number/million person)	CSY
Food Education		PCHEF	Ratio of chef in total number of employed person (%)	PC
		EDUC	The average year of education (years)	PC
House		HOUSE_AME	Ratio of house with water supply facility in total number of house (%)	PC
	Minority	MINORITY	Ratio of ethnic minority in total number of population (%)	PC
MFA	Economy	ECO	Output value of agriculture (excluding livestock) / Total sown area (million yuan/ha)	AC
Environment		ENV	Ratio of village with treatment facility of livestock manure in total number of village with livestock concentrated area (%)	AC
	Sociality (Tourism)	SOC_T	The number of village with farm household accommodation in the total number of village (%)	AC
Sociality (Job)		SOC_J	The number of employed person in the primary industry / Total sown area (person / 1,000 ha)	AC
	CC	CC2000	Ratio of CC in total number of employed person (%) in 2000	PC

Notes: District level data in Shanghai city and city level data in other three provinces are used.

The nine wards in the central part of Shanghai where agriculture related data cannot be obtained are excluded from the sample. Professional and technical workers who used as CCs are those who are classified into the occupational classification 206-219 (medium classification).

Source: The abbreviations of Source indicates the statistical data as follows.

PC: Chinese Population Census

CSY: China City Statistical Yearbook and Shanghai Statistical Yearbook

AC: 2nd Agriculture Census

Table 2. Average of Main Variables in Each Region

	Year	Total	Shanghai	Jiangsu	Zhejiang	Anhui	
Basic Information							
Population (person)	2010	4,172,577	1,782,378	6,050,769	4,947,909	3,500,028	
CC (person)	2010	17,861	12,798	27,602	23,125	9,688	
Dependent Variables							
GCC	2000-10	50.52	116.09	41.08	59.96	16.90	
DGCC	2000-10	34.60	40.44	36.63	39.80	26.58	
GP	2000-10	19.30	71.71	7.99	15.21	2.85	
CC2010	2010	7.80	10.53	7.86	7.55	6.46	
Independent variables							
Urbanization	PD	2010	1098.74	3173.82	836.46	599.39	523.85
Amenity	PPAGREEN	2006	2.81	5.82	2.70	1.76	1.98
	PTHEATER	2006	0.07	0.08	0.11	0.06	0.02
	PCHEF	2010	13.29	10.83	11.69	14.65	14.94
	EDUC	2010	8.91	9.81	9.22	8.63	8.39
Tolerance	HOUSE_AME	2010	77.37	91.23	87.63	89.82	54.13
	MINORITY	2010	1.01	1.15	0.46	2.14	0.61
MFA	ECO	2006	0.22	0.31	0.20	0.24	0.17
	ENV	2006	38.31	71.52	35.34	39.70	22.11
	SOC_T	2006	0.02	0.01	0.02	0.04	0.02
	SOC_J	2006	156.92	122.28	128.28	189.54	176.05
CC	CC2000	2000	6.07	8.46	5.96	5.84	5.02
Observations		50	9	13	11	17	

As shown by Table 3, the presence or absence of spatial autocorrelation was checked on four variables of CC, GCC (CC rate), DGCC (CC increase rate minus non-CC increase rate) and GP (the growth rate of population), and Moran's I was calculated as well. Due to a positive spatial autocorrelation was confirmed for the three variables of GCC, CC, GP, spatial error model was used for the estimations in our analysis.

Table 3. Results of Spatial Auto-correlation (Moran's I)

	GCC	CC(2010)	DGCC	GP
Moran's I	0.518 ***	0.239 ***	0.013	0.596 ***
Z-value	6.779	3.219	0.419	7.970
p-value	0.000	0.001	0.338	0.000

4.2.2 Results of estimation

Two models of Basic Model and MFA Model (by adding variables of multi-functionality of urban agriculture to basic model) were estimated as shown in Table 4. In order for our object to clarify the relationships between multi-functionality of urban agriculture and CC, we will analyze the results based on MFA model in the following.

First, the significance of the whole model was confirmed in all three estimations except for DGCC and the sign of the explanatory variables and the significance were generally in agreement with the theoretical prediction except for some explanatory variables. It was confirmed that there was a positive correlation between population density (PD), GCC (growth rate of CC), CC2010 (population of CC in 2010) and DGCC (GCC – Growth rate of non-CC) but a negative correlation with GP (growth rate of population). As for the amenity of cities, the statistical significance of the variables for the amenities of nature, food, education and living were all confirmed, and the statistical significance of minority variables for the tolerance of the cities was also confirmed in GCC with a positive correlation.

Next, the variables of multi-functionality of urban agriculture in the estimations were confirmed as follows.

-A positive correlation of economic indicators (ECO) with GCC and GP was confirmed.

-A positive correlation of environmental index (ENV) with GCC and GP, and a negative correlation of it with CC2010 was confirmed.

-A positive correlation of social indicators (SCO) with CC and DGCC, and a negative correlation of it with GP was confirmed for tourism but no significant results for employment.

Furthermore, a positive correlation of CC2000 (the ratio of CC in the population in 2000) with GP (the population growth rate) was confirmed.

Therefore, our hypothesis of “Multi-functionality of urban agriculture (MFA) has a positive influence on the utility of the CCs” (H1) was verified in the case of YREB (among the MFA, a higher level of economic efficiency and a more environment-friendly urban agriculture were positive to a higher rate of growth in the CCs were clarified). On the other hand, a higher level of social function positively influence the ratio of the CCs was consistent with the results of questionnaire survey in the next part, but a higher level of environmental function negatively influence the ratio of the CCs could be explained that the degree of controlled negative externality as non-commodity outputs of livestock farming has greater influence on non-CC than CC.

Table 4. Results of Spatial Error Model

	Expected Sign	Dependent Variables															
		GCC				CC 2010				[For Reference] DGCC				GP			
		Basic Model		MFA Model		Basic Model		MFA Model		Basic Model		MFA Model		Basic Model		MFA Model	
		Coef.	z-value	Coef.	z-value	Coef.	z-value	Coef.	z-value	Coef.	z-value	Coef.	z-value	Coef.	z-value	Coef.	z-value
PD	+	0.383	3.594 ***	0.347	4.456 ***	0.097	1.234	0.197	2.684 ***	0.304	1.932 *	0.418	2.491 **	0.172	1.231	0.030	0.253
PPAGREEN	+	-0.290	-2.759 ***	-0.319	-3.022 ***	0.123	1.536	0.166	2.079 **	-0.560	-2.817 ***	-0.492	-2.324 **	-0.071	-0.489	-0.146	-1.021
PTHEATER	+	0.004	0.053	-0.022	-0.369	-0.049	-0.979	-0.019	-0.411	-0.083	-0.708	-0.055	-0.463	0.012	0.141	-0.012	-0.169
PCHEF	+	-0.037	-0.500	0.050	0.707	0.195	3.475 ***	0.143	2.520 **	0.139	1.099	0.039	0.267	-0.160	-1.906 *	0.060	0.726
EDUC	+	0.599	4.550 ***	0.466	4.080 ***	0.828	8.365 ***	0.806	8.768 ***	0.768	3.349 ***	0.763	3.279 ***				
HOUSE_AME	+	0.072	0.615	-0.156	-2.239 **	0.023	0.272	0.045	0.593	0.089	0.670	0.065	0.407	0.099	0.658	-0.253	-2.217 **
MINORITY	+	0.149	1.741 *	0.210	4.389 ***	0.021	0.337	0.068	1.262	0.078	0.751	0.150	1.375	0.115	0.967	0.060	0.724
ECO	+			0.274	3.308 ***			0.021	0.265			-0.068	-0.384			0.361	2.966 ***
ENV	+			0.320	3.338 ***			-0.246	-2.815 ***			-0.215	-1.040			0.570	4.127 ***
SOC_T	+			0.056	0.906			0.191	3.579 ***			0.266	2.038 **			-0.194	-2.215 **
SOC_J	+			-0.077	-1.171			-0.042	-0.715			-0.090	-0.638			-0.107	-1.192
CC2000	+													0.260	1.496	0.288	1.792 *
Constant		0.004	0.029	0.000	0.004	0.001	0.013	0.001	0.014	-0.001	-0.015	-0.001	-0.016	0.016	0.053	0.000	-0.003
LR test value		3.790		4.060		4.288		0.950		0.512		0.958		9.085		0.243	
p-value		0.052	*	0.044	**	0.038	*	0.330		0.474		0.328		0.003	***	0.622	
Log likelihood		-29.525		-19.729		14.958		-8.589		56.598		54.579		42.714		-30.737	
No. of Sample		50		50		50		50		50		50		50		50	
		1		1b		2a		2b		3a		3b		4a		4b	

Notes: “***”, “**” and “*” indicate statistically significant at 1%, 5%, 10% level, respectively. The coef. indicates the standardized coefficient

4.3 Results of the structural equation modeling (SEM)

4.3.1 Basic outline of the questionnaire survey and variable setting

In order to verify our hypotheses of “The CCs prefer MFA more than that of non-CC”(H2), “The CCs have a high level of social capital as well” (H3) and “The CCs prefer diversified lifestyles and contribute to the development of cities” (H4), we carried out a questionnaire survey targeting at the residents in Shanghai. Internet usage survey was conducted on January 24-27, 2018 through Macromill Co., Ltd. The number of collected samples is 1029. To clarify the different influences between creative occupation (CC) and non-CC on the results of answer, the condition of assignment including “managers and executives”, “professionals/technical workers”, and “company officers who are neither manager nor professional or technical work” are equally allocated.

Table 5 shows the profile of respondents in the questionnaire survey. The results of population census on the distribution of male-female ratio and age hierarchy in 2010 are shown in parentheses. It is obvious that survey respondents are

almost equal to population census in terms of gender ratio, but in terms of age “30 - 39 years old” accounted for the largest and about half while in other age groups the proportion of respondents was small though the percentage of responses of “40 to 49 years old” almost agree with each other.

As for creative thinking, 44.2% is “very important”, followed by 38.9% “extremely employing” and 14.0% “important”. Furthermore, as shown in Table 6, thinking creatively is also considered to be important in non-professional/technical worker although there is a stronger positive correlation between creative occupation (CO) and thinking creatively (TC).

Table 5. Socio-economic attributes and basic results of the questionnaire (%)

	Item	Distribution of the ratio of respondents					
		Male	Female	Total			
Socio-economic attributes	Sex	50.7 (57.1)	49.3 (42.9)	100.0 (100.0)			
		18-19	20-29	30-39	40-49		
	Age (years old)	1.1	18.0 (26.1)	47.1 (20.3)	18.3 (18.5)		
		-	50-59	60-69	70 and above	Total	
		9.6 (17.7)	5.7 (9.1)	0.2 (8.4)	100.0 (100.0)		
	Household income (1,000 yuan)	< 10	10 to <12	12 to < 14	14 to < 16	16 to < 18	
		1.5	2.7	4.7	7.1	7.4	
		18 to < 20	20 to < 30	30 to < 40	40 and above	Don't Know	Total
		12.6	25.8	19.7	18.5	0.1	100.0
	Farmland	There is a lot	There is a bit	There is not much	There is not any	Total	
12.0		40.5	36.2	11.4	100.0		
Creative class	Occupation	Executive in a company	Professional / technical worker	The other worker	Total		
		33.3	33.3	33.3	100.0		
	Thinking creatively	Extremely important	Very important	Important	Somewhat important	Not important	Total
		38.9	44.2	14.0	2.7	0.2	100.0

Notes: The value in parenthesis of sex item indicates the ratio calculated from the *Population Census 2010* (the age of 20 and above: Shanghai).

The value in parenthesis of age item indicates the ratio calculated from the *Population Census: 2010* (the age of 20 and above: Shanghai).

Null hypotheses that ‘the ratio of the response by the questionnaire survey is equivalent to the ratio calculated from a population’ was not rejected in sex ratio and was rejected in the age structure as a result of the test of the goodness of fit.

Sex ratio: Chi-square = 0.148 (p-value =0.701)

Age structure: Chi-square = 527.508 (p-value =0.000)

Table 6. Occupational CC and Thinking Creatively

		Total	Executives in a company	Professional /technical worker	Non-professional/technical worker
Ratio (%)	Extremely important (4)	38.9	50.1	40.2	26.2
	Very important (3)	44.2	38.8	46.6	47.2
	Important (2)	14.0	9.0	10.8	22.2
	Somewhat important (1)	2.7	2.0	2.0	4.1
	Not important (0)	0.2	0.0	0.3	0.3
Average score (0-4)		3.19	3.37	3.24	2.95

4.3.2 Results of the structural equation modeling (SEM)

Here, we apply the covariance structure analysis to the results obtained from the questionnaire survey to clarify the formation process of the relationships among the multi-functionality of urban agriculture, social capital, and the diversity of lifestyle.

Table 7 summarizes the basic statistics of variables used for SEM. Variables of socioeconomic attributes and farmland existence are set for layer 1, variables of CC and social capital (SC) are set for layer 2 and variables relating to diversity of lifestyle and multi-functionality of urban agriculture (MFA) are set for layer 3. Detailed information on the variable setting concerning multi-functionality of urban agriculture, social capital, and diversity of lifestyle is shown in Appendix.

In the estimation, correlation of error term of each variable in layer 1, layer 2 and layer 3 is assumed. Also, estimation method of Maximum-likelihood with missing value is used because there are missing variables for household income among socioeconomic attributes. In the following, we will testify three models (creative occupation, thinking creatively, and twin analysis) for analysis.

Table 7. Descriptive statistics of variables

Variables	Layer	Number. of Obs.	Average	S.D.	Min.	Max.	
Socio-economic attributes	Sex	(1)	1,029	0.51	0.50	0.00	1.00
	Age	(1)	1,029	2.35	1.10	0.00	6.00
	Household Income	(1)	1,028	5.67	1.96	0.00	8.00
Farmland	(1)	1,029	1.53	0.85	0.00	3.00	
Creative class	Creative thinking	(2)	1,029	3.19	0.79	0.00	4.00
	Executive	(2)	1,029	0.33	0.47	0.00	1.00
	Prof./Tech. worker	(2)	1,029	0.33	0.47	0.00	1.00
Social capital	(2)	1,029	1.58	0.68	0.00	2.00	
Diversity of lifestyle	Self-actualization(high-low)	(3)	1,029	0.98	0.58	0.04	3.55
	Self-investment(high-low)	(3)	1,029	0.06	0.46	-1.04	1.51
	Altruism (low-high)	(3)	1,029	-0.03	0.41	-1.24	1.47
Multi-functionality of agriculture	Economic function	(3)	1,029	0.63	0.68	0.00	2.00
	Environmental function	(3)	1,029	0.93	0.71	0.00	2.00
	Social function	(3)	1,029	2.27	1.51	0.00	8.00

Notes: Details of each variable are as follows. Values in parentheses are given when applicable.

Sex: Male (1), Female (0)

Age: 18-19(0), 20-29 (1), 30-39(2), 40-49(3), 50-59(4), 60-69(5), 70 years old and above(6)

Income: < 10 (0), 10 to < 12 (1), 12 to < 14 (2), 14 to < 16 (3), 16 to < 18 (4), 18 to < 20 (5), 20 to < 30 (6), 30 to < 40 (7), 40 thousand yuan above (8)

Farmland: There is a lot (3); There is a bit (2); There is not much (1); There is not any (0)

Thinking Creatively: Extremely important (4); Very important (3); Important (2); Somewhat important (1); Not important (0)

Executive: Executive in a company (1); Others (0)

Professional/technical worker: Professional/technical worker (1); Others (0)

Model of creative occupation

Figure 3 and Table 8 are the path diagram and path coefficient obtained from the result of covariance structure analysis for the model of creative occupation. The main goodness of fit indicator is Chi 2 (7) = 437.210 (p-value: 0.000), RMSEA = 0.244, CFI = 0.735 which is a good result. According to the analysis results, the formation process of consciousness about the diversity of lifestyle such as the types of “Self-actualization”, “Self-investment” and “Altruism” is complicatedly influenced by occupation, social capital, socioeconomic attributes, farm land, evaluation on multifunctional function of urban agriculture. Below we will look at the items that were significant at 1% level.

First, for socioeconomic attributes, “gender (+)”, “age (+)” and “income (+)” have positive correlation with “executive” but age has negative correlation with “professional and technical workers” and “self-investment”, which clearly presented the image that creative occupations in Shanghai with the aged, high income and male “executive” on one side, and younger “professional/technical worker” who prefer the lifestyle of “self-actualization” and the environmental and social functions of urban agriculture on the other. However, it is also clarified that women prefer the lifestyle of “self-actualization” and social function of urban agriculture than man and young people prefer “self-investment” than elderly one in Shanghai.

Next, neither correlation between “creative occupation” and “social capital”, nor variables of socioeconomic attributes affecting “social capital” was confirmed in the model, though those who have high level of social capital prefer the lifestyle of “self-actualization” and environmental function of urban agriculture was confirmed. Subsequently, regarding the relationship between the diversity of lifestyle and the multi- functionality of urban agriculture in layer 3, “self-actualization” was positively correlated with all dimensions of MFA and “altruism” was negatively correlated with social function, but there was no confirmed correlation with self-investment. However, looking at the factors affecting the diversity of lifestyle in layer 2, only “professional/technical worker” in creative occupation and those who have higher level of “social capital” prefer the lifestyle of “self-actualization”. Furthermore, among creative occupations, professional/technical workers and those who have higher level of social capital prefer environmental and social functions while those who are living in the place with more farm land prefer economic function of urban agriculture.

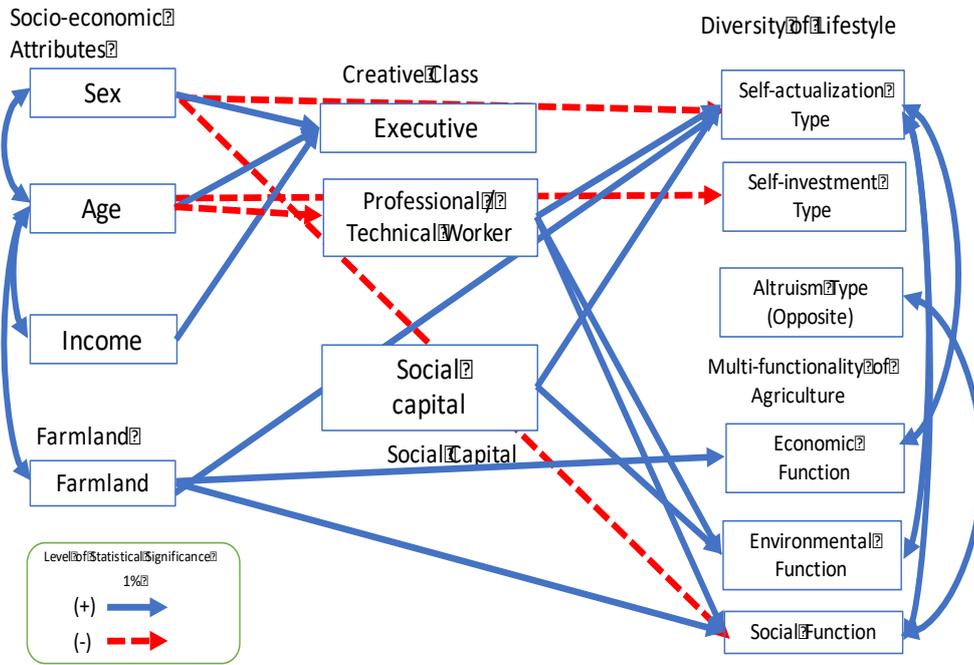


Figure 3. Path Diagram (Creative Occupation Model)

Table 8. Estimated results of path coefficient (Creative occupation model)

				Shanghai			
				Coef.	P>|z|		
1	Economy: MFA	(3)	Executive	(2)	-0.091	0.124	
2		(3)	Prof./Tech. worker	(2)	0.010	0.846	
3		(3)	Social capital	(2)	0.044	0.148	
4		(3)	Farmland	(2)	0.082	0.001	***
5		(3)	Sex	(2)	-0.096	0.027	**
6		(3)	Age	(2)	0.017	0.430	
7		(3)	Income	(2)	0.030	0.010	**
8	Environment: MFA	(3)	Executive	(2)	-0.127	0.040	**
9		(3)	Prof./Tech. worker	(2)	0.154	0.005	***
10		(3)	Social capital	(2)	0.130	0.000	***
11		(3)	Farmland	(2)	0.014	0.583	
12		(3)	Sex	(2)	-0.075	0.094	*
13		(3)	Age	(2)	-0.002	0.914	
14	(3)	Income	(2)	-0.009	0.471		
15	Sociality: MFA	(3)	Executive	(2)	-0.272	0.044	**
16		(3)	Prof./Tech. worker	(2)	0.353	0.003	***
17		(3)	Social capital	(2)	0.050	0.466	
18		(3)	Farmland	(2)	0.148	0.009	***
19		(3)	Sex	(2)	-0.299	0.002	***
20		(3)	Age	(2)	0.047	0.337	
21	(3)	Income	(2)	0.017	0.509		
22	Self-actualization: Diversity of Lifestyle	(3)	Executive	(2)	0.011	0.823	
23		(3)	Prof./Tech. worker	(2)	0.234	0.000	***
24		(3)	Social capital	(2)	0.072	0.003	***
25		(3)	Farmland	(2)	0.069	0.001	***
26		(3)	Sex	(2)	-0.103	0.003	***
27		(3)	Age	(2)	-0.022	0.209	
28	(3)	Income	(2)	0.014	0.125		
29	Self-investment: Diversity of Lifestyle	(3)	Executive	(2)	0.082	0.046	**
30		(3)	Prof./Tech. worker	(2)	0.025	0.491	
31		(3)	Social capital	(2)	-0.042	0.044	**
32		(3)	Farmland	(2)	-0.014	0.411	
33		(3)	Sex	(2)	0.058	0.051	*
34		(3)	Age	(2)	-0.053	0.000	***
35	(3)	Income	(2)	-0.002	0.787		
36	Altruism: Diversity of Lifestyle (Opposite sign)	(3)	Executive	(2)	-0.006	0.875	
37		(3)	Prof./Tech. worker	(2)	0.017	0.600	
38		(3)	Social capital	(2)	-0.012	0.513	
39		(3)	Farmland	(2)	-0.015	0.321	
40		(3)	Sex	(2)	-0.054	0.043	**
41		(3)	Age	(2)	0.032	0.015	**
42	(3)	Income	(2)	0.007	0.329		

43	Executive	(2)	Farmland	(1)	0.036	0.020	**
44		(2)	Sex	(1)	0.093	0.000	***
45		(2)	Age	(1)	0.151	0.000	***
46		(2)	Income	(1)	0.062	0.000	***
47	Prof./Tech. worker	(2)	Farmland	(1)	-0.004	0.820	
48		(2)	Sex	(1)	0.054	0.068	*
49		(2)	Age	(1)	-0.101	0.000	***
50		(2)	Income	(1)	0.011	0.125	
51	Social capital	(2)	Farmland	(1)	0.034	0.190	
52		(2)	Sex	(1)	0.029	0.501	
53		(2)	Age	(1)	-0.008	0.692	
54		(2)	Income	(1)	0.019	0.081	*
Covariance							
55	Social capital	(2)	Executive	(2)	0.002	0.849	
56		(2)	Prof./Tech. worker	(2)	0.007	0.558	

Note: “***”, “**” and “*” indicate statistically significant at 1%, 5%, 10% level, respectively. Results of the estimates between variables within layer 1 and 3 are abbreviated in the table.

Model of Thinking Creatively

Figure 4 and Table 9 are the path diagram and path coefficient obtained from the result of covariance structure analysis on the model of thinking creatively. The main goodness of fit indicator is Chi 2 (6) = 139.678 (p-value: 0.000), RMSEA = 0.147, CFI = 0.860, which is a good result.

Initially, the factors that influence “thinking creatively” are the such as “income (+)” and “farmland ()” among social economic attributes. Next, regarding the relationship between “thinking creatively” and “social capital”, a positive correlation was confirmed according to the result of assuming covariance of error terms. Subsequently, the relationships between diversity of the lifestyle and multi-functionality of urban agriculture were almost similar to the model of creative occupation. Furthermore, it is clarified that those who are “thinking creatively” positively evaluate the social function of MFA and prefer the lifestyle of “self-actualization”, and those who have higher level of “social capital” positively evaluate the environmental function of MFA. In addition, those who are living in the place with more farmland prefer more economic function of urban agriculture.

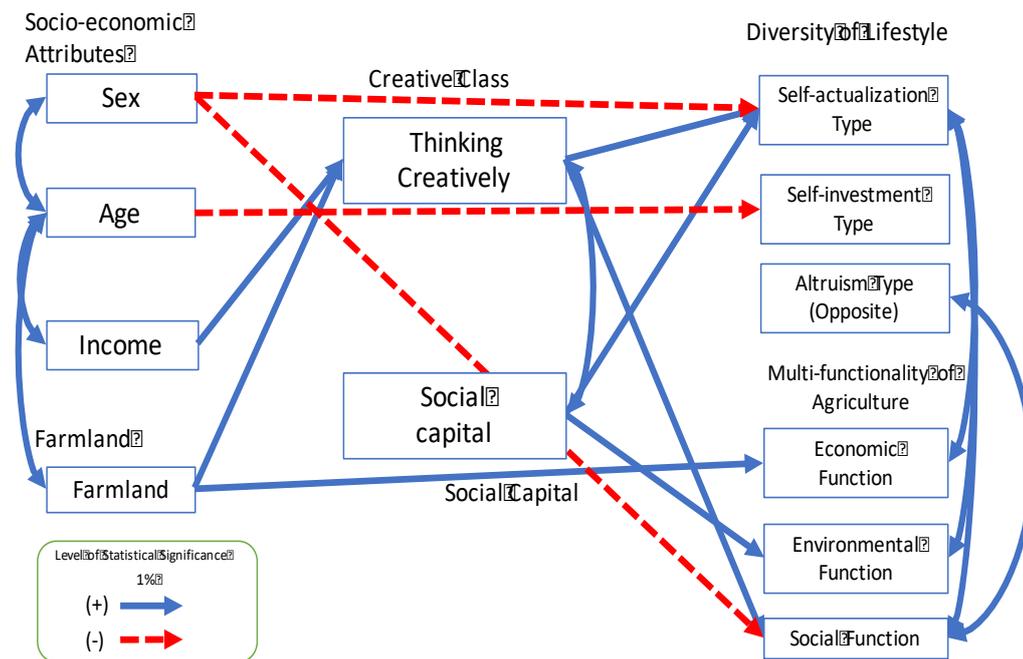


Figure 4. Path Diagram (Thinking Creatively Model)

Table 9. Estimated results of path coefficient (Thinking creatively model)

				Shanghai			
				Coef.	P>|z|		
1	Economy: MFA	(3)	Thinking Creatively	(2)	0.049	0.068	*
2		(3)	Social Capital	(2)	0.039	0.206	
3		(3)	Farmland	(2)	0.075	0.003	***
4		(3)	Sex	(2)	-0.106	0.014	**
5		(3)	Age	(2)	0.004	0.837	
6		(3)	Income	(2)	0.021	0.052	*
7	Environment: MFA	(3)	Thinking Creatively	(2)	0.033	0.247	
8		(3)	Social Capital	(2)	0.128	0.000	***
9		(3)	Farmland	(2)	0.006	0.815	

10		(3)	Sex	(2)	-0.080	0.075	*
11		(3)	Age	(2)	-0.036	0.091	*
12		(3)	Income	(2)	-0.017	0.148	
13	Sociality: MFA	(3)	Thinking Creatively	(2)	0.182	0.003	***
14		(3)	Social Capital	(2)	0.034	0.626	
15		(3)	Farmland	(2)	0.120	0.037	**
16		(3)	Sex	(2)	-0.310	0.001	***
17		(3)	Age	(2)	-0.023	0.621	
18		(3)	Income	(2)	-0.007	0.794	
19	Self-actualization:	(3)	Thinking Creatively	(2)	0.096	0.000	***
20	Diversity of Lifestyle	(3)	Social Capital	(2)	0.064	0.009	***
21		(3)	Farmland	(2)	0.060	0.003	***
22		(3)	Sex	(2)	-0.092	0.007	***
23		(3)	Age	(2)	-0.040	0.013	**
24		(3)	Income	(2)	0.012	0.188	
25	Self-investment:	(3)	Thinking Creatively	(2)	0.002	0.902	
26	Diversity of Lifestyle	(3)	Social Capital	(2)	-0.042	0.045	**
27		(3)	Farmland	(2)	-0.012	0.503	
28		(3)	Sex	(2)	0.067	0.023	**
29		(3)	Age	(2)	-0.043	0.002	***
30		(3)	Income	(2)	0.003	0.679	
31	Altruism:	(3)	Thinking Creatively	(2)	-0.004	0.819	
32	Diversity of Lifestyle	(3)	Social Capital	(2)	-0.012	0.538	
33	(Opposite sign)	(3)	Farmland	(2)	-0.015	0.325	
34		(3)	Sex	(2)	-0.053	0.042	**
35		(3)	Age	(2)	0.029	0.017	**
36		(3)	Income	(2)	0.007	0.296	
37	Thinking creatively	(2)	Farmland	(1)	0.095	0.001	***
38		(2)	Sex	(1)	0.032	0.519	
39		(2)	Age	(1)	-0.040	0.090	*
40		(2)	Income	(1)	0.063	0.000	***
41	Social capital	(2)	Farmland	(1)	0.034	0.190	
42		(2)	Sex	(1)	0.029	0.501	
43		(2)	Age	(1)	-0.008	0.692	
44		(2)	Income	(1)	0.019	0.082	*
	Covariance						
45	Thinking creatively	(2)	Social Capital	(2)	0.054	0.001	***

Note: “***”, “**” and “*” indicate statistically significant at 1%, 5%, 10% level, respectively.

Results of the estimates between variables within layer 1 and 3 are abbreviated in the table.

Twin Analysis (Creative occupation and Thinking Creatively)

Figure 5 and Table 10 are the path diagram and path coefficient obtained from the result of covariance structure analysis on the twin model. The main goodness of fit indicator is Chi2(7)=434.21(p-value: 0.000), RMSEA=0.244、CFI=0.751, which is a good result. According to the analysis results, the formation process of consciousness about the diversity of lifestyle and multi-functionality of urban agriculture in Shanghai is clarified as below.

First, as for the effective socioeconomic attributes on the creative occupations and thinking creatively, sex, age and income were positive for the executive, but age was negative for professional and technical workers while income and farmland were positive for thinking creatively. Therefore, the characteristics of CCs in Shanghai could be described as follows. They are aged men with high income executives and young professional and technical workers for occupational CC on one side, and high income of living in the place with more farmland for thinking creatively on the other.

Next, although there are positive correlations among executive, professional/technical worker and thinking creatively, the executives don't prefer MFA and give negative evaluation on social function while the young professionals prefer environmental function and those who are thinking creatively with higher level of social capital prefer social function.

Furthermore, there are positive correlations among lifestyles and MFA, especially the lifestyle of self-actualization is positive to all the functions of urban agriculture while altruism is positive to social function.

Finally, it is interesting that the CCs in Shanghai (both creative occupation and thinking creatively) prefer the same lifestyle of self-actualization which is quite different from the result of our survey on Tokyo. Additionally, women in Shanghai prefer self-actualization and social function of urban agriculture than men, and younger prefer the lifestyle of self-investment than elder are clarified as well.

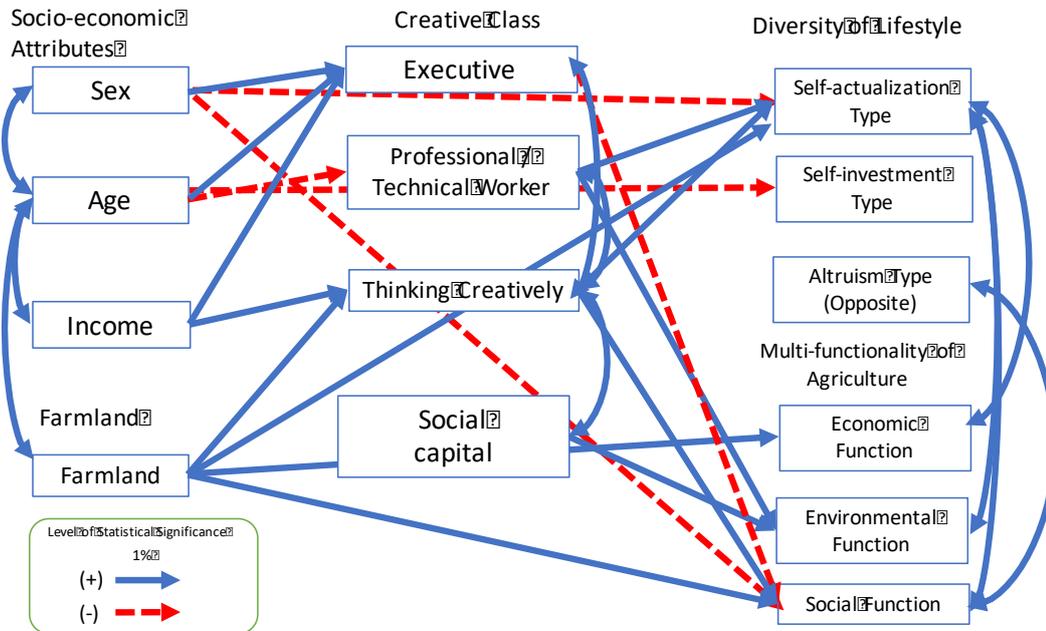


Figure 5. Path Diagram(Twin Analysis)

Table 10 Estimated results of path coefficient (Twin Analysis)

				Coef.	P>|z|		
1	Economy: MFA	(3)	Thinking Creatively	(2)	0.058	0.035	**
2		(3)	Executive	(2)	-0.116	0.055	*
3		(3)	Professional/Tech. worker	(2)	-0.005	0.925	
4		(3)	Social capital	(2)	0.038	0.220	
5		(3)	Farmland	(2)	0.078	0.002	***
6		(3)	Sex	(2)	-0.095	0.029	**
7		(3)	Age	(2)	0.021	0.322	
8		(3)	Income	(2)	0.028	0.015	**
9	Environment: MFA	(3)	Thinking Creatively	(2)	0.040	0.162	
10		(3)	Executive	(2)	-0.144	0.023	**
11		(3)	Professional/Tech. worker	(2)	0.143	0.009	***
12		(3)	Social capital	(2)	0.126	0.000	***
13		(3)	Farmland	(2)	0.011	0.667	
14		(3)	Sex	(2)	-0.075	0.099	*
15		(3)	Age	(2)	0.001	0.979	
16		(3)	Income	(2)	-0.010	0.408	
17	Sociality: MFA	(3)	Thinking Creatively	(2)	0.202	0.001	***
18		(3)	Executive	(2)	-0.357	0.009	***
19		(3)	Professional/Tech. worker	(2)	0.300	0.012	**
20		(3)	Social capital	(2)	0.027	0.690	
21		(3)	Farmland	(2)	0.132	0.020	**
22		(3)	Sex	(2)	-0.294	0.003	***
23		(3)	Age	(2)	0.062	0.203	
24		(3)	Income	(2)	0.011	0.677	
25	Self-actualization: Diversity of Lifestyle	(3)	Thinking Creatively	(2)	0.093	0.000	***
26		(3)	Executive	(2)	-0.028	0.555	
27		(3)	Professional/Tech. worker	(2)	0.210	0.000	***
28		(3)	Social capital	(2)	0.062	0.011	**
29		(3)	Farmland	(2)	0.062	0.002	***
30		(3)	Sex	(2)	-0.101	0.003	***
31		(3)	Age	(2)	-0.015	0.395	
32		(3)	Income	(2)	0.011	0.223	
33	Self-investment: Diversity of Lifestyle	(3)	Thinking Creatively	(2)	-0.005	0.806	
34		(3)	Executive	(2)	0.084	0.045	**
35		(3)	Professional/Tech. worker	(2)	0.026	0.474	
36		(3)	Social capital	(2)	-0.042	0.048	**
37		(3)	Farmland	(2)	-0.014	0.424	
38		(3)	Sex	(2)	0.058	0.051	*
39		(3)	Age	(2)	-0.053	0.000	***
40		(3)	Income	(2)	-0.002	0.800	
41	Altruism: Diversity of Lifestyle (Opposite sign)	(3)	Thinking Creatively	(2)	-0.004	0.816	
42		(3)	Executive	(2)	-0.004	0.913	
43		(3)	Professional/Tech. worker	(2)	0.018	0.581	
44		(3)	Social capital	(2)	-0.012	0.530	

45		(3)	Farmland	(2)	-0.015	0.333	
46		(3)	Sex	(2)	-0.054	0.043	**
47		(3)	Age	(2)	0.032	0.016	**
48		(3)	Income	(2)	0.007	0.323	
49	Thinking Creatively	(2)	Farmland	(1)	0.095	0.001	***
50		(2)	Sex	(1)	0.032	0.527	
51		(2)	Age	(1)	-0.040	0.096	*
52		(2)	Income	(1)	0.063	0.000	***
53	Executive	(2)	Farmland	(1)	0.036	0.020	**
54		(2)	Sex	(1)	0.093	0.000	***
55		(2)	Age	(1)	0.151	0.000	***
56		(2)	Income	(1)	0.062	0.000	***
57	Professional/Tech. worker	(2)	Farmland	(1)	-0.004	0.820	
58		(2)	Sex	(1)	0.054	0.068	*
59		(2)	Age	(1)	-0.101	0.000	***
60		(2)	Income	(1)	0.011	0.125	
61	Social capital	(2)	Farmland	(1)	0.034	0.190	
62		(2)	Sex	(1)	0.029	0.501	
63		(2)	Age	(1)	-0.008	0.691	
64		(2)	Income	(1)	0.019	0.081	*
Covariance							
65	Thinking Creatively	(2)	Executive	(2)	0.069	0.000	***
66		(2)	Professional/Tech. worker	(2)	0.056	0.000	***
67	Social capital	(2)	Thinking Creatively	(2)	0.055	0.002	***
68		(2)	Executive	(2)	0.002	0.849	
69		(2)	Professional/Tech. worker	(2)	0.007	0.558	

Note: “***”, “**” and “*” indicate statistically significant at 1%, 5%, 10% level, respectively. Results of the estimates between variables within layer 1 and 3 are abbreviated in the table.

Table 11 summarizes the results of questioning about what items of the MFA are important or not, and what items they are enjoying about. It is clarified that the items thought to be important are also the items to be enjoyed about, although there are 4.8% responded “No function seemed important” and 5.4% responded “I don’t enjoy any role of urban agriculture” among the respondents.

Table 11. Importance and Enjoyment about Functions of Urban Agriculture (Ratio of response: %)

	Important (A)	Enjoyment (B)	(A)-(B)
Supply of fresh and safe agricultural and livestock products	47.5	41.4	6.0
Providing the employment	56.6	26.2	30.4
Conservation of the green and environment	93.8	50.7	43.1
Education functions such as farming experience and food education	51.0	24.8	26.2
Revitalization of regional industry	55.4	24.2	31.1
Disaster prevention function such as evacuation place in case of disaster	42.9	18.6	24.2
Making a life tasteful and peaceful	63.0	33.2	29.8
Succession of local tradition and culture	45.4	24.6	20.8
Formation of good scenery	54.3	31.6	22.7
Place for local community	35.4	19.5	15.9
Medical and welfare functions such as horticulture therapy	29.7	15.2	14.5
Place of familiar recreation	21.4	9.2	12.2
Other	0.1	0.0	0.1
No function seemed important (I don’t enjoy any role of urban agriculture)	4.8	5.4	-0.5

Note: The bold emphasizes are added to the top three items with the largest point in each column. Respondents where there isn’t any farmland of urban agriculture in their residence are excluded.

5. CONCLUDING REMARKS

The above-mentioned analytical results clarified that our hypothesis of “Multi-functionality of urban agriculture (MFA) has a positive influence on the utility of the CCs” (H1) was verified in the case of Shanghai mega region. “The CCs prefer MFA more than non-CC” (H2) was verified in the case of Shanghai City. Additionally, “The CCs (especially those who are young professional/ technical workers) prefer the social and environmental functions of urban agriculture more than others” was also verified as a complementary hypothesis (H2-a). Furthermore, our hypothesis of “The CCs have a high level of social capital as well” (H3) was verified besides “those who have high level of social capital prefer the environmental function of urban agriculture” was verified as a complementary hypothesis (H3-a). Although, our hypothesis of “The CCs prefer diversified lifestyles and contribute to the development of cities” (H4) could not be verified directly in the case of Shanghai City because all the CCs (including creative occupation and thinking creatively) prefer the same lifestyle of ‘self-actualization’. However, women evaluate social function of MFA and prefer the lifestyle of “Altruism” than men, and the younger prefer self-investment than the elder in Shanghai were also clarified from the results.

Although, urbanization in China was long underpinned by cheap labor, cheap land, the underpricing of environmental externalities and rising export demand, Chinese policy makers recently have therefore begun to place greater emphasis

on domestic consumption, efficient resource use and productivity in order to shift to a new model of urbanization so called “people-centered urbanization” (OECD, 2015). Therefore, policy implication from this research encourages the city leaders to pay more attention to the multi-functionality of urban agriculture in order to realize an efficient, inclusive and sustainable urbanization (The World Bank, 2014).

However, a uniform policy for improving MFA without considering the regional diversification might bring on the results of the concentration of the CCs in urban central areas and the declination in suburban areas under the circumstance of globalization as pointed out by the existing research on Tokyo (Kiminami et al. 2018), because the economic advantage of agriculture in land endowment in suburban areas comparing to that in urban central areas has obviously resulted in a decrease of the CCs in there. To lead to a more universally applied study, international comparative study will be taken into account in our next research agenda.

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REFERENCES

- [1] Batabyal AA, Nijkamp P (2013) The creative class, its preferences, and unbalanced growth in an urban economy. *Journal of Evolutionary Economics* 23:189-209
- [2] Boschma RA, Fritsch M (2009) Creative class and regional growth: Empirical evidence from seven European countries. *Economic Geography* 85(4):391-423
- [3] Chow YF (2017) Exploring creative class mobility: Hong Kong creative workers in Shanghai and Beijing. *Eurasian Geography and Economics* 58(4):361-385
- [4] Florida R (2002) *The rise of the creative class: And how it's transforming work, leisure, community and everyday life*. Basic Books, New York
- [5] Florida R (2003) Cities and Creative Class. *City & Community* 2(1):3-19
- [6] Florida R, Mellander C, Stolarick K (2008) Inside the black box of regional development: Human capital, the creative class and tolerance. *Journal of Economic Geography* 8:615-649
- [7] Florida R, Mellander C, King KM (2015) *The Global Creativity Index 2015*. Martin Prosperity Institute
- [8] Hamilton AJ, Burry K, Mok HF, Barker SF, Grove JR, Williamson VG (2014) Give peas a chance? Urban agriculture in developing countries. A review, *Agronomy for Sustainable Development* 34:45-73
- [9] He J, Huang X, Xi G (2018) Urban amenities for creativity: an analysis of location drivers for photography studios in Nanjing, China. *Cities* 74:31-319
- [10] Hoyman M, Faricy C (2009) It takes a village: A test of the creative class, social capital, and human capital theories. *Urban Affairs Review* 44(3):311-333
- [11] Jacobs J (1961) *The Death and Life of Great American Cities*. Random House, New York
- [12] Kiminami L, Kiminami A (2006) Sustainability of agriculture and urban quality of life in Japan - Economic efficiency, sociality and environment Protection. *Studies in Regional Science* 36(2):305-321
- [13] Kiminami L, Kiminami A (2007) Sustainability of urban agriculture: A comparative analysis of Tokyo and Shanghai. *Studies in Regional Science* 37(2):585-597
- [14] Kiminami L, Kiminami A, Furuzawa S (2018) Impacts of multi-functionality of urban agriculture on the CCs in Japan. *Asia-Pacific Journal of Regional Science* (in press)
- [15] Li LMW (2017) Social class, social capital and residential mobility in China. *Social Indicators Research* 132(2):1117-1129.
- [16] Marlet G, van Woerkens C (2005) Tolerance, aesthetics, amenities or jobs? Dutch city attraction to the creative class, Tjalling C. Koopmans Research Institute Discussion Paper Series nr: 05-33
- [17] McClintock N, Simpson M (2018) Stacking functions: identifying motivational frames guiding urban agriculture organizations and businesses in the United States and Canada. *Agriculture and Human Values* 35(1) 19-39
- [18] McGranahan D, Wojan T (2007) Recasting the creative class to examine growth processes in rural and urban counties. *Regional Studies* 41(2):197-216
- [19] OECD (2015) *OECD Urban Policy Reviews: China 2015*.
- [20] Peng J, Liu Z, Liu Y, Hu X, Wang A (2015) Multifunctionality assessment of urban agriculture in Beijing City, China. *Science of the Total Environment* 537:343-351
- [21] Rao Y, Dai D (2017) Creative class concentrations in Shanghai, China: what is the role of neighborhood social tolerance and life quality supportive conditions? *Social Indicators Research* 132(3):1237-1246
- [22] Rich MA (2012) From Coal to Cool: The Creative Class, Social Capital, and the Revitalization of Scranton. *Journal of Urban Affairs* 35(3):365-384
- [23] Reynolds K (2015) Disparity despite diversity: social injustice in New York city's urban agriculture system. *Antipode* 47(1):240-259
- [24] Schoales, J (2006) Alpha clusters: Creative innovation in local economies. *Economic Development Quarterly* 20(2):162-167
- [25] Westlund H, Calidoni F (2014) Regional development and the creative class in Japan. In Mellander C et al. (eds) *The creative class goes global*. Routledge, Abington, pp 262-282
- [26] World Bank (2014) *Urban China: Toward Efficient, Inclusive, and Sustainable Urbanization*. World Bank

APPENDIX

Diversity of lifestyle

Table 12 is the results of principal component analysis about the answer of “Please select all that apply as your ideal life”. In order to compare with the results in Tokyo (the same questions in Japanese), we used the data obtained by summing

the two survey results. The cumulative contribution rate of eigenvalue that is 1st, 2nd and 3rd principal component is 28.7%. When interpreting each principal component based on the principal component score, the first principal component is “self-actualization type (high - low)”, the second principal component is “self-investment type (high - low)”, the 3rd principal component is “altruism (low - high)”.

Table 12. Results of the principal component analysis about the ideal life style

		Ratio of response (%)			PC1	PC2	PC3
		Total	Tokyo	Shanghai			
1	Living while enjoying comfortable living space in the suburbs with moderate convenience.	36.1	35.3	36.9	0.257	-0.184	0.308
2	Living while being surrounded by nature in rural areas and countryside.	22.0	14.2	29.7	0.220	-0.356	0.154
3	Living while enjoying various activities in urban areas with high convenience.	27.7	24.8	30.7	0.186	0.452	-0.117
4	Living a life to be devoted to a hobby while working.	43.4	42.0	44.8	0.303	0.053	0.167
5	Living a simple life with having less things as much as possible.	24.6	27.1	22.2	0.179	-0.135	0.073
6	Living a life to be devoted to a hobby while working.	33.3	33.4	33.2	0.290	-0.151	0.219
7	Living a highest convenient life using IT apparatus and service.	22.3	15.7	28.8	0.135	0.405	-0.093
8	Living and working in abroad for a long time.	9.1	12.1	6.0	0.122	0.316	0.380
9	Addressing energy-saving, recycling and other environmentally-friendly life and activity	29.3	12.1	46.5	0.361	-0.158	-0.402
10	Addressing activities that contribute to society such as a volunteer.	20.5	8.9	32.0	0.350	-0.179	-0.304
11	Building family life with bearing housework and childcare regardless of gender.	27.4	18.5	36.2	0.393	-0.077	-0.155
12	Doing the work that can be only done by oneself utilizing one's skill and sense.	31.6	27.9	35.4	0.210	0.282	0.068
13	Enjoying various art works such as fine art and architecture.	23.5	17.2	29.7	0.336	0.152	-0.024
14	Spending one's time on what one likes by retiring work before one's retirement age.	18.3	19.1	17.4	0.181	-0.012	0.443
15	Devoting oneself to work for promotion in one's company.	13.9	8.5	19.3	0.105	0.261	-0.336
16	Living a life in a luxurious house, wearing high grade jewelry and brand goods.	7.0	5.2	8.9	0.044	0.308	0.203
Number of items selected (average)		3.90	3.23	4.58			
Eigenvalue					1.895	1.438	1.252
Ratio of accumulated contribution					11.84	20.83	28.66
Interpretation of each component					Self-actualization	Self-investment	Altruism

Notes: The sentence of the question is “Please choose all that apply as your ideal living.” The answer of “Other” is not used in the analysis.

Importance of multifaceted function of urban agriculture

Table 13 shows the result of classifying the item of multi-functionality of urban agriculture into economic, environmental, and social categories based on the answers to the role they think about in their urban life. The simple accumulation value of each selection item is sued as a variable.

Table 13. Classification of multi-functionality of agriculture

		Ratio of response (%)	Economic function	Environmental function	Social function
1	Supply of fresh and safe agricultural and livestock products	60.4			✓
2	Providing the employment	31.9	✓		
3	Conservation of the green and environment	63.3		✓	
4	Education functions such as farming experience and food education	38.1			✓
5	Revitalization of regional industry	41.4	✓		
6	Disaster prevention function such as evacuation place in case of disaster	28.4			✓
7	Making a life tasteful and peaceful	41.8			✓
8	Succession of local tradition and culture	32.8			✓
9	Formation of good scenery	41.7		✓	
10	Place for local community	30.9			✓
11	Medical and welfare functions such as horticulture therapy	32.8			✓
12	Place of familiar recreation	28.5			✓
	Total		2	2	8

Notes: The sentence of the question is “It is told that urban agriculture has various role for urban life. Please choose all that you think to be important from the roles of urban agriculture below.” The answers of “Other” and “No function seemed important” are not used in the classification.

Social Capital

Table 14 shows the results concerning the social capita (SC) and its variable creation. The answer of "Most people try to be helpful" in Q2 and "Most people can be trusted" in Q3 are judged to have social capital and used as a variable.

Table 14. Results concerning the social capital

Question	Answer	Ration of response (%)	Social capital
Q2. Would you say that most of time, people try to be helpful, or that they are mostly just looking out for themselves?	Try to be helpful	80.8	✓
	Look out for themselves	19.2	
Q3. Generally speaking, would you say that most people can be trusted or that you had better to be careful in dealing with people?	Can be trusted	77.6	✓
	Had better to be careful	22.4	
	Total		2

SS03.1. Territorial Governance and Local Development in Developing Countries

1012 POVERTY AND NONGOVERNMENTAL ORGANIZATIONS IN NEPAL: SOME DISTRIBUTIONAL OBSERVATIONS

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ABSTRACT

Since the early 1990s, the number of nongovernmental organizations (NGOs) has been growing rapidly in Nepal but Nepal remains a very poor country. In examining the distribution of NGOs, this study finds that districts with higher poverty levels have fewer local NGOs. Although NGOs play an important role in poverty reduction, poverty itself limits their growth in various districts in Nepal. While local NGOs provide an important contribution to the margin of poverty reduction, they alone cannot engineer national poverty reduction. This paper suggests that the Government of Nepal expand its poverty reduction program, streamline foreign aid and infrastructure development, but continue to attract both national and international NGOs for help in reducing poverty.

Keywords: poverty, nongovernmental organizations, two-stage least-squares regression, Nepal

1 INTRODUCTION

This is a preliminary study of the distribution of nongovernmental organizations (NGOs) and poverty in Nepal. As such it is limited in scope and exploratory in nature but some associations are identified that may be helpful to local authorities in managing these internal and external resources in regard to their contribution to poverty reduction.

NGOs as service providers, innovators, collaborators, activists, advocates, and change agents, are capable of positively transforming a society (see Korten, 1987; Price, 1998; van Tuijl, 1999; Mitlin, Hickey, & Bebbington, 2007; Werker & Ahmed, 2008). NGOs contribute to various sectors including health care, education, farming, and sanitation and their number is also dramatically increasing (see Werker & Ahmed, 2008). Overall, they have been extremely beneficial, but not free from criticism. For instance, Hearn (2007, 1102) noted that “husband- and-wife NGOs” or “briefcase NGOs” are often self-serving and even fake; Nega & Schneider (2014) found that NGOs are unable to contribute to development because of various factors, such as their inability to promote certain kind of changes and that they sometimes support corrupt dictatorships; and Banks, Hulme, & Edwards (2015) suggested that NGOs have not been able to adopt new tools and approaches that are necessary for reducing poverty and inequality.

The number of NGOs affiliated with the Social Welfare Council (SWC), Government of Nepal (GoN) has been increasing since the early 1990s (SWC, 2015a) and poverty is declining. In spite of this positive trend there are people and regions that continue to suffer even in areas directly affected by these organizations (GoN & United Nations Country Team of Nepal, 2013; Poverty Alleviation Fund, 2015; Mitra, 2016). Since NGOs are playing an important and significant role in poverty reduction in Nepal, this paper proposes to examine the relationship between the number of NGOs and poverty at the district level.

The rest of the paper is arranged in the following manner. Section 2 provides an overall introduction to NGOs in Nepal and introduces the research issue. Methodology and data are discussed in Section 3 and empirical findings are presented in Section 4. Section 5 includes concluding remarks, policy recommendations, and the direction of future research.

2 NONGOVERNMENTAL ORGANIZATIONS IN NEPAL

The linkages between NGO's and poverty alleviation strategies are multi-faceted. They include support for minimum levels of health, shelter, nutrition and safety that need to be met in order for people to function effectively. They extend to helping with human capital development including literacy, numeracy and skill development. They are important on the output side in helping with participation in the market economy. This includes access to finance and micro- finance and development of productive skills that generate products and crafts that can be marketed thus creating remunerations can flow back into the community. They also include groups that help with institution building including local empowerment to ensure that individual and community needs are articulated and communicate to the government and ensuring that the government responds appropriately. It is often thought that NGO's can help deliver these support activities more efficiency and effectively than over stretched and often politicized government agencies. In this way NGO's often expand or complement government programs in these areas.

Further NGO's provide access to new resources to help support these critical areas of service delivery and institution building. Last but not least, they are often important in addressing issues of crime and corruption as well as reducing or ameliorating victimization. The result is a wide variety of NGO's with different short term purposes and aims but all clearly related directly and indirectly to the huge problem of poverty alleviation. It seems reasonable to expect NGO's are located close to their clients so that their contributions will directly impact poverty reduction.

The emergence and growth of civic institutions in Nepal has been attributed to its religious, social, cultural, economic, and political constructs. From the nation's early period to mid-20th century, local entities, such as *Arya Samaj* (civic society), *Nepal Nagrik Adhikar Samiti* (Committee for Citizens' Rights), and *Paropakar Sansthan* (Charity Association), took active roles in fighting against prejudice, inspiring public consciousness, demanding political freedom, and improving public life (Dahal, 2001).

In the 1960s and 1970s, welfare-oriented NGOs, such as the Family Planning Association of Nepal, Nepal Red Cross Society, and National Anti-Tuberculosis Association, had already started operating on a national scale through regional frameworks (Ghimire, 2003). In addition, various regulatory frameworks, such as the *Society Registration Act of 1960*, *Association Registration Act of 1977*, and *Social Service National Coordination Council Act of 1977*, were adopted to streamline the activities and legitimize the participative involvement of the Third Sector in economic development (see Dahal, 2001; Uprety, 2011).

During the absolute monarchical Panchayat era, Queen consort Aishwarya was the patron of the Social Welfare Coordination Council (SWCC). At that time there were less than 250 NGOs registered with the central government. According to Whelpton (2005), NGOs of this period behaved more like consulting companies instead of advocacy bodies, which was commonly observed in the West. The international donor agencies often by passed government and cooperated directly with the NGOs in the development process. Some NGOs were more advocacy-oriented. Basnet (2012) noted that some not-for-profit organizations, such as the Human Rights Organizations of Nepal and Forum for Protection of Human Rights, played an important role in coercing the monocratic government to adopt human rights measures. Such organizations also contributed to the political movement that ended the Panchayat regime and established a multiparty democratic system with a constitutional monarchy in 1990.

The new political milieu created an environment conducive to the growth of NGOs. The *Social Welfare Council Act of 1992* was promulgated to repeal the *Social Service National Co-ordination Council Act of 1977* and to dissolve the SWCC. Under the provision of the Act of 1992 the SWC was created and made responsible for coordinating, cooperating, mobilizing, and promoting social organizations and institutions. The *Cooperatives Act of 1992*, *Forest Act of 1993*, *Local Self-governance Act of 1999*, and *Good Governance Act of 2007* were also enacted to further the role of NGO's as cooperatives, community user groups, ethnic and indigenous communities, and to support civil society participation in Nepal's development (see Uprety, 2011).

Since 1990, NGOs in Nepal have assumed these various roles to support a wide range of activities. For instance, Bhatta (2001) noted that many NGOs often act as intermediaries to disburse government credit that target rural micro-entrepreneurs as well as connect rural clients to commercial banks. They are also involved in creating self-reliance and augmenting knowledge of community forest projects (Ito et al., 2005) and contributing to upward social mobility through education (Whelpton, 2005). Anti-trafficking NGOs combat human trafficking, help to reduce the stigma on trafficking victims, rescue and integrate trafficked survivors back into the communities, and provide income-generating skills (Crawford & Kaufman, 2008; Thapa, 2015).

The implementation of water supply and sanitation projects and the promotion of sanitation and hygiene campaigns in rural areas by NGOs are well developed in Nepal (Barrington, Fuller, & McMillan, 2013). They have also contributed to domestic human rights and conservation issues (Bhandari, 2014). According to the Poverty Alleviation Fund (2015), NGOs facilitate the government's poverty reduction programs that target marginalized and vulnerable communities living below the national poverty line. In Nepal, NGOs are also known for creating international alliances, advocating for laws, and contributing to public policies (Forbes, 1999; Jones, Oven, Manyena, & Aryal, 2014; Thapa, 2015).

NGOs in Nepal are playing an important role in strengthening institution in civil society, but they are also, as in other parts of the world, not free from criticism. Rademacher & Tamang (1993) argued that while NGOs have proliferated, they have not been able to prove their worthiness and effectiveness to the government and the general public. They also noted that NGOs are highly politicalized. Further, Roka (2012) suggested that NGOs generally do not address local issues and cater to the needs of donors and politicians. Ulvila & Hossain (2002) and Risal (2014) have also reached similar conclusions.

Controversies (Forbes, 1999), lack of professionalism, transparency, accountability, and commitment (Ghimire, 2003; Dhakal, 2007), and failure to set priorities and reach the targeted individuals (Sajjad, 2016) under cut the legitimacy and integrity of NGOs. Often, NGOs are not even registered with the SWC or District Administration Offices (DAOs) (C. D. Bhatta, 2012) which makes it difficult for the government to monitor, coordinate and facilitate their activities. Such limitations could be the reasons why Roka (2012) noted that rural communities often prefer government to NGOs in implementing rural development projects and Karkee & Comfort (2016) proposed that NGOs should focus on advocacy issues instead of becoming service providers.

Poverty is associated with various factors, such as inherent human weaknesses, poor government structure, topographic isolation, health and diseases, corruption, conflicts, and weak civil institutions (Hine & Montiel, 1999; Sachs, Mellinger, & Gallup, 2001). Moreover, the poverty trap is self-reinforcing suggesting that poverty is endogenous (Bird, 1999; Azariadis & Stachurski, 2005). Since NGOs have been playing an important role in the fight against poverty (Riddell & Robinson, 1992; Poverty Alleviation Fund, 2015) does this imply that districts with higher poverty should have more local NGOs to tackle the problem? This study does not answer this question but it does propose to assess this issue.

3 METHODOLOGY AND DATA

The instrumental variable (IV) approach is a commonly used econometric technique to examine the effect of an endogenous explanatory variable on the dependent variable. The IV is not directly associated with the dependent variable, but operates through the endogenous variable and is not associated with the error term (Cameron & Trivedi, 2005).

Following Cameron & Trivedi (2005), a multiple regression model is written as:

$$y = \mathbf{x}'\boldsymbol{\beta} + u$$

with K regressor variables, so that \mathbf{x} and $\boldsymbol{\beta}$ are $K \times 1$ vectors. It is assumed that an $r \times 1$ vector of instruments \mathbf{z} , with $r \geq K$, exists. The regressor vector $\mathbf{x} = [\mathbf{x}'_1, \mathbf{x}'_2]'$ is the combination of endogenous regressors (\mathbf{x}_1) and exogenous regressors (\mathbf{x}_2). Then a valid instrument is $\mathbf{z} = [\mathbf{z}'_1, \mathbf{x}'_2]'$. While \mathbf{x}_2 can be its own instrument, there must be as many instruments \mathbf{z}_1 as there are endogenous variables \mathbf{x}_1 . The instruments \mathbf{z} must satisfy the conditional moment restriction:

$$E(u|\mathbf{z}) = 0$$

A common IV estimation procedure is the two-stage least-squares (2SLS) approach that involves two consecutive ordinary least-squares (OLS) regressions. The first-stage regression involves the OLS regression of \mathbf{x} on \mathbf{z} to obtain the fitted values of \mathbf{x} . In the second-stage regression, y is regressed on the fitted \mathbf{x} to obtain the 2SLS $\boldsymbol{\beta}$ estimates.

Data for this study come from various sources. The number of NGOs at the district level is obtained from the SWC (2016). The Human Poverty Index (HPI) is a multidimensional index that is based on the percentage of people not expected to survive beyond age 40, adult illiteracy rate, deprivation of economic provisioning, percentage of people without access to safe water, and percentage of malnourished children under age five. The larger the HPI value, the higher is the level of poverty. The HPI is obtained from the National Planning Commission and United Nations Development Programme (2014). Population density gives the number of individuals per square kilometer and comes from the Central Bureau of Statistics (2013). Foreign aid disbursement per capita (in US dollars) and road density (road length in kilometer per 100 square kilometer) are from the Ministry of Finance (2013) and the Department of Roads (2012), respectively. Finally, per capita income, purchasing power parity (in US dollars) is obtained from the National Planning Commission and United Nations Development Programme (2014).

4 FINDINGS

Figure 1 shows the annual and cumulative number of NGOs registered with the SWC. From the late 1970s through the late 1980s, there were less than 200 NGOs affiliated with the SWC. Since the early 1990s, the number of NGOs started to increase and by mid-2014, there were about 40,000 NGOs registered with the Council.

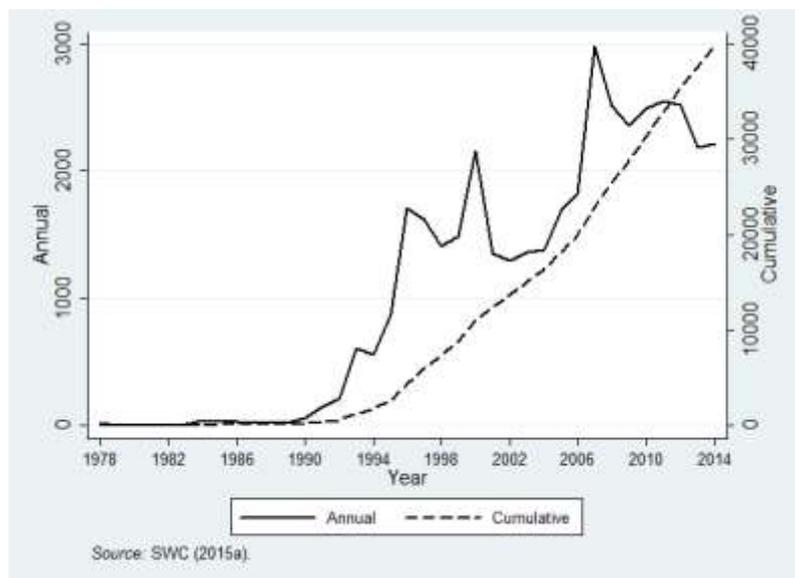


Figure 1: NGOs registered with the SWC

According to the SWC (2015b), more than 25,000 NGOs are involved in the community and rural development services sector. The remaining are in sectors, such as youth services, women services, and health services. Less than 100 NGOs are working in the area of AIDS and abuse control (see Figure 2).

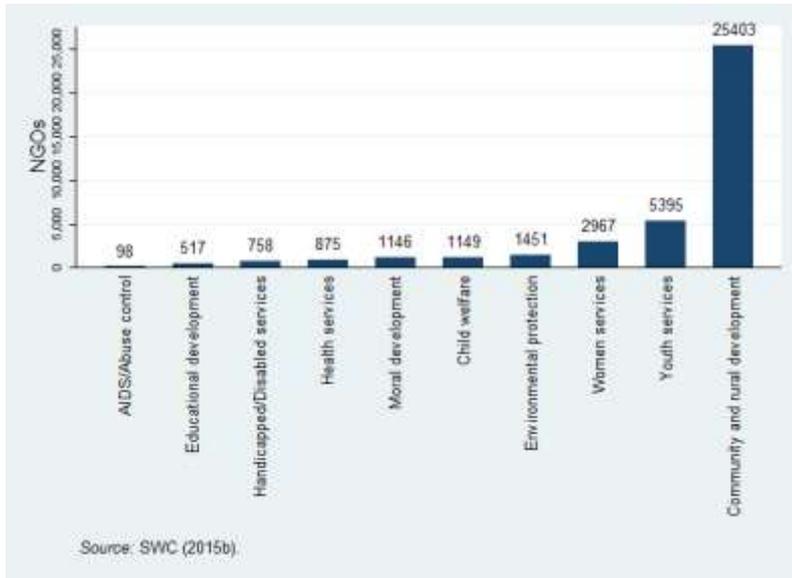


Figure 2: NGOs by sector

The distribution of NGOs in Nepal is uneven and is shown in Figure 3. While more than 12,500 NGOs are registered in Kathmandu, less than 20 NGOs are in Manang (SWC, 2016). In general, moving northward from the southern Terai, the number of NGOs declines.



Source: SWC (2016).

Figure 3: Distribution of NGOs by district

The summary statistics of all variables (in logarithm) are shown in Table 1.

Table 1: Summary statistics

Variable	Observation	Mean	Std. Deviation	Minimum	Maximum
Nongovernmental organizations (Ingo)	73	5.6295	0.9730	2.8332	9.4467
Human Poverty Index (Ihpi)	73	3.4851	0.2355	2.8034	3.8971
Population density (Ipopden)	73	5.0915	1.1971	1.0685	8.3929
Road density (Irden)	73	2.1300	0.8615	0.0000	4.5433
Foreign aid disbursement per capita (Ifaidpc)	73	2.8565	1.0890	0.6931	6.2265
Per capita income, purchasing power parity (Ipcinc)	73	6.9210	0.3556	6.1883	8.0602

Source: Authors' calculations.

As shown in Figure 4, the HPI and number of NGOs are negative related. That is, as poverty increases, the number of NGOs decreases at the district level in Nepal.

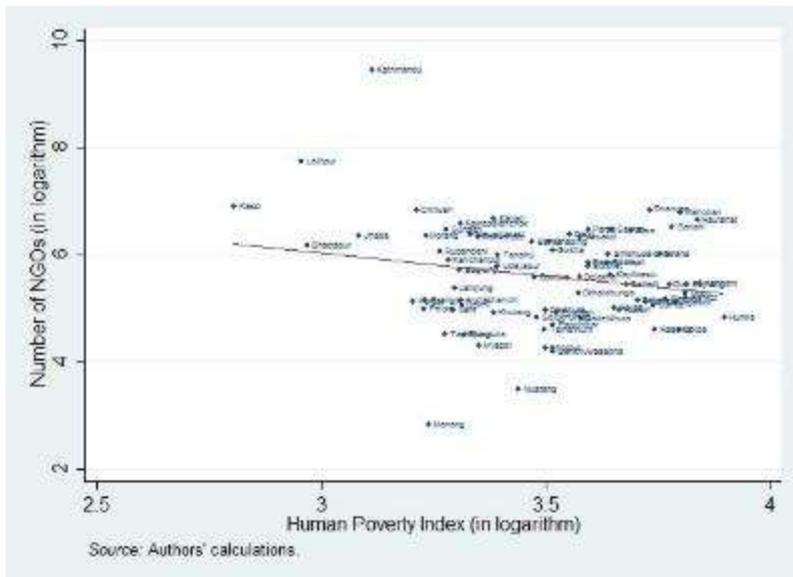


Figure 4: Relationship between poverty and NGOs

Table 2 shows the results of the first-stage and second-stage regression models. As poverty is endogenous, it is instrumented with per capita income in the 2SLS regression model. The correlation between per capita income and the HPI is -0.6522 . As the correlation coefficient between the endogenous variable and its instrument is large, there should not be efficiency loss using IV compared to OLS (see Cameron & Trivedi, 2005, 195).

According to Staiger & Stock (1997), if there is one endogenous variable, the F -statistic in the first-stage should be at least 10. If $F \geq 10$, there is no weak IV and the single instrument enters the first-stage of the 2SLS model. Here, $F(1, 68)$ is equal to 53.35, which suggests that per capita income is not a weak instrument. Further, Shea's partial R -squared (Shea, 1997) is 0.4396 which also indicates that the instrument is not weak.

In the first-stage model, foreign aid per capita and road density (measure of infrastructure and access) are not significantly associated with poverty. While the association between population density and poverty is negative and statistically significant, the relationship is weak compared to per capita income. Per capita income and the HPI are strongly negatively associated with poverty and are statistically significant at the 1% significance level, *ceteris paribus* and can be introduced in the 2SLS model.

Next, the estimated coefficient of poverty is -0.8220 and is statistically significant at the 10% significance level. The estimate implies that for a 10% increase in the HPI, the number of NGOs decreases by 8.22%, *ceteris paribus*. Further, the number of NGOs is positively associated with population density and is negatively associated with foreign aid disbursement per capita as well as road density.

The HPI is treated as an endogenous variable. If it was exogenous, the OLS estimator is more efficient. The Durbin-Wu-Hausman test is used to examine the endogeneity of the poverty variable. The Chi-squared value with one degree of freedom is 6.89 (p -value = 0.009), which is significant at the 1% significance level. Thus, the null that the HPI is exogenous is rejected.

Table 2: 2SLS regression results

Variable	First-stage regression (Dependent variable: lhpi)	Second-stage regression (Dependent variable: lngo)
lpopden	-0.0641* (-1.87)	0.6844*** (5.90)
lfaidpc	-0.0233 (-0.87)	-0.1560* (-1.73)
lrden	-0.0074 (-0.19)	-0.3126** (-2.34)
lpcinc (instrument)	-0.4226*** (-7.30)	
lhpi (endogenous)		-0.8220* (-1.79)
constant	6.8189*** (15.08)	6.1214** (3.27)
Observations	73	73
R-squared	0.4891	0.6384

* 10% significance level, ** 5% significance level, and *** 1% significance level; t -values in parentheses
 Source: Authors' calculations.

5 CONCLUSION

This paper examined the relationship between poverty and the number of NGOs registered with the SWC at the district level in Nepal. Based on the 2SLS approach, it was found that the HPI is negatively associated with the number of NGOs. Note that the poverty index is multidimensional in nature and is based on survivability, illiteracy, economic deprivation, inaccessibility to safe water, and child malnourishment. With larger incomes, individuals are more likely to live long and healthy lives as they can access healthcare facilities, invest in education, provide themselves and their family nutritional food and safe drinking water as well as create economic opportunities. Once people are self-sufficient and live a decent life, they are capable of contributing to development activities through NGOs. On the contrary, poorer individuals are possibly more focused on making their “ends meet” including seeking economic opportunities for uplifting their socio-economic conditions. As survivability and sustenance become more important and as people are not well educated, NGOs are less likely to be established in the poverty-stricken districts.

Although the number of NGOs in Nepal has dramatically increased since the early 1990s, in general, regions with higher poverty have a smaller number of local NGOs compared to regions with lower poverty. This could be attributed to the fact that poverty is endogenous and that poverty inhibits the establishment of local NGOs. Thus, while NGOs can play an important role, they cannot reduce poverty single-handedly. In such a situation, government intervention is essential. First, the GoN has its own poverty alleviation program, but its reach is limited (Poverty Alleviation Fund, 2015). Thus, the Government should consider expanding the program. Second, as foreign aid and road density are negatively associated with the number of NGOs, the positive externalities associated with government investment and infrastructure could help in supplementing the role of NGOs in poverty reduction. Third, the GoN should consider supporting the creation of an environment conducive for both national and international NGOs to actively contribute to poverty reduction programs, especially in areas that have high poverty rates, but have a limited number of local NGOs.

This study focused on the number of locally registered NGOs, but it was not possible to recognize their operational status. While some of them might be actively involved in various programs, others could be nonoperational. This should be assessed and taken into account in future studies. In addition, NGOs that are registered only with the DAOs have not been taken into considerations and should be included in succeeding studies.

REFERENCES

- Azariadis, C., & Stachurski, J. (2005). Poverty Traps. In P. Aghion & S. N. Durlauf (Eds.), *Handbook of Economic Growth* (Vol. 1A, pp. 295–384). Amsterdam, The Netherlands: Elsevier.
- Banks, N., Hulme, D., & Edwards, M. (2015). NGOs, States, and Donors Revisited: Still Too Close for Comfort? *World Development*, 66, 707–718.
- Barrington, D., Fuller, K., & McMillan, A. (2013). Water Safety Planning: Adapting the Existing Approach to Community-Managed Systems in Rural Nepal. *Journal of Water Sanitation and Hygiene for Development*, 3(3), 392–401.
- Basnet, C. (2012). Three Faces of Civil Society Activism in Nepal. *New Angle: Nepal Journal of Social Science and Public Policy*, 2(1). Retrieved from <http://nepalpolicy.net/images/NewAngle/Vol%202/Chudamani%20article%20final.pdf>
- Bhandari, M. (2014). Civil Society and Non-Governmental Organizations (NGOs) Movements in Nepal in terms of Social Transformation. *Pacific Journal of Science and Technology*, 15(1), 177–189.
- Bhatta, C. D. (2012). Unveiling Nepal's Civil Society. *Journal of Civil Society*, 8(2), 185–199. Bhatta, G. (2001). Small Is Indeed Beautiful but...: The Context of Microcredit Strategies in Nepal. *Policy Studies Journal*, 29(2), 283–295.
- Bird, E. J. (1999). Politics, Altruism, and the Definition of Poverty. *Journal of Comparative Policy Analysis: Research and Practice*, 1(3), 269–291.
- Brass, J. N. (2012). Why Do NGOs Go Where They Go? Evidence from Kenya. *World Development*, 40(2), 387–401.
- Cameron, A. C., & Trivedi, P. (2005). *Microeconometrics: Methods & Applications*. New York, NY, US: Cambridge University Press.
- Central Bureau of Statistics. (2013). *Statistical Year Book of Nepal-2013*. Kathmandu, Nepal: Central Bureau of Statistics. Retrieved from http://elibrary.xyz/cbs/image/data/Publication/Statistical%20Year%20book%202013_SS/Statistical-Year-book-2013_SS.pdf
- Crawford, M., & Kaufman, M. R. (2008). Sex Trafficking in Nepal: Survivor Characteristics and Long-Term Outcomes. *Violence Against Women*, 14(8), 905–916.
- Dahal, D. R. (2001). *Civil Society in Nepal: Opening the Ground for Questions*. Kathmandu, Nepal: Center for Development and Governance. Retrieved from http://www.nepaldemocracy.org/civic_education/civil_society_in_nepal.PDF
- Department of Roads. (2012). *Road Network Data*. Kathmandu, Nepal: Department of Roads, Government of Nepal. Retrieved from http://www.dor.gov.np/documents/Road_Network_data.pdf
- Dhakal, T. N. (2007). Challenges of Civil Society Governance in Nepal. *Journal of Administration and Governance*, 2(1), 61–73. Retrieved from <http://joag.com/uploads/Dhakal.pdf>
- Forbes, A. A. (1999). The Importance of Being Local: Villagers, NGOs, and the World Bank in the Arun valley, Nepal. *Identities*, 6(2-3), 319–344.
- Ghimire, H. (2003). NGO/INGO Centered Approach: An Alternative Approach to Development. *Occasional Papers in Sociology and Anthropology*, 8, 204–217. Retrieved from <http://www.nepjol.info/index.php/OPSA/article/view/1128/1581>
- GoN, & United Nations Country Team of Nepal. (2013). *Nepal Millennium Development Goals Progress Report 2013*. Kathmandu, Nepal: Government of Nepal and United Nations Country Team of Nepal.
- Hearn, J. (2007). African NGOs: The New Compradors? *Development and Change*, 38(6), 1095–1110.
- Hine, D. W., & Montiel, C. J. (1999). Poverty in Developing Nations: A Cross-cultural Attributional Analysis. *European Journal of Social Psychology*, 29(7), 943–959.
- Ito, K., Oura, Y., Takeya, H., Hattori, S., Kitagawa, K., Paudel, D., & Paudel, G. (2005). The Influence of NGO Involvement on Local People's Perception of Forest Management: A Case Study of Community Forestry in Nepal. *Journal of Forest Research*, 10(6), 453–463.
- Jones, S., Oven, K. J., Manyena, B., & Aryal, K. (2014). Governance Struggles and Policy Processes in Disaster Risk Reduction: A Case Study from Nepal. *Geoforum*, 57, 78–90.

- Karkee, R., & Comfort, J. (2016). NGOs, Foreign Aid, and Development in Nepal. *Frontiers in Public Health*, 4. Retrieved from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4995364/pdf/fpubh-04-00177.pdf>
- Korten, D. C. (1987). Third Generation NGO Strategies: A Key to People-centered Development. *World Development*, 15(Supplement 1), 145-159.
- Mallick, D., & Nabin, M. (2010). *Where NGOs Go and Do Not Go?* (No. 27185). Munich, Germany: Munich Personal RePEc Archive. Retrieved from https://mpra.ub.uni-muenchen.de/27185/1/MPRA_paper_27185.pdf
- Ministry of Finance. (2013). *Development Cooperation Report, Fiscal Year 2011-2012*. Kathmandu, Nepal: Ministry of Finance, Government of Nepal. Retrieved from mof.gov.np/ieccd/newsbook/20130416132209.pdf
- Mitlin, D., Hickey, S., & Bebbington, A. (2007). Reclaiming Development? NGOs and the Challenge of Alternatives. *World Development*, 35(10), 1699-1720.
- Mitra, S. (2016). Synergies Among Monetary, Multidimensional and Subjective Poverty: Evidence from Nepal. *Social Indicators Research*, 125(1), 103-125.
- National Planning Commission, & United Nations Development Programme. (2014). *Nepal Human Development Report 2014: Beyond Geography, Unlocking Human Potential*. Kathmandu, Nepal: National Planning Commission and United Nations Development Programme. Retrieved from http://www.npc.gov.np/images/download/NHDR_Report_20141.pdf
- Nega, B., & Schneider, G. (2014). NGOs, the State, and Development in Africa. *Review of Social Economy*, 72(4), 485-503.
- Poverty Alleviation Fund. (2015). *PAF Annual Report 2015*. Kathmandu, Nepal: Government of Nepal.
- Price, R. (1998). Reversing the Gun Sights: Transnational Civil Society Targets Land Mines. *International Organization*, 52(3), 613-644.
- Rademacher, A., & Tamang, D. (1993). *Democracy Development and NGOs*. Kathmandu, Nepal: SEARCH.
- Riddell, R., & Robinson, M. (1992). *The Impact of NGO Poverty Alleviation Projects: Results of the Case Study Evaluations* (Working Paper No. 68). London, UK: Overseas Development Institute, Regent's College.
- Risal, S. (2014). Mismatch between NGO Services and Beneficiaries' Priorities: Examining Contextual Realities. *Development in Practice*, 24(7), 883-896.
- Roka, K. B. (2012). *Are NGOs Making a Difference? A Community Approach to Measuring Non-government Organizations (NGOs) Effectiveness in Nepal*. Pennsylvania State University, USA.
- Sachs, J. D., Mellinger, A. D., & Gallup, J. L. (2001). The Geography of Poverty and Wealth. *Scientific American*, 284(3), 70-75.
- Sajjad, T. (2016). Heavy Hands, Helping Hands, Holding Hands: The Politics of Exclusion in Victims' Networks in Nepal. *International Journal of Transitional Justice*, 10(1), 25-45.
- Shea, J. (1997). Instrument Relevance in Multivariate Linear Models: A Simple Measure. *Review of Economics and Statistics*, 79(2), 348-352.
- Staiger, D., & Stock, J. H. (1997). Instrumental Variables Regression with Weak Instruments. *Econometrica*, 65(3), 557-586.
- SWC. (2015a). Annual Growth Chart of NGOs Affiliated with SWC. Retrieved from <http://www.swc.org.np/wp-content/uploads/2015/08/Annual-chart.pdf>
- SWC. (2015b). NGOs Affiliated with SWC by Sector. Retrieved from <http://www.swc.org.np/wp-content/uploads/2015/08/By-Sectorwise.pdf>
- SWC. (2016). NGOs Affiliated with Social Welfare Council (2034-2071 Ashad Masant). Retrieved from http://www.swc.org.np/wp-content/uploads/2016/01/SWC_NGOs_2034_071-asadh_-Final-in-bhadra-2072.pdf
- Thapa, P. (2015). Human Trafficking in Nepal: Changing Dimensions. *Asian Journal of Women's Studies*, 21(4), 450-459.
- Ulvila, M., & Hossain, F. (2002). Development NGOs and Political Participation of the Poor in Bangladesh and Nepal. *Voluntas: International Journal of Voluntary and Nonprofit Organization*, 13(2), 149-163.
- Uprety, U. (2011). The Reflection on the Legal Framework for Civil Society in Nepal. *International Journal of Not-for-Profit Law*, 13(3), 50-89. Retrieved from http://www.icnl.org/research/journal/vol13iss3/art_3.htm
- Van Tuijl, P. (1999). NGOs and Human Rights: Sources of Justice and Democracy. *Journal of International Affairs*, 52(2), 493-512.
- Werker, E., & Ahmed, F. Z. (2008). What Do Nongovernmental Organizations Do? *Journal of Economic Perspectives*, 22(2), 73-92.
- Whelpton, J. (2005). *A History of Nepal*. Cambridge, UK: Cambridge University Press.

1018 UNDER WHAT MANAGEMENT PRACTICES THE LAND USE CONFLICTS ON LARGE CONSTRUCTION PROJECTS CAN BE MINIMIZED IN PAKISTAN?

ABSTRACT

Previous studies show that blemished infrastructural development projects dispossessed local population and degraded natural resources to a greater extent in developing countries like Pakistan. Therefore, this research is aimed to determine that how land use decision affect local habitats and the resources in various part of Pakistan. Thus, we use data from Chotiari water reservoir and Diamer Bhasah Dam projects, which were constructed in the country, where we emphasize the impacts of the projects on socioeconomic and natural resources in the respective regions. Our findings show that forceful displacement with no proper rehabilitation plan propagated the confrontations at local, regional and national level. The project is hampered by local actors' nonparticipation in decision-making, deceptive information dissemination by the authorities, misuse of funds, power relations, diverse interests and unequal access to natural resources. We paid attention to the actors' network over land and property rights violations, which have created a dissimilar power distribution. We assess the root causes of conflicts with response to land use decision in the light of international rules and laws. It is recommended that for natural resource governance and land use conflict management is imperative to take all stakeholders on board during feasibility of any water sector development project. We also suggest to the government that the awareness campaigns regarding the environmental importance and valuation of natural resources must be on its topmost agenda.

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1052 HOUSEHOLD WATER SUPPLY IN THE GREATER ACCRA REGION, GHANA

ABSTRACT

The Greater Accra Region is generally tropical and humid in nature, and is facing insufficient water supply in the majority of the towns in the region. In recent years, access to safe and reliable water supply in the region has received increased government attention. As a result, the region’s water coverage rate has gradually improved. Yet 75% of the households are without 24-hour access to improved water and 10% with no access at all. The purpose of this study is to investigate the causes of the current water supply situation in the Greater Accra Region using the method of secondary analysis. The paper analyzes various annual reports from the Ghana Water Company Limited (GWCL), Community Water and Supply Agency (CWSA) and various other published works on the water sector in the region to review the availability of water resources, water quality and the characteristics of the water provision sector. It furthermore discusses the causes of the water situation and how it affects the health of millions of residents in the region. The findings of the paper reveal that the water provision problems in the region are mostly due to high population growth, the contamination of the drinking water, effects of climatic change and lack of effective and efficient management of the Ghana Water Company Limited (GWCL). Given these realities, GWCL will have to develop strategies to address the water issues in the region. For instance, the paper recommends that the capacity of Kpong and Weija water plant in the region needs to be expanded and regularly maintained to catch up with the sprawling city’s expansion to meet consumers demand and expectations. Thus government should endeavour to enter into more public private partnership water projects to improve on water infrastructure and consequently water quality and quantity supply in the region.

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1143 SPATIAL VARIATION IN TENURE SECURITY PREMIUM: EVIDENCE FROM INDONESIA

ABSTRACT

This paper estimates the spatial variation of resident’s willingness-to-pay for secure property rights within Indonesia. Previous studies have examined the tenure security premium in developing countries; however, it remains unknown the extent to which this premium is constant across regions and what local factors explain variation in the premium. Using a spatially rich dataset of property prices across the country, we estimate the premium for secure property rights using spatial hedonic and geographically weighted regressions. We find the premium ranges regionally from less than 10% to over 45% of the property price. We then explore this spatial variation to understand the relationship between the tenure security premium and local governance characteristics, socioeconomic factors, and strength of traditional cultural values. Larger premiums for secure property rights are found in areas with higher levels of local corruption. Additionally, local governments that spend less and have a lower percentage of their spending financed through transfer payments have higher premiums, particularly relevant given pushes toward fiscal decentralization in many developing countries. Literacy rates, immunization coverage, poverty rates, and the share of the population living in urban areas are also all correlated with the tenure premium. Understanding these driving forces underlying the tenure security premiums explains the challenges of effective land registration programs. Furthermore, our findings provide direction for potential property rights’ policies that can better align incentives of local governments with the interests of the general public.

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SS03.2. Territorial Governance and Local Development in Developing Countries

1343 GOVERNANCE AND THE QUALITY OF INFRASTRUCTURES AT VILLAGE LEVEL: ANALYSIS USING THE INDONESIA FAMILY LIFE SURVEYS

ABSTRACT

The quality of local infrastructures is important for economic development. One of the crucial policies to improve the quality of local infrastructures is decentralisation, in which local governance is involved. It is known that many developing countries promote self-governance at the local level in order to gain positive impacts on the quality of local infrastructures. In Indonesia, self-governance is also promoted at village level. Granting village autonomy and creating for democratic institutions indicate that the aim of decentralisation is basically to improve village development and as an expected result is an improvement in the the quality of infrastructures at village level. However, empirical investigation on the relationship between governance and the quality of infrastructure at the lowest level of government in Indonesia is still less well documented. This paper contributes with a study of Indonesia using the Indonesia Family Life Surveys (IFLS). Therefore, our analysis employs IFLS data at community level to explore the impact of governance on the quality of several public services and infrastructures. These local public services and infractructre include sanitation, road, drainage, irrigation, public lighting, and clean water. Our regression analysis also includes two group of control variables, the first is geographical or locational characteristics of the village, and the second one is local community participation.

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1386 INCOME INEQUALITY AND QUALITY OF LOCAL GOVERNANCE ACROSS INDONESIA

ABSTRACT

This paper analyzes the relationship between income inequality and the quality of local governance in Indonesia at the district level during the period 2000-2014. Specifically, we test for the hypothesis that across districts better local governance reduces income inequality. We also search for main driving forces and spatial patterns of changes in the relationship between governance quality and inequality. Indonesia is the 4th most populous country in the world and currently undergoes rapid socio-economic changes. The big bang decentralization in 2001 and the introduction of direct elections of president and local district heads since 2004 has led to an emerging role for more than five hundred districts in local and national governance processes. In recent years, economic development in Indonesia is characterized by high economic growth and a rapid increase of overall income inequality. Our analysis makes intensive use of secondary data from various sources and levels such as Central Bureau Statistics Indonesia (BPS) for household and village level, Audit Board Indonesia (BPK), Ministry of Finance, and Regional Autonomy Watch (Kppod) for district level. We measure the quality of local governance in different ways. First, we use quality of institution in terms of budget efficiency and as presented in audit results. Second, we use governance outcomes by developing a public service delivery index and a local regulation index. In our analysis, we include local economic performance (GDP per capita), urban population, infrastructure, and education as control variables. We employ a GMM-system estimator as our empirical strategy and focus on the dynamic relationship in order to test our hypothesis (i) if institutions are strong, inequality remains constant, (ii) if governance is good, income inequality will be low. We expect governance variables will have a negative relationship with the inequality as hypothesized. If budget is spent efficiently in terms of disbursement and absorption as resulted from a strong institution, income inequality will be stable. This paper will contribute to understanding the mechanism how governance affecting inequality and vice versa, especially in the Indonesian context. We find that local audit result is strongly positively related to increasing income inequality while the quality of local public service delivery is strongly negative to increasing income inequality. In contrast, local budget efficiency and the regulatory index both are weakly and oppositely related to income inequality. In other words, our findings suggest that income inequality across Indonesia could be lowered by improving local public service delivery. Meanwhile, improving transparency of local administrative government practices, as captured by local audit result, may help in attracting more firms to local districts – hereby contributing to increasing income inequality.

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1447 ADMINISTRATIVE SYSTEM OF SRI LANKA: CHALLENGES AND PROSPECTS

ABSTRACT

In Sri Lanka administrative system has been expanded gradually to four levels: the central, provincial, district and divisional levels. With the socio-economic and political changes of the country mainly occurred after the 1970's, as a new emerging state, Sri Lanka introduced some constitutional changes and administrative reforms with the main objectives of gaining rapid socio- economic development and an efficient administration. As a result of these reforms, a number of administrative institutions have been proliferated and the public administrative system of Sri Lanka has become extremely complicated. However, regarding these administrative reforms, their implications, and performance, managerial issues and recent reform initiatives of these institutions have not been fully examined academically, though a few researches have been done by using mainly the historical descriptive approach (Warnapala (1974), Bandara (2010, 2013), Navaratna (1989), Wanasinghe (1994), Somasundaram (1997), Leitan (1983). These studies have been done on some specific areas such as: District Political Authority system, District Ministerial System, and Provincial Council system. Therefore, in our view, it is fundamentally necessary to examine through scholarly research whether the objectives of these constitutional and administrative reforms have been fruitfully achieved during the period of last three decades or whether they have created new problems and challenges to the Sri Lankan administrative system and made it complicated. This study will also shed light on emerging issues in the administrative system and its implications for public sector management. The objectives of this study are to describe briefly the historical background and evolution of the Sri Lankan administrative system, the existing institutional structure of the Sri Lankan administration, the recent constitutional and administrative reforms introduced after the 1970's, the objectives behind these reforms, adjustment of administrative system, proliferation of administrative institutions, changing relations of the administrative institutions in various levels and with the centre, their roles and performance in practice and how the new systems have created constraints such as politicization, centralization, lack of administrative efficiency and professionalism etc. and how they destructed legitimate institutions of public administration and how they have become corrupted, less effective and less efficient. The study will be mainly based on the review of relevant documents and literature survey. This paper flows on six aspects: i) Historical overview and evolution of Sri Lankan administrative system, ii) The existing central, provincial, district and divisional structures, the functions and powers are given to these institutions, iii) Constitutional and administrative reforms introduced mainly after the 1970's, the objectives behind them, iv) Implications of these reforms and v) lessons for future with recommendations, VI) emerging issues in the administrative system.

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1455 COEXISTENCE AND HYBRIDIZATION OF AGRICULTURAL MODELS IN ORIENTAL AMAZON. THE DAIRY PRODUCTION EXAMPLE IN TWO VILLAGES OF THE “GREEN MUNICIPALITY” OF PARAGOMINAS (BRAZIL)

ABSTRACT

The coexistence of agricultural models arise as an issue when several types of farming systems meet within the same territory or supply chain. In our communication, we evaluate the effect of this type of coexistence on the evolution of socio-technical systems and development of a given territory. We conducted our study in the Brazilian amazon municipality of Paragominas, spearhead of the green municipality program led by the federated state of Pará. This municipality sealed a territorial pact against deforestation practices with the local stakeholders, but the originally significant effects became to slowdown. We present primary data collected on an emerging milk supply chain within two villages of the municipality and the interpret our results by means of social network analysis. We demonstrate that beyond the temporary adoption of practices considered as eco-efficient by specialized producers, the sustainability of productive systems at territorial scale depend above all on the management of the coexistence of farming systems and the power relationship that lie behind it.

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1501 DURBAN AND RECIFE URBAN DEVELOPMENT PROCESS: CRITICALLY COMPARING PLANNING APPROACHES AND TREATMENT OF SOCIAL JUSTICE IN EACH CASES

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ABSTRACT

Although all cities in the world aim to provide socially, economically and politically equal environment to their citizens; there are major differences among cities in terms of living standard and accessibility to quality life. Durban and Recife are significant example to examine poverty and social exclusion. This paper aims to provide a critical review of development process of these two cities. Since they aspire to provide basic needs, enhance quality of life and improving political structure. In this paper, two different development approaches to interventions of social justice is critically analyse based on planning approaches criteria. Consisted of two parts starts with explaining different planning approaches which can be used for establishing city strategies and also their changes through time. The paper proceeds to exploring how Durban and Recife have addressed distribution of social justice in their interventions on the basis of social justice definition and criteria.

All cities in the World consist of unique combinations of social, political and economic environment. Yet, some cities have variant cases in terms of equality and living standards. Durban and Recife are two different cities which have been suffering from poverty and social exclusion. Durban, or the municipality of eThekweni, is the largest urban area in the province of KwaZulu-Natal, South Africa and the largest port city on the east coast of Africa with 3.5 million populations (Local Agenda 21, 2001) and Recife is the fifth largest metropolitan influence area in Brazil and the capital and largest city of the state of Pernambuco with 1.4 million populations (Cabral and Moura, 1996). Both cities have been experiencing development planning process in order to improve the quality of life, access to basic needs and enhance a strong political structure. The aim of this paper is to compare these two cities' interventions within the context of planning approach and treatment of social justice. The paper will be composed of two parts. It prefaces with identifying which planning approaches are implemented during the process of establishing city strategies and illuminates whether or not these approaches have been changed over time and the paper will continue to explore, through provision of a social justice definition and criteria, how local governments in these two cities have addressed distribution of social justice in their intervention periods.

To begin with planning approaches, it can be said that both Durban and Recife local governments considered public participation as a fundamental strategy in order to establish good government communication with citizens. As Davidoff (1965) stated the process has to include all community, if the primary agenda is to promote democratic urban government. Citizens 'inclusion' means not only to be heard but also to be informed about the planning process with inferable language (Davidoff, 1965).

In Durban, Long Term Development Framework (LTDF) has been constituted by the municipality for 20 years long term city-wide planning and implemented by council in 2002, after a society participation process. Continually, as a medium term plan, with purpose of accommodating a system for the activities of council, which would be updated every five year, Integrated Development Plan (IDP) was conducted in June 2003. These developments are significant for generating democracy in the city. Since 'not only did it involve substantial process of participation, widening the decision-making process beyond formal realm of politicians and officials, it is also highlights the range of intuitional and informal process which are substantially shaping the kind of democracy' (Ballard et.al. n.d., p. 3). As it is seen, participation was pivotal factor of the process and one of the underlying assumptions of advocacy planning is pluralism and participation (Mazziotti, 1974). According to Davidoff (1965), intention of pluralism and advocacy is to raise concern about future conditions among all different groups in society. At first Durban was sub-divided into 100 wards and a large scale of participation process so meetings and workshops with stakeholders, councils and locals was developed in all wards and established a draft of IDP. However, this process conveyed the impression as participative but it was more consultative and politically-driven and city's development strategies were dominant (Ballard et.al. n.d.). Therefore, tenor and contexts of LTDF and IDP were shaped by 'a complex process of participation, informal influences and political contestation' (Ballard et.al. n.d., p.5). Moreover, the IDP process was not only collecting data and community expectations, but so was vitiating expectations, such as unfeasible or realistic demands. The main reason for that, community participation was problematic in some cases because citizens tented to concentrate on their immediate environment changes rather than metropolitan-scale problems. On the other hand, there were two key actors in Durban: the one being local business interest and the other local, regional and national political party interests (Ballard et.al. n.d.) and according to Logie Naidoo, Deputy Mayor and chair of the council's Economic Development Committee, these main players were interested in 'building a closer bond between the political leadership and the business sector' (interview, 25 November 2003 ; Ballard et.al. no date) through development of LTDF and IDP. Whereupon, participatory process diverged from democracy became more market-driven and closely related to politics. In 2004 an IDP review was published and suggested that economic development strategies had still not been accomplished; consequently, the review started to be evolved from individual and household focus to a particular pro-growth orientation (World Bank, 2005). As things stand, it can be indicated that development process in Durban had been changed from participatory to entrepreneurial planning

overtime. This means that planners need to support the market and increase city competitiveness. Because former industrial cities like Durban has to restructure its economy. For instance, Durban Growth Coalition encouraged economic growth and realise city's potential as a world-class port and leisure centre. The local and city government started to focus on partnership with companies and put community engagement into the back burner.

Recife had also experienced a development process based on participation and master plan was a planning tool. Namely, the approach was the same yet participation process was different from Durban. Compare to Durban's participatory process, case of Recife is a very positive example of this process in such a deprived and dynamic urban area.

Tenure was the key problem and slum upgrading was the key issue of master plan. In the late 1970s, a strong popular movement was expressed by slum-called *mocambos*- dweller for squatters' rights and this was supported by political decentralization and growing local democracy in the early 1980s. As a result citizens were ensured for the institution of a system for security of tenure (Jones and Carmona, 2002). After establishing the planning law of 1983 by the mayor of right wing Gustavo Krause, 27 land use zoning areas, called ZEIS (Zonas Especiais de Interesse / Zones of Special Interest) was formulated for the city and now there are 65 such ZEIS in various states of formation (Guide of good practise in Urban Development, 2001). These were consisted of extempore the popular settlement, formed by the occupations of public or private areas, lacking basic infrastructure, urbanization and legalisation. In 1987, Plan of Regularisation of the Zones of Social Interest, known as PREZEIS, was confirmed in order to legitimise the process of legalisation of land of those settlements and be a national guide for implementation of public policies and it particularly emphases on fortification of the occupations in those settlements instead of relocation or eviction them (Guide of good practise in Urban Development, 2001). The Urbanisation and Legalisation Commissions – COMUL's and the FORUM of PREZEIS are two components of PREZEIS. Firstly, with its two representatives, COMUL's main goal is to determine the priorities for the areas, negotiate with authority to tackle conflictual cases and planning strategies. On the other hand, the FORUM of PREZEIS is a forum to control the process of urban development, bureaucratic and legislative, related with the ZEIS. Inarguably, it can be said that participation and transformation of planning process was dominantly contributed by this mechanisms of ZEIS and PREZEIS between squatters and authority. In 1991, a master plan was written by three private consulting groups of planner, who were hired by the city. This plan was focused on decentralisation and all land-use issues, such as fees, taxes, valuation. Also it was a protection for squatter settlement in terms of displacement and recognition of informal settlements (Cabral and Moura, 1996). In this stage, with purpose to citizen participation in planning process three advisory committees were set up. Firstly, Government Organisation Committee presented different city agencies. Secondly, the Civil Society Committee was mainly consisted of citizens and NGO representatives. The last one is Popular Representatives Committee was representative of squatter settlements and *mocombos* (Cabral and Moura, 1996). In spite of the fact that this process was well organised, meetings worked as advisory rather than integrating community into master plan. Additionally, governments did not embrace NGOs or NGOs criticisms and Popular Representative's Committee also did not engage with the process because their representatives were not expert or did not have sufficient knowledge; therefore, they did not play a strong role in this process. However, in 1991 a series of debates was started among the NGOs and city's professional associations. These debates strengthened not only the community engagement but also political representation of community at the level of governance.

To reach the conclusions, it can be said that participation process in Durban started as a core strategy yet, in the course of events, in order to strength the economy, group of officials, 'councillors, consultants, ward level representatives, traditional authorities, business leaders, and senior ruling party members' (Ballard et.al. no date) have change the direction of LTDFs and IDPs policies. Hence, participation has become solely consultation session. As in the interview TC Chetty (July, 2004 ; Ballard et.al. no date) stated 'it tried to make ever body happy' but at the end of the day 'it was a political rather than a planning process'. On the other hand, Recife development process showed a successful participation process and master plan was explicit with advocacy approach.

There is no doubt that planning and participation are two key components that need to be linked; however, in terms of distribution of social justice, the key question is how can a plan make a city more just? The answer depends on how to define social justice. This should be pointed out that social justice within the context of planning does not only mean accessing material goods equally but also receiving, as Young stated (1990), nonmaterial social goods. There is a tendency to define social justice as a distribution of primary urban needs, such as wealth, income and resources yet Young (1990) emphasised on social justice need to be considered into a wider context with regard to an individual as a consumer of goods, which are included action, rights, opportunity and self respect. For instance, Rawls said that 'the way in which the major social institutions distribute fundamental rights and duties' (Rawls, 1971, p.7) and he explicitly underlies these rights and duties are related to decision making, social positions and power (Young, 1990). Runciman (1978) and Ackerman (1980) emphasised on problems of social justice in terms of distribution of *which* social good in society and determining and converting resources into social good (Young, 1990).

As we can understand the issue of defining social justice, there are considerable amount of theory addressing this notion. I should say that, as indicated above, although many theories address social justice as individual posses only material goods, I take the similar approach to Young (1990, p.16 and p.248) 'the concept of social justice includes all aspects of institutional rules and relations...' such as decision -making, rights and self-respect as well as income and other goods and also 'involves equality among groups who recognise and affirm one another on their specificity'. As Smith (2002, p.69) expressed ' ...everyone should be guaranteed a minimum level of material well-being...to remain a normal functioning human being' only then social justice can be distributed equally. Consequently, social justice means that a

person should access basic needs equally and also receive social rights, regardless of person's income, age, ethnicity or culture.

Whatever all these theories explore, social exclusion is the main problem of many countries such as Durban and Recife. The development process experienced in each city was aimed to address this problem through participation process. Durban, in its LTDFs and IDPSs, mainly focused on three criteria. Building skills, meeting basic needs and strength the economy were the key strategies of improving quality of life (LTDF, 2001). Regrettably, neither LTDFs nor IDPs did not advert social justice within the concept of the three criteria decision-making, rights and self-respect. Development process concerned only improving spatial and economic perspectives; therefore, participation and planning process has turned its ways to economic perspective rather than upgrading social developments. Individuals should be able to contribute decision-making process; however, as indicated earlier, this process was not engaging citizen's expectation and listening voice of all groups in society. On the other hand in Recife, during master plan process, citizens had right to elect their own representatives and create Popular Representatives Committee and communicate with authority. Recife had been suffering from social exclusion, the primary agenda of master plan was eliminate this problem, reduce socio-political issue about clientism and protect rights of the squatters in informal settlements, so it can be seen social inclusion interventions were made. Also, in order to include women and increase community engagement in the process, gender and the participatory budget strategy was set up (Women's International Network News, 2003). This intervention provides community to receive social goods equally and helps develop self respect. In theory this notion can be well-organised yet in practice it is hard to implement

To evaluate, both cities attempted to implement advocacy approach in their development process. As we discussed earlier, advocacy planning mainly consist of participation and political interference. In both cases, improving quality of life through participation process was the major goal; however, Durban has changed the approach to entrepreneurial planning since the informal economy had a significant effect on contribution to the Durban's social and economy. Although, there was a commitment to improve economic development set up new strategies tackling with safety healthy and investor friendly (Durban Economy Policy, 2001). On the other hand, in Recife, participatory process was conducted through political interventions. The mayor promised a master plan with well-organised community engagement and advisor committees in order to eliminate social exclusion and the master plan was became a law. Due to these legal approaches, it was easy to distribute social equality. It can be said that legal attempts strength the process.

In conclusion, I should say that planning is a complex process and includes different elements. Yet the most important two factors are participation and equality in all groups of society. In order to achieve a successful development, these key elements must be considered. Durban and Recife had clear visions in theory but in practice Recife had been successful in terms of social inclusion. Governments in developing countries usually are mistaken prioritising economic developments. This is the first mistake Durban authority. Briefly, if cities are living organism then it cannot be separated from human life.

BIBLIOGRAPYH

- Akerman, B.A 1980, *Social Justice in the Liberal State*, New Haven, CT, Yale University Press
- Ballard, R, Bonnin, D, Robinson, J & Xaba, T no date, *Development and New forms of Democracy in Durban*, Centre for Public Participation
- Cabral, J & Moura, A 1996, *City Management, Local Power and Social Practice: An analysis of the 1991 Master Plan Process in Recife*, Latin American Perspectives vol.23, no.4 The 'Urban Question' in Latin America, page .54-70
- Davidoff, P 1965, *Advocacy and Pluralism in Planning*, Journal of the American Institute of Planners, 31:4, 331-338
- Guide Of Good Practices In Urban Development 2001, *Brazilian Research Report*. Retrieved December 10, from <http://home.wmin.ac.uk/MLprojects/Core Areas/Studies/Recife.pdf>
- Jones, T & Carmona, S 2002, *Good practice in core area development: Combating Poverty Through a Participatory Approach*, chapter 12. Retrieved November 30, 2012, from <https://www.dfid.gov.uk/R4D/PDF/Outputs/R686020.pdf>
- Local Agenda 21 programme 2001, *Model Communities Programme*, vol.1., International Council for Local Environmental Initiatives, Canada
- Long Term Development Framework 2001, *An Overview of the Key Development Challenges, Unicity vision, Outcomes and City Strategy*, eThekweni Municipality, Durban
- Mazziotti, D.F 1974, *The Underlying Assumptions of Advocacy Planning: Pluralism and Reform*, AIP Journal, page 38-47
- Rawls, J 1971, *A Theory of Justice*, Harvard University Press
- Runciman, WC 1978, *Process, End-States and Social Justice*, The Philosophical Quarterly, vol.28, no.110, page 37-45
- Smith, D 2002, 'Social Justice and South African City' from Eade, John and Mele, Christopher, *Understanding the city: Contemporary and Future Perspectives*, page 66-81, Oxford:Blackwell
- Women's International Network News 2003, *Report From Around the World: Recife, Brazil: Gender and the Participatory Budget*, Institute of Development Studies, University of Sussex, Brighton
- World Bank-Netherlands Partnership Program 2005, *Evaluating and Disseminating Experiences in Local Economic Development (LED) Investigation of Pro-Poor LED in South Africa*
- Young, I 1990, *Displacing The Distributive Paradigm*, Justice and the Politics of Difference page 15-38, Princeton University Press

SS03.3. Territorial Governance and Local Development in Developing Countries

1512 DOES FISCAL EFFICIENCY SUPPORT POVERTY ALLEVIATION IN THE INDONESIAN REGIONS?

ABSTRACT

Poverty alleviation in the decentralization era has been faced with new challenges in coordinating policies and programs between central and local government. The effectiveness of poverty alleviation program is not only the responsibility of central government since it also greatly depends on the local government participation. This is inline with the goal of decentralization to improve wealth and wellbeing of the local residents. This paper focuses on the impact of state fiscal efficiency on poverty rate of the Indonesian regions, particularly after the implementation of decentralization in 2001. An expenditure efficiency score of each state government is computed using a non-parametric method of Data Envelopment Analysis (DEA) and a Panel Data is constructed to measure the effect of expenditure efficiency on poverty rate. This study finds that the correlation between state fiscalefficiency and poverty reduction is not significant. There is an indication that the utilization of public expenditure to reduce the poverty rate has not been optimal despite the expansion of the social transfer program.

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1526 CONCEPTUALIZING ECONOMIC UNDERDEVELOPMENT AND INSURGENCY NEXUS: CASE STUDIES OF ASSAM, MANIPUR AND NAGALAND

Dona Ganguly, Debasis Patnaik

INTRODUCTION

The last half of the twentieth century marked the inception and the expansion of the waves of globalization and its adjuncts- democratization, liberalization, privatization and free market principles. Its spill over effect is now realized in the twenty first century as well. Unfortunately these much hyped processes seem to be serving the interests of the developed nations only, whereas the developing countries and the least developed countries together known as the Third World countries, are suffering from gross inequities in terms of political and economic power coupled with minimal opportunities for political reforms and upward economic mobility. In 1985, according to the World Bank's classification one out of every three persons, some 1,116 million men, women, and children, in the poorly or least/less developed countries were extremely poor having less than the equivalent of about \$1 a day per person to meet their needs. By 2002, this number fell slightly to 1015 million persons in poverty. Former World Bank president Robert McNamara called these people the absolute poor human beings who suffer a condition of life so degraded by disease, illiteracy, malnutrition, and squalor as to deny its victims basic human necessities. In other words under the influence of globalization, what is observed in this part of the world is the inversely proportional relationship between the ever increasing demands of the masses and the slow pace of politico-administrative and socio-economic modernization. Consequently the popular grievances are finding expressions through violence, extremism and insurgent conflicts. Therefore insurgent warfare, which has now become a fact of life in most of the third world countries feeds on instability as well as breeds in instability, volatility and flux which in turn give birth to failed or failing states, often struggling to recover from bloody civil or interstate wars. Failed states further create a vicious cycle of political, economic, and social unpredictability in which deep-seated maladies related to economic underdevelopment, undemocratic institutions and social inequality fester and then erupt into insurgency violence once more. Against the above background, the present study makes an attempt to assess the delicate and vulnerable relationship that exists between the economic underdevelopment and insurgency conflicts in the context of Assam, Manipur and Nagaland-India's three most insurgency-prone states located in the Northeastern region- the area which is infamous for being the breeding ground of the violent secessionist movements, intense ethnic insurgency insurrections coupled with massive underdevelopment and chronic poverty.

THEORIZING UNDERDEVELOPMENT

The idea of underdevelopment is a much contested and debated topic. There are two broad paradigms that have offered different theoretical perspectives on the idea. One is the theory of Modernization and the other is the Dependency theory. However modernisation has failed to explain the process of underdevelopment in the way dependency theory does. According to Hopkins whereas modernization has attributed the economic backwardness to the internal constraints in "traditional" societies and presumed that external contacts would be instrumental in removing them, the dependency thesis argues that it is the external links which have created the economic backwardness by forging chains of dependence and inequality between a privileged core and an exploited periphery.³²¹ Broadly there are two intellectual strands of thinking involved in dependency theory: Emmanuel Wallerstein and Andre Gunder Frank. According to Emmanuel Wallerstein, the global system is characterized by unequal but simultaneous development of its component national units. The new capitalist world system was based on an international division of labor that determine relationships between different regions as well as the types of labor conditions within each region. In this model, the type of political system is also directly related to each region's placement within the world economy. As a basis for comparison, Wallerstein proposes four different categories, core, semiperiphery, periphery, and external, into which all regions of the world can be placed. The categories describe each region's relative position within the world economy as well as certain internal political and economic characteristics. The Core regions benefit the most from the capitalist world economy. Politically, the states develop strong central governments, extensive bureaucracies, and large mercenary armies. This permit the local bourgeoisie to obtain control over international commerce and extract capital surpluses from this trade for their own benefit. On the other end of the scale lay the peripheral zones. These areas lack strong central governments or are controlled by other states, export raw materials to the core, and rely on coercive labour practices. The core expropriate much of the capital surplus generated by the periphery through unequal trade relations. Between the two extremes lie the semi-peripheries. These areas represent either core regions in decline or peripheries attempting to improve their relative position in the world economic system. They often also served as buffers between the core and the peripheries. As such, semi-peripheries exhibit tensions between the central government and a strong local landed class. Economically, these regions retain limited but declining access to international banking and the production of high cost high quality manufactured goods. Unlike the core, however, they fail to predominate in international trade and thus do not benefit to the same extent as the core.³²²

According to Andre Gunder Frank the present capitalist system has enforced a rigid international division of labour which is responsible for the underdevelopment of the many areas of the world. The dependent states supply cheap minerals,

³²¹A.G. Hopkins, Two essays on Underdevelopment: From Underdevelopment to Modernization, Geneva Institut Universitaire de Hautes Etudes Internationales, 1979, p.27

³²² Immanuel Wallerstein, The Modern World System: Capitalist Agriculture and the Origins of the European World Economy in the Sixteenth Century, New York: Academic Press, 1974

agricultural commodities, and cheap labour, and also serve as the repositories of surplus capital, obsolescent technologies, and manufactured goods. These functions orient the economies of the dependent states towards the outside for money, goods and services. However the allocation of these resources are determined by the economic interests of the dominant states and not by the dependent states. This pattern of unequal exchange ultimately explains the causes of underdevelopment of the dependent states: a situation in which the resources are being actively used, but used in a way which benefits dominant states and not the poorer states in which the resources are found.³²³

MEASURING ECONOMIC UNDERDEVELOPMENT

The level of economic underdevelopment of any country can be determined by studying and analysing the level of economic development and growth, which in turn is measured by the growth of total income gained by the country in question. The two most common methods used for measuring economic growth are *gross national income* (GNI) and *gross domestic product* (GDP). **GNI** is the annual total value of all income *accruing to* residents of a country, regardless of the source of that income, that is, irrespective of whether such income is derived from sources within or outside the country. **GDP** is the annual total value of all income (= value of final output) *created within* the borders of a country, regardless of whether the ultimate recipient of that income resides within or outside the country. Therefore based on these developments, a country can be declared to be economically underdeveloped if it shows:

- Low GDP/SDP (in case of individual states within a country)
- High poverty rate
- High Literacy Rate but High Unemployment Rate
- Low Industrialization
- Low Female Education Rate

UNDERSTANDING INSURGENCY AND ITS CRADLES

The last half of the twentieth century marked the inception and the expansion of the waves of globalization and its adjuncts- liberalization, privatization, free market principles and democratization. Its spill over effect is now realized in the twenty first century as well. Unfortunately these much hyped processes seem to be serving the interests of the developed nations only, whereas the third world countries are suffering from gross inequities in political and economic power, combined with the perception of minimal opportunities for political reform and economic upward mobility. In other words under the influence of globalization, what is observed in this parts of the world is the inversely proportional relationship between the ever increasing demands of the masses and the slow pace of politico-administrative and socio-economic modernization. Consequently the popular grievances are finding expressions through insurgent conflicts. It is notable here that during the colonial era, such protests often combined with nationalistic stirrings were manifested in anticolonial movements, but in the postcolonial period, the same have led to struggles to overthrow regimes ruled by wealthy elites often far more incompetent, fraudulent, and tyrannical than their colonial predecessors. The end result is that insurgent warfare has become a fact of life in most of the third world countries.

Insurgency as a concept frequently engages widely disparate interpretations and conceptual confusions. Insurgency falls within the genre of irregular, unconventional, revolutionary and guerrilla warfare but it cannot be used interchangeably with terrorism. Although insurgents employ guerrilla and terrorist tactics, espouse revolutionary and radical causes, pose asymmetric threats to modern conventional forces, operate on the legal and moral margins of societies and blur distinctions between civilians and combatants, yet insurgency is different from terrorism. Insurgency, unlike terrorism, is characterized by the support and mobilization of a significant proportion of the population. According to Mao insurgency operates at three Stages - **Stage I/Strategic Defensive** is characterized by avoidance at all costs of pitched, set-piece battles and the moral superiority of the guerrillas is established with the local population, political indoctrination is carried out and new recruits are trained to fight as irregulars in remote, safe bases; **Stage II/Stalemate** begins the prolonged battle to attrite thenemy's physical and moral strength and government control, in the form of local officials, is targeted and its representatives are either killed or forced to leave, with government presence in rural areas neutralized, the population is drawn upon for moral and physical support channelled into building capable, conventional *main forces*; **Stage III/Strategic Offensive** is the end game of the conflict, in which popular and main forces conduct the battle of manoeuvre and use overwhelming force to destroy decimated enemy forces in their defensive positions.³²⁴ From the above interpretation it can be concluded that an insurgency is a prolonged violent conflict based on popular support in which one or more groups strive for overthrowing or profoundly changing the existing political or social order in a state or region through the use of sustained violence, insurrection, social disruption and political action.

It is to be borne in mind that although all the successful insurgencies have common characteristic features yet the causes behind the emergence of each insurgency movement vary from one another. Debates over the causes of insurgencies often focus on issues, usually related to modernization, globalization, poverty, or political ineptitude. Scholars like Thomas Barnett identifies the failure of the states and regions to tap into globalization and its economic and political

323 Andre Gunder Frank. The Development of Underdevelopment, in James D. Cockcroft, Andre Gunder Frank, and Dale Johnson eds., Dependence and Underdevelopment, Garden City, New York, Anchor Books, 1972.

324 James D Kiras , Irregular Warfare: Terrorism and Insurgency in Baylis John et al (eds), Strategy in the Contemporary World: An Introduction to Strategic Studies, Second Edition, Oxford University Press, 2007, p.190

benefits as the cause of insurgency.³²⁵ Others, such as Samuel Huntington, cite the violent disruptiveness of competing cultures, embodied in religious and ethno-nationalism and exemplified by Islamist radicalism and al Qaeda to be at the roots of insurgent upheavals.³²⁶ Still others focus on repression, terrorism, crime and corruption, and discrimination, actions that incite popular unrest and feed insurgency. However insurgency is the spontaneous interactions between actions, structures and beliefs which explode into sustained violence. Structurally, insurgencies most often occur in poorly developed and unstable states or regions, unwilling or unable to address their endemic problems of inequitable political, social and economic conditions characterized by poverty combined with inadequate services, lack of education and crime; oppressive or corrupt regimes; ethnically exclusive enclaves leading to factionalism; lack of natural resources or disparities in their distribution; and social exclusion and stratification or military occupation. The discontents rooted in the discriminatory and undemocratic socio-economic and political structures of the poorly developed nations are further aggravated by the extremist and exclusionary beliefs about identity, especially ethno-nationalism, cultural exclusiveness, religion, or a combination of the three which dominate the socio-economic and political life of these countries. Individual and group identity, radical worldviews, attitudes, and historical myths (particularly if they involve past tragedies) promoted and sustained by charismatic leaders who offer insurgency as an alternative to the current intolerable situation (as was the case of Mao, Castro, Issac Muivah and many others) barely leave room for conciliation and compromise. The structural inequities coupled with fanatical beliefs and radical attitudes, in turn, are powered and exploded by the catalysing actions inclusive of state violence and repression against a particular segment of the population, economic exclusion either by existing governments or by one political or ethnic group against another, acts of corruption and crime that no longer can be tolerated, or even single acts, such as arrests, political assassinations or overreactions to protests. Therefore it may be observed that insurgency feeds on instability as well as breeds in instability, volatility and flux which in turn give birth to failed or failing states, often struggling to recover from bloody civil or interstate wars. Failed states further create a vicious cycle of political, economic, and social unpredictability in which deep-seated maladies related to economic underdevelopment, undemocratic institutions and social inequality fester and then erupt into insurgency violence in turn.

ECONOMIC UNDERDEVELOPMENT AND INSURGENCY NEXUS: THEORETICAL UNDERPINNINGS

In 1985, according to the World Bank's classification one out of every three persons, some 1,116 million men, women, and children, in the poorly or least/less developed countries were *extremely poor* having less than the equivalent of about \$1 a day per person to meet their needs.³²⁷ Former World Bank president Robert McNamara called these people the *absolute poor* human beings who suffer a condition of life so degraded by disease, illiteracy, malnutrition, and squalor as to deny its victims basic human necessities.³²⁸ Therefore very often both the national and international policy makers as well as academicians and scholars across the wide political spectrum prefer to consider insurgency and other forms of political violence affecting the third world nations, to be a product of poverty and poor distribution of income and resources leading to a widening gap between the rich and poor. The link between political extremism, violence and instability and socioeconomic discontent and desperation can be understood from three economic explanations as follows:³²⁹

- a) **Group Motivation:** Groups engaged in internal conflict are often united by a common ethnic or religious identity and fight for a common cause/ purpose. The conflict occurs where there are significant underlying differences in access to economic or political resources among ethnic or religious groups, providing both leaders and followers with a strong motive to fight. Ted Robert Gurr terms such group differences *relative deprivation*; Frances Stewart defines differences in groups' access to economic, social, and political resources as *horizontal inequalities*, in contrast to the traditional *vertical inequalities* that apply to individuals rather than groups. Horizontal inequalities (HIs) are multidimensional, involving access to a variety of resources along economic, social, and political dimensions. Along the economic vector, not only income is important, but access to employment and to a variety of assets (e.g., land, credit, education) comes into play. The social vector includes decisions on official languages, religion, or cultural events that favor one group or another, access to services (e.g., health care, water) and to assets (e.g., housing). The political vector includes power at the top (e.g., the presidency, the cabinet), at lower levels (e.g., parliamentary assemblies, local government), in the bureaucracy at all levels, and in the army and the police. For example, in Zimbabwe unequal access to land is important, while in Northern Ireland conflict concerned HIs in housing, education, and jobs.
- b) **Failure of the Social Contract:** The second explanation of violent conflict points directly to grievances. It derives from the view that social stability is premised on an implicit social contract between the people and the government. According to this contract, people accept state authority as long as the state delivers services and provides reasonable economic conditions in terms of employment and incomes. With economic stagnation or decline and worsening state services, the social contract breaks down and violence results. Thus, high (and rising) levels of poverty and a decline in state services would be expected to cause conflict.

325 R Scott Moore , The Basics of Counterinsurgency, p.6, <http://www.smallwarsjournal.com> (accessed on 09/09/2017)

326 Ibid

327 James M. Cypher , The Process of Economic Development, Fourth Edition, Routledge, London and New York, 2014, p.7

328 Ibid

329 Graham K Brown and Frances Stewart, Economic and Political Causes of Conflict: An Overview and Some Policy Implications, CRISE (Centre for Research Inequality, Human Security and Ethnicity) Working Paper 81, February 2015, pp.5-14, <http://www3.qeh.ox.ac.uk/pdf/crisewps/workingpaper81.pdf> (accessed on 17/09/2017)

- c) **Green War (Environmental Scarcity):** The third explanation of violent conflict, associated with the work of Thomas Homer-Dixon, is the *green war*, or *environmental scarcity*, argument. The essence of this perspective is that the contest for control over declining natural resources, often intensified by population pressures, is a major cause of violent conflict around the world. Poorer societies are more at risk because they are less able to buffer themselves from environmental pressures. Three dimensions of environmental scarcity that may lead to conflict are: supply-induced scarcity, linked to the depletion and degradation of an environmental resource; demand-induced scarcity, linked to population growth and the consequent extra pressures on existing resources; and structural scarcity, which arises from an unequal distribution of a resource that concentrates it in the hands of a relatively few people.

Violent conflicts result into the destruction or removal of physical capital, including bridges, buildings, and communications and energy sector infrastructure. A fall in investment (especially private rather than public investment) is also observed because the investors are discouraged by the unstable political and economic situation of the country. The skills and abilities of labour force alter as a result of conflict. During conflicts, schools are either closed or are destroyed and students and often teachers join rebellions and armies. These effects reduce investment in human capital. Production and trade is also interrupted by blocking freedom of movement. People become less productive when they are displaced or unable to access their workplaces due to landmines and other threats. Expectations of looting have implications for economic production, much like taxation; and the responses to looting, such as reduced travel, the closure of markets or the imposition of curfews hit production and trade.

OBJECTIVES OF THE PRESENT STUDY:

Against the above background, the present study makes an attempt to assess the delicate and vulnerable relationship that exists between the economic underdevelopment and insurgency situations in the North Eastern part of India. India's North Eastern region which is also recognized as a rainbow zone of the country, extraordinarily diverse, colourful and mysterious when seen through parted clouds, stretches from the foothills of the Himalayas in the eastern range and is surrounded by Bangladesh, Bhutan, China, Nepal and Myanmar. It includes the eight sisters - Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and Sikkim. The region is rich in natural resources, covered with dense forests, has the highest rainfall in the country, with large and small river systems nesting the land and is a treasure house of flora and fauna. It is marked by diversity in customs, cultures, traditions and languages, it is home to multifarious social, ethnic and linguistic groups. The troubled history and geo-politics, of the North East has been primarily responsible for the most backward status of the region by placing hurdles on its future economic progress. Further the evils of partition in 1947 isolated the region, sealed both land and sea routes for commerce and trade and severed access to traditional markets and the gateway to the East and South-East Asia- the Chittagong port in East Bengal (now Bangladesh). It also distanced the approach to the rest of India by confining connectivity to a narrow 27-km-wide Siliguri corridor popularly known as Chicken Neck, making it a remote land and constraining access for movement of goods and people. Moreover India's uneasy relationship with most of the neighbouring countries has not helped the cause of development of the region either: with 96 per cent of the boundary of the region forming international borders, private investment has shied away from the region. Poor infrastructure and governance is combined with low productivity and market access. Inability of governments to control floods and river bank erosion causes unmitigated damage to properties and lives of millions of people every year in the region. If the quest for ethnic and cultural identities has sowed the seeds, frustration and dissatisfaction from seclusion and remoteness then the problems of governance and economic backwardness have provided fertile ground for breeding armed insurgencies. Therefore out of the eight sister states in the North Eastern region, the present article focusses on the cases of Assam, Manipur and Nagaland which have been mostly plagued by the insurgency violence. The study seeks to project:

- That negligence of the Central government towards these three states since the very inception of the First Five Year Plan till the Ninth Five Year Plan has been responsible for a long period of economic underdevelopment of these states
- That the economic underdevelopment has triggered the insurgency situation in these three states
- That with the inception of Tenth Five Year Plan followed by the Eleventh and Twelfth Plan successively, the states of Assam, Manipur and Nagaland are recording fast economic growth and development
- That the economic development is gradually ameliorating the insurgency situation

METHODOLOGY

The study has been essentially based on the analysis of secondary data procured from the various government archives, statistical databases and annual reports of various ministerial departments of Government of India.

ECONOMIC UNDERDEVELOPMENT AND INSURGENCY NEXUS IN ASSAM, MANIPUR AND NAGALAND: THE PROBLEMATIQUE

In this part of the article an attempt has been made to analyse the correlation between economic backwardness and the growth of insurgency in Assam, Manipur and Nagaland. As already mentioned above that underdevelopment results from the exploitation of the dependent state by the dominating state which uses the resources of the former to further its economic interests. In case of North East India, the situation is bit tricky. The mainland India has never exploited the virgin reserve of the natural resources of the region and at the same time for almost 50-55 years after independence, New Delhi showed enough reluctance in addressing the paralysed economic situation of the region. The cultural

distinctiveness and the remoteness of the region coupled with the difficulty in accessing the region has been often cited as the cause behind the lack of attention towards the Northeast. The Central Government profusely influenced by the Nehruvian ideas of *leaving the North East on their own* somehow misinterpreted the economic requirements of the region. It can be argued that the negligence of the Central Government towards the North eastern region in general and Assam, Manipur and Nagaland in particular since the First Five Year Plan till the Ninth Five Year Plan, has been primarily responsible for the economic travails of these three states. However it is also important to note that since Nagaland could not become a state before 1963 due to its severe insurgency affected atmosphere, Kohima failed to reap the economic benefits of the first three five year plans and lagged behind the rest of the country in the process of development. Thus it is clear in case of Nagaland that the economic underdevelopment breeds in insurgency which in turn further provokes the former. **Table 1** below shows the central allocation of funds for these three states from the First (1951-56) to Ninth (1997-2002) Five Year Plan periods. It can be observed that from 1951 till 2000 the Central Government of India does not seem to have exhibited enough concern for these states. The statement can be justified by the fact that the Central allocation during this period for these three states had been fairly meagre. During the First Plan the percentage shares of the total allocation by the Centre for Assam and Manipur were 5.2% and 0.32% respectively. During the Second Plan the percentage shares of the total allocation by the Centre for Assam and Manipur were 5.31% and 0.35% respectively. During the Third Plan the percentage shares of the total allocation by the Centre for Assam and Manipur were 2.98% and 0.29% respectively. During the Fourth Plan the percentage shares of the total allocation by the Centre for Assam, Manipur and Nagaland were 3.12%, 0.43% and 0.49% respectively. During the Fifth Plan the percentage shares of the total allocation by the Centre for Assam, Manipur and Nagaland were 1.09%, 0.23% and 0.17% respectively. During the Sixth Plan the percentage shares of the total allocation by the Centre for Assam, Manipur and Nagaland were 2.29%, 0.49% and 0.43% respectively. During the Seventh Plan the percentage shares of the total allocation by the Centre for Assam, Manipur and Nagaland were 2.60%, 0.53% and 0.49% respectively. During the Eighth Plan the percentage shares of the total allocation by the Centre for Assam, Manipur and Nagaland were 1.07%, 0.22% and 0.21% respectively. During the Ninth Plan the percentage shares of the total allocation by the Centre for Assam, Manipur and Nagaland were 1.83%, 0.49% and 0.30% respectively. It is important to note here that while Assam has shown a decreasing trend from 5.2% to 1.07%, the fates of Manipur and Nagaland floated around 0.32% to 0.43%.

TABLE 1. FIVE YEAR PLAN OUTLAYS FOR ASSAM, MANIPUR AND NAGALAND (Rs in crores)

FIVE YEAR PLANS	ASSAM	MANIPUR	NAGALAND	TOTAL OUTLAY
First plan (1951-56)	75.9	4.8	NA*	1456.8
Second plan (1956-61)	119.0	7.9	NA*	2240.9
Third plan (1961-66)	120	12	NA*	4022.0
Fourth plan (1969-74)	220.0	30.25	35.0	7031.47
Fifth plan (1974-79)	429.0	92.86	70.15	39303.0
Sixth plan (198-85)	1115.00	240.00	210.00	48600.0
Seventh plan (1985-90)	2100.00	430.00	400.00	80698.00
Eighth plan (1992-97)	4672.00	979.00	939.80	434100.00
Ninth Plan (1997-2002)	8983.93	2426.69	1493.24	489361.00

Source: Compiled from the Five Year Plan Reports, Planning Commission, Government of India, <http://planningcommission.gov.in> (accessed on 09/01/2018)

*Since Nagaland attained statehood in 1963, therefore could not enjoy the benefits of the first three Five Year Plans.

The paucity of fund has been responsible for the increasing poverty accompanied by lack of employment and industrialization, all subsequently leading to the economic backwardness and underdevelopment in these three states. As per the sample surveys conducted by the National sample Survey (NSS) since 1973, **Table 2** below shows the percentage of population living below the poverty line in these three states during the entire period of First to Ninth Five Year Plans. When compared to the All India percentage of population below poverty line each of the three states have exhibited a decreasing trend in 1973-74 followed by increase in 1977-78, decrease in 1983, 1987-88 and then continuous increasing trend throughout 1993-94 and 1999-2000.

TABLE 2 PERCENTAGE OF POPULATION BELOW POVERTY LINE

STATE	1973-74	1977-78	1983	1987-88	1993-94	1999-2000
ASSAM	51.21	57.15	40.47	36.21	40.86	36.09
MANIPUR	49.96	53.72	37.02	31.35	33.78	28.54
NAGALAND	50.81	56.04	39.25	34.43	37.92	32.67
ALL INDIA	54.88	51.32	44.48	38.86	35.97	26.10

Source: Compiled from 10th Five Year Plan Report 2002-2007, Planning Commission, Government of India, <http://planningcommission.gov.in> (accessed on 02/04/2018)

The increasing poverty level has resulted into poor education Table 3 below projects the ever increasing unemployment rates in Assam, Manipur and Nagaland when compared to the All India level. It is important to note here that the female unemployment rate in these three states is very alarming. Female empowerment being one of the important determinants of economic development, the situation in Assam, Manipur and Nagaland was not very encouraging. The situation was further aggravated by the lack of industrialization apart from the increasing level of

poverty and unemployment. **Table 4** below shows the poor development of small and medium size industries in Assam, Manipur and Nagaland from 1972-73 to 2006-07.

Table 3 Unemployment rates by sex 1993-94 to 1999-2000

STATE	1993-94				1999-2000			
	RURAL		URBAN		RURAL		URBAN	
	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
ASSAM	62	143	62	289	47	119	91	223
MANIPUR	19	11	53	44	24	25	74	103
NAGALAND	21	0	69	70	30	38	93	108
ALL INDIA	20	14	45	82	21	15	48	71

Source: Compiled from Employment and Unemployment in India 1993-94, Fifth Quinquennial Survey NSS Fiftieth Round (July 1993-June 1994), Report No. 409, National Sample Survey Organisation, Department of Statistics, Government Of India, March 1997 and Employment and Unemployment Situation in India 1999-2000, NSS 55th Round (July 1999-June 2000), Report No. 458(55/10/2), National Sample Survey Organisation Ministry of Statistics and Programme Implementation, Government Of India, May 2001

TABLE 4 STATE-WISE MEDIUM & SMALL SCALE INDUSTRIES - TOTAL NUMBER OF UNITS (in lakhs)

States	First Census (1972-73)	Second Census (1987-88)	Third Census (2001-02)	Fourth Census (2006-07)
ASSAM	0.02	0.04	1.94	6.62
MANIPUR	0.00	0.02	0.48	0.91
NAGALAND	0.00	0.00	0.14	0.39
ALL INDIA	1.40	5.82	105.21	361.76

Source: Compiled from Handbook of Statistics on Indian States, Reserve Bank of India, 2016-17,

The evils of economic backwardness and underdevelopment bred into violent secessionist and insurgency movements under the able leaderships of huge number of educated unemployed youths. **Table 5** below shows that compared to the All India statistics, there has been a continuous increase in the literacy level in these three states from 1961-2001. Unfortunately, despite of high literacy rate, as shown in Table 3 above, the corresponding increase in the rate of unemployment created frustration and anger among the youths of these three states. Therefore these youths sought to pursue the paths of violence and secessionism as a remedy to their economic plights and isolation from the mainstream Indian economic development.

TABLE 5 LITERACY RATES FOR MALE AND FEMALE 1961, 1981 AND 2001

STATES	1961		1981		2001	
	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
ASSAM	44.3	19.6	NA	NA	71.9	56.0
MANIPUR	53.5	18.9	53.3	29.1	77.9	59.7
NAGALAND	27.2	13.0	50.1	33.9	71.8	61.9
ALL INDIA	40.4	15.4	56.4	29.8	75.9	54.2

SOURCE: 10TH Five Year Plan Report 2002-2007, Planning Commission, Government of India, <http://planningcommission.gov.in> (accessed on 02/04/2018)

Resultantly, the insurgency situation in the states of Assam, Manipur and Nagaland, assumed a diabolical shape. **Table 6** below shows the intensity of the insurgency situation as evident in the number of insurgency related killings from 1992-2001. In case of Assam the number has increased from 133 in 1992 to 606 in 2001, in Manipur the number increased from 165 in 1992 to 256 in 2001 and in Nagaland it was 96 in 1992 and 103 in 2001. Therefore it can be concluded that with the increase in the rate of economic underdevelopment, the insurgency situation aggravated over the period of 1970 to 2001.

TABLE 6 INSURGENCY RELATED KILLINGS AND CASUALTIES FROM 1992 TO 2001

STATE	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
ASSAM	133	131	271	270	451	537	783	503	758	606
MANIPUR	165	423	350	321	275	495	244	231	246	256
NAGALAND	96	173	192	213	304	360	112	148	101	103

Source: Compiled from South Asia Terrorism Portal, <http://www.satp.org> (accessed on 02/04/2018)

However, the economic situation in Assam, Manipur and Nagaland began to change since Tenth Five Year Plan (2002-2007) due to number of factors: **First**, recognizing the special requirements of the region and the need for significant levels of government investment, the North Eastern States have been categorized as Special Category States and Central Plan assistance to these States is provided on liberal terms. **Secondly**, in October 1996, the Central Government's announcement of 'New Initiatives for the North Eastern Region' included a number of measures for the development of the NER which covered policy changes, special area development and development projects in key sectors. In order to mobilize financial resources, a policy decision was taken to earmark at least 10% of the Plan Budget(s) of the Central ministries/departments for development of the North Eastern States. **Thirdly**, the Non-Lapsable Central Pool of Resources (NLCPR) created in 1997-98 (operationalized in 1998-

99) is the accrual of the unspent balance of the mandatory 10% budgetary allocation of the Ministries/Department. The broad objectives of the NLCPR Scheme is to ensure speedy development of infrastructure by way of filling the existing

infrastructural gaps (economic and social) in the region by making funds available from the pool. **Fourthly**, the Ministry of Development of North Eastern Region (DoNER) was set up in 2001 to coordinate and give impetus to the Centre's development efforts pertaining to socio-economic development of the region. **Fifthly**, the Central Government has also been announcing special packages for socio-economic development of the NER from time to time. Priority funding (both in the Central plan and State Plan) are being arranged from time to time for expeditious implementation of these packages. **Finally** and most importantly, in the second phase of Look East policy which is now rechristened as the Act East Policy under the Modi Government, India is now eager to involve North eastern region as the potential connectivity corridor towards the Southeast Asian markets. It will not only forge integration the East and Southeast Asian economies but will also promote a holistic development of the North Eastern region which is lagging far behind the overall national development, growth and prosperity. Although the North Eastern part of India suffers from geographical isolation, and socio-cultural asymmetries in relation to the mainland India, but it shares geographical contiguities and ethno-cultural continuities with the countries of Southeast Asia. Therefore North East India forms both a geographical gate way and a cultural linking bridge to ASEAN and countries of Southeast Asia. In this initiative the states of Assam, Manipur and recently Nagaland have gained prominence due to their geographical proximity to the Southeast Asian region.

With an aim to prepare the North eastern region a potential corridor to the Southeast Asia, it has become imperative for the Central Government of India to flood the states of Assam, Manipur and Nagaland with developmental projects and necessary funds required for the same. Resultantly, now the areas are experiencing a euphoria of economic development. It may be observed from the **Table 7** below, that from the 8th to 11th Plan periods, Assam, Manipur and Nagaland have shown considerable increase in the growth rates in State Domestic Product. Assam has registered an increase from 2.8% to 6.8%, Manipur shows an increase from 3.7% to 6.2% but Nagaland however has shown a decrease from 7.2% to 6.2%. The surge in growth rates is further validated by the developmental growth rates in industry and services sectors witnessed during the 12th Plan as shown in **Table 8** below. When compared to the all India growth rates in agriculture, industry and service sectors, all the three states of Assam, Manipur and Nagaland have recorded much higher growth rates with Nagaland having 9.0% growth rate in industrial sector. Further, the fast increasing level in female literacy rate in 2011 as shown in **Table 9** below also projects the development of these three states economically.

TABLE 7 Growth Rates in State Domestic Product (SDP) in Different States (% per annum)

STATE	8 TH PLAN (1992-97)	9 TH PLAN (1997-2002)	10 TH PLAN (2002-2007)	11 TH PLAN (2007-2012)
ASSAM	2.8	1.8	5.0	6.8
MANIPUR	3.7	4.7	5.7	6.2
NAGALAND	7.2	6.5	7.4	6.2
ALL INDIA GDP	7.5	5.5	7.8	8.0

SOURCE: 12th Five Year Plan Report 2002-2007, Planning Commission, Government of India, <http://planningcommission.gov.in> (accessed on 02/04/2018)

TABLE 8 State-wise and Sector-wise Growth Rates for the Twelfth Five Year Plan (2012-17) (in percentage %)

STATE	INDUSTRY	SERVICES	TOTAL
ASSAM	4.6	8.9	7.0
MANIPUR	4.5	8.4	6.5
NAGALAND	9.0	7.5	7.0
ALL INDIA	7.6	9.0	8.0

SOURCE: 12th Five Year Plan Report 2002-2007, Planning Commission, Government of India, <http://planningcommission.gov.in> (accessed on 02/04/2018)

TABLE 9 Literacy rates in 2011

STATES	LITERACY RATE MALE	LITERACY RATE FEMALE	GAP IN LITERACY RATE
ASSAM	78.81	67.27	11.54
MANIPUR	86.49	73.17	13.32
NAGALAND	83.29	76.69	6.60
ALL INDIA	82.14	65.46	16.68

Source: Compiled from Census India, 2011, <http://censusindia.gov.in> (accessed on 12/04/2018)

From the Tables above it can be concluded that these three states have been experiencing an economic developmental phase since 2002. Thanks to the Look East Policy, that Assam, Manipur and now also Nagaland are receiving due attention of the Central Government. Eventually, the insurgency situation in all these three states have also declined over the years barring one or two stray events. **Table 10** below shows the decreasing level of insurgency related violence in these three states since 2002.

TABLE 10 INSURGENCY RELATED VIOLENCE AND KILLINGS IN ASSAM, MANIPUR AND NAGALAND SINCE 2002-2017

YEAR	ASSAM	MANIPUR	NAGALAND
2002	445	190	36
2003	505	198	37
2004	354	208	58
2005	242	331	40
2006	174	285	92
2007	437	408	108

2008	373	485	145
2009	392	416	18
2010	158	138	3
2011	94	65	15
2012	91	110	61
2013	101	55	32
2014	305	54	15
2015	59	94	46
2016	86	55	6
2017	26	33	8

Source: Compiled from South Asia Terrorism Portal, [http:// www.satp.org](http://www.satp.org) (accessed on 02/04/2018)

CONCLUDING OBSERVATIONS

The end-objective of economic development is the development and growth of the human being. Therefore, any talk of trade and commerce and better livelihood options etc. are for the improvement of life of the people and increasing their happiness factor. However, the aim of developing the Northeast by facilitating increased regional and international trade with the neighbouring countries, aimed at providing the scope for industrialization and growth will have only marginal impact on the economy unless the region can be converted into a production hub. However in this context, it is to be noted that there are several challenges which need to be faced and solved accordingly. The **first** challenge is to overcome the general tribal mentality of subsistence economic production and transform into a market oriented one. There is as yet little concept of market forces and much learning is required. A few Border Haats and Land Customs Stations (LCS), where the trade is largely on barter, will not bring prosperity. **Secondly**, absence of proper communication infrastructure must be mitigated immediately by trained, skilled and enthusiastic manpower. **Thirdly**, the evils of corruption at various levels, illegal taxes, absence of coordinated official planning and concerted action, general indifferent attitude of the people etc need good governance and impartial administrative system. Fourthly, security and safety must be prioritized and for these law and order machinery must be fine-tuned through proper legislations. **Fourthly**, excessive industrialization and communication networks should not destroy the traditional resource base and the virgin environment of the region. Therefore care should be taken to ensure a sustainable development. **Fifthly**, draconian laws like AFSPA and many other undemocratic legislations should be repealed without further delay as it is endorsing more alienation and isolation.

Economic development should therefore encompass not only the material well being of any particular community but should also address the challenges of proper governance, environmental security and infrastructural bottlenecks. It is only possible then to mitigate both the evils of economic underdevelopment and insurgency situation.

REFERENCES

1. Immanuel Wallerstein, The Modern World System: Capitalist Agriculture and the Origins of the European World Economy in the Sixteenth Century, New York: Academic Press, 1974
2. Andre Gunder Frank. The Development of Underdevelopment, in James D. Cockcroft, Andre Gunder Frank, and Dale Johnson eds., Dependence and Underdevelopment, Garden City, New York, Anchor Books, 1972.
3. James D. Kiras, Irregular Warfare: Terrorism and Insurgency in Baylis John et al (eds), Strategy in the Contemporary World: An Introduction to Strategic Studies, Second Edition, Oxford University Press, 2007
4. Planning Commission Reports
5. Census India 2011
6. Handbook of Statistics on states in India, Reserve Bank of India

1627 MINORITIES AND REGIONAL AUTONOMY: AN ANALYSIS OF ETHNIC AND POWER POLITICS IN EASTERN SRI LANKA

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ABSTRACT

Regional politics play a decisive role in national politics. When ethnic groups are regionally concentrated, the politics for regional autonomy not only challenges the territorial integrity of a country, but also controls the country's national political destiny. Similar to many developing countries, Sri Lanka has also severely suffered due to the political claims for self-rule, regional autonomy and separation by the regionally concentrated ethnic minorities. Sri Lanka's Eastern province has been highly influential in national politics as well as minority politics from the independence of the country, during civil war, and in the post-civil war era. Particularly, the province has continued to be a contested region in terms of state-building, national, and regional integration, and the integration of minority politics. The ethnic composition of the region has played an influential role in this regard. This study explores the ethnic group' competition for political control and autonomy, as well as its impact in Eastern Sri Lanka. This study has employed both qualitative and quantitative data, collected mainly through secondary sources such as literary books, journal articles, newspaper cuttings, and government documents, which are analyzed and presented through an interpretive and descriptive manner. The study reveals that the Eastern province has been a contested choice for the ethnic majority to extend their ethnic domination, and to implement ethno-centric development-cum settlement policies and programs, all of which are ultimately induced to change the ethnic composition of the region in favor of the ethnic majority and pushing ethnic minorities to mobilize and demand for more decentralized power and autonomy in the region. The thirty-year prolonged civil war made the region not only a war-torn one, but also the one that undermined regional democratic principles, including minorities' rights for autonomy. The study also reveals that the demerger of the Northern and the Eastern provinces, the establishment of the Eastern provincial council in 2006, and the end of the civil war in 2009 created hopes among the minorities that the region would return to a democratic system that ensures their self-rule and autonomy in the region. However, the new emerging political context at the provincial and national levels continues to undermine these hopes. Nevertheless, the region has emerged as one for ethnic cohesive politics.

Key Words: Regional politics, regional autonomy, ethnic minorities, Sri Lanka's Eastern province.

1 INTRODUCTION

Like many plural states, Sri Lanka has also been severely suffering due to claims and mobilization of ethnic minorities towards more autonomy and self-rule in their traditionally inhabited areas. Sri Lanka's Eastern province has been a contested region for ethnic and power politics, which brought the region to be important and politically influential in the post-independent era of regional development, administration, and governance. The settlement pattern of the ethnic groups in the region has induced the people of the region as well as the central governments to dominate the regional politics. Throughout history, Eastern province has been a Tamil-speaker predominant one with 'ethnic Tamils' formed the majority. Therefore, Tamils argue that the Eastern province is part of their traditional homeland with the Northern province. As a result, Tamil political leaders are claiming that Tamils should be given self-rule or more autonomy to be politically independent in order to control their inhabited areas. However, these claims and arguments have received little support from the country's ethnic majority, the Sinhalese, who form about 75 percent of the country's population and predominantly living in the country other than the Northern and the Eastern regions. However, when political power was transformed to Sinhalese from the British colonial, their immediate focus was on the Eastern province. As to sabotaging the minority claims for autonomy and power domination in the regional politics, Sinhalese-dominated successive governments made number of initiatives and implemented a number of policies and projects in the region, so as to ensure their dominance in the administrative and political affairs. Irrigation-based land settlement projects were the major target to make affective change in the region's ethnic composition and to control lands in the province.

Similarly, the Eastern province is one of the regions that continue to be under the control of Sinhalese bureaucrats and the dominance of their language, the Sinhala. This imposed a number of challenges for Tamil-speakers, the predominant linguistic communities living in the region. Even at the political level, the region has continued to be under the control of Sinhalese Governors, appointed by the country's President, and the major portfolios of the provincial government have also been controlled by the Sinhalese provincial councilors in the post-civil war era. All these socio-development and political contexts urge an academic investigation into why Eastern province has been important for ethnic majority and Sinhalese rulers and how it has undermined the political autonomy of minorities in the region. The existing literatures show a clear gap in answering the above research problem; therefore, this study attempts to fill this gap. The major objective of this study is to examine the nature of majoritarian dominance in politics, development, and administration in the Eastern province. The other objective is to examine the drive and challenges for political autonomy of minorities in the region and how their autonomy thirsts and demands were viewed and accommodated by the ethnic majority and their politics.

2. METHODOLOGY

This study is qualitative in nature and has used mostly secondary data collected from different sources such as literary books, book chapters, academic journals, newspaper articles, government departmental reports, and websites. These sources have recorded and reviewed many discourses and changing dynamics of ethnic and power politics for regional autonomy in the Eastern province and their recent developments. However, this study has taken a few thematic areas to test the ethnic and power politics for regional autonomy in the Eastern province. They are: (a) politics of development and the land-based rights of minorities, (b) politics of language and the denial of linguistic rights, and (c) the politics of representation and provincial autonomy in provincial governance. Also, this study has specially focused on the position of Muslims in regional autonomy discourse in the Eastern province, where they form a decisive majority in provincial population. The concerns and grievances of Muslims in the ethnic politics, and their autonomy proposals have influenced in the politics for regional autonomy of Tamils and ethnic dominance system of Sinhalese in the region. Therefore, Muslims and their demands have become the center of any kind of autonomy discourse in post-independence Sri Lanka. This context induces us to place a special focus on the Muslim part.

This paper is divided into eight major sections. After a brief introduction and methodology parts, the next section reviews the historical background of the Eastern province, its demography and political-administrative profiles. The next part examines the impact of politics of development and land settlement projects on the autonomy rights and concerns of minorities in the Eastern region, followed by a section examining the linguistic politics as a way to deny the linguistic rights of minorities in administration and as a means to dominate the provincial public administration. In the last part, before the discussion and conclusion sections, the representative politics and autonomy in the provincial governance are extensively reviewed through examining the provincial council system as a mean to accommodate political autonomy of minorities in the region. The discussion part views the rationales behind the minorities' autonomy concerns and claims and the reactions of the ethnic majority to those claims. The conclusion section summarizes the major findings of the study and proposes alternatives to accommodate the autonomy concerns of ethnic minorities in regional politics and governance.

3. EASTERN PROVINCE: DEMOGRAPHIC, ADMINISTRATIVE, AND POLITICAL PROFILES

The Eastern province covers an area of about 10,000 sq.km, which makes it the fourth biggest province in the country. According to the census of 2012, the Eastern province is a home for a population of 1,555,510, which comprises the country's three major ethnic groups in a competing manner. Accordingly, the Tamils are the majority ethnic group in the region forming 39.5 percent in the provincial population. The Muslims (Moors) form the second majority with 37 percent in provincial population, while Sinhalese forms the second minority with 23 percent in provincial population (See: DCS 2014 & Table-1). The settlement pattern of ethnic groups is also important in the context of ethnic competition and power politics in the Eastern province. The province is divided into three administrative districts in which the Tamils form the first majority in Batticaloa and the second majority in the Trincomalee district. The Muslims form the first majority in Amparai and Trincomalee districts and the second majority in the Batticaloa district. The Sinhalese forms the second majority in Amparai district and the second minority in Batticaloa and Trincomalee districts. However, this ethnic composition is artificially formed through a number of development-cum-settlement projects as extensively viewed in section four of this paper.

The Eastern province is one of the nine provinces, the first level administrative divisions in Sri Lanka. When the British gained control of the entire island of Ceylon in 1815, they divided the island into three ethnic-based administrative regions: one for low country Sinhalese, one for the Kandyan Sinhalese, and one for the Tamils, where the eastern province was part of the Tamil unit since it had predominantly Tamil-speakers (Tamils and Muslims). With the recommendation of Colebrooke-Cameron Commission in 1833, the ethnic-based administrative units were unified into a single central administration in which five provinces were created including the Eastern province in which Governors functioned as administrative heads. Later, these provinces further divided into nine (Ranasinge 2014; Yusoff et al. 2015a). For the administrative easiness, each province is now sub-divided into administrative districts and administered by the Government Agents (GA, also called as District Secretary). Both Governors and the Government Agent are directly appointed by the Head of the State. The Eastern province is divided into three administrative districts, namely Amparai, Batticaloa, and Trincomalee each are sub-divided into 43 Divisional Secretariat (DS) divisions. The province is politically divided into 45 Local Government units (3 Municipal Councils, 5 Urban Councils, and 37 Pradesiya Sabhas), three Electoral Districts and 10 Constituencies, which elect 16 members to the central Parliament, and 37 members to the Provincial Council.

The provinces gained political importance when United National Party (UNP) government introduced Provincial Council system based on the Thirteenth Amendment to the constitution made in 1987, as a mechanism to accommodate minorities claims for self-rule or autonomy. However, in this system, the Eastern province was merged with the Northern province on a temporary basis as to fulfil the autonomy demands of Tamils without the concern from the Eastern provincial population. This reduced the population strengthen of ethnic minorities in the region particularly of Muslims who formed 33 percent earlier and became 17 percent later. This also induced them to advocate for self-rule and a separate autonomous political unit for them in the region. However, the merger of these provinces continued till 2006 when the Supreme Court found the merger illegal and demerged the two provinces. The de-merger had a strategic importance for the Muslim community in the Eastern province, since they obtained the capability of living without the domination of any ethnic group and to ensure the attainment of their regional autonomy demand. However, the emerging ethnic context in the regional politics and the post-civil war political development little supported the Muslims [even the

Tamils] to experience self-rule or autonomy in the region. As history recorded, the province continue to be controlled by the central government authorities, ethnic majorities—the Sinhalese, and their language—Sinhala in the entire post-independent era, as extensively discussed in the following sections.

4. POLITICS OF DEVELOPMENT, LAND SETTLEMENT, AND THE QUESTION OF MINORITY RIGHTS FOR AUTONOMY

The land settlement projects implemented by the successive central government expecting to enhance regional development have also highly influenced in the demographic change, territorial demarcations, and ultimately territorial autonomy in the Eastern province. Historically, the most territories of the Eastern province were under the control of Sinhalese kingdoms and the region was rarely under the control of the North nor was it part of the traditional home rule of Tamils. However, even before independence, the Tamil politicians were claiming or advocating for a separate state or a federation covering the territories of the entire Northern and the Eastern provinces. This claim or advocacy is based on the argument that these regions are the traditional homeland of Tamils where Tamils experience a kind of self-rule. The formation of Federal Party (FP) under the leadership of SJV.Chelvenagayam was also partly based on the above argument and the party has continued to keep this as one of its major demands in its ethnic politics. This is a highly challenging concept and demand for the country's ethnic majority, the Sinhalese, as they have been advocating that Sri Lanka is a Sinhalese-Buddhist nation. Therefore, the Eastern province is the major target of Sinhalese rulers when they receive power from the British colonists. At the time of independence, the Eastern province was entirely a predominant Tamil-speaker region, but most of their settlements were in the coastal areas or belt. Targeting the inland areas, the successive governments initiated many irrigation-cum land settlement projects, and expecting to settle more Sinhalese and to challenge the ethnic dominance of Tamil-speakers in the region.

The successive governments policies with respect to population settlement and regional development in Eastern province have been characterized first by a regime of ethnic transmigration of Sinhalese populations, and second, by an effort to segregate all three ethnic groups into segregated zones of ethnic concentration (Routray and Singh 2007). In the immediate post-colonial period, the Sri Lankan governments engaged in a number of major irrigation and land settlement projects which provided preferential water access to upland Sinhalese populations and served as a platform for programs encouraging the systematic migration of Sinhalese populations into cleared jungle and populated Tamil-or Muslim-majority areas (Peebles 1990). Thereafter, the upland areas of Eastern province have always had a Sinhalese majority population. These Sinhalese settlements induced a rapid decline in the minority population in the region and also questioned the Tamil claim of continued or merged North-Eastern region as the autonomous or federal unit for them.

Starting from the Kantale irrigation-based settlement scheme in 1948 in the Trincomalee district, the land settlement project continued to other parts of the region; Gal Oya settlement project started in 1949 in the Southern part of the Batticaloa district (presently the Amparai district) and Alle and Morawewa in the Trincomalee district and Mahaweli-E scheme in the border of Batticaloa district from 1950 up to 1980s (See: Hasbullah et al. 205; Fonseka and Raheem 2010; Yusoff et al. 2015b). Under the auspices of the above various irrigation-based land settlement and development schemes, Sinhalese peasants were encouraged from the 1950s through the 1980s to move into many parts of the Eastern province by providing them with irrigable agricultural lands and basic amenities. According to the ICG (2008), by the late 1960s, the government had alienated more than 300,000 acres of land to 67,000 allottees in these major colonization schemes. The settlement of so many Sinhalese in these districts which were, at independence, almost entirely Tamil-speaking, was politically explosive and emerged as one of the major grievances expressed by the Tamil and Muslim public, their political leaders, and the Tamil militant groups fought for the liberation of Tamils in North-Eastern region. This process of state-aided colonization was seen not only as a threat to the political and autonomy status of Tamils [and Muslims] but also a threat to the existence of Tamils community with its linguistic and cultural identity (Reddy 2002).

These Sinhalese settlers were further empowered with the establishment of local government and administrative bodies, and electoral constituencies. Borders of these units were also redrawn, favoring them. The ultimate result of these projects was the progressive increase of Sinhalese and the decline of Tamil-speakers in the regional population. The review of the census reports reveals that the Sinhalese population of 4.23 percent in the Eastern province in 1921 has increased to 24.99 percent in 1981. On the other hand, the percentage of Tamils and Muslims has gone down progressively, as summarized in Table-1. Table-2 and Table-3 clearly summarizes the population changes in terms of ethnic groups in the districts of Amparai and the Trincomalee, respectively.

Table-1 Population of Eastern Province by Ethnic Groups (1921-2012)

Census Year	Tamils (a)		Muslims (b)		Sinhalese		Others		Total
	No	%	No	%	No	%	No	%	
1921	103,245	53.54	75,992	39.41	8,744	4.53	4,840	2.51	192,821
1946	136,059	48.75	109,024	39.06	23,456	8.40	10,573	3.79	279,112
1953	167,898	47.37	135,322	38.18	46,470	13.11	4,720	1.33	354,410
1963	246,059	45.03	184,434	33.75	108,636	19.88	7,345	1.34	546,474
1971	315,566	43.98	247,178	34.45	148,572	20.70	6,255	0.87	717,571
1981	410,156	42.06	315,436	32.34	243,701	24.99	5,988	0.61	975,251
2012	614,184	39.48	574,898	36.96	360,738	23.19	5,690	0.37	1,555,510

(a) Sri Lankan Tamils and Indian Tamils (b) Sri Lankan Moors and Malays

Source: DCS 2007 & 2014.

One of the districts that was seriously affected by land-cum-irrigation-based settlement schemes in the Eastern province is the Amparai district. Before the district was formed in 1961, the Muslims and Tamils had been the predominant population in this area. However, due to the implementation of the Gal Oya project, thousands of acres of lands owned by Muslims and by Tamils were seized by government authorities in order to settle more Sinhalese. As a result, the Sinhalese population progressively increased in the district, reducing the strength of the Tamils and the Muslims (See: Table-2). According to Hasbullah et al. (2005), under the colonization project, beneficiaries were selected overwhelmingly from the Sinhalese rather than the Muslims and Tamils who formed a majority in the region at that time. Table-4 summarizes how the land was shared or allocated among the divisional administrative divisions predominated by ethnic groups in Amparai district.

Table-2 Changing Ethnic Balance in the District Population, Amparai (1963-2012)

Census Year	SL Muslims		Sinhalese		SL Tamils		Others		Total
	No	%	No	%	No	%	No	%	
1963	97,621	46.11	61,996	29.28	49,185	23.23	2,930	1.38	211,732
1971	126,365	46.35	82,280	30.18	60,519	22.20	3,441	1.26	272,605
1981	161,568	41.45	146,943	37.78	77,826	20.01	2,633	0.67	388,970
2007	268,630	43.99	228,938	37.49	111,948	18.33	1,203	0.20	610,719
2012	281,702	43.40	252,458	38.90	112,457	17.30	2,785	0.40	649,402

Source: DCS 2007 & 2014.

Table-3 Population of Trincomalee District by Ethnic Groups (1921-2012)

Census Year	Tamils (a)		Muslims (b)		Sinhalese		Others		Total
	No	%	No	%	No	%	No	%	
1921	18,580	54.47	12,846	37.66	1,501	4.40	1,185	3.47	34,112
1946	33,795	44.51	23,219	30.58	11,606	15.29	7,306	9.62	75,926
1953	37,517	44.71	28,616	34.10	15,296	18.28	2,488	2.96	83,917
1963	54,452	39.30	40,775	29.43	39,925	28.82	3,401	2.45	138,553
1971	71,749	38.11	59,924	31.83	54,744	29.08	1,828	0.97	188,245
1981	93,132	36.39	75,039	29.32	85,503	33.41	2,274	0.89	255,948
2012	117,873	32.01	159,127	41.92	101,483	26.74	1,058	0.28	379,541

(a) Sri Lanka Tamils and Indian Tamils (b) Sri Lankan Moors and Malays

Source: DCS 2007 & 2014

Table-4 Land Allocation Based on the DS Divisions Dominated by the Ethnic Group in Amparai District (2014)

DS Divisions Dominated by Ethnic Groups	Total Population (2014)		Allocated Land for DS Divisions Predominated by Ethnic Groups	
	Amount	Percentage	Amount (KM ²)	Percentage
Muslims	281,702	43.6	759.4	17.2
Sinhalese	252,458	38.7	3248.5	73.6
Tamils	112,457	17.4	407.1	9.2
Others	2785	0.3	-	-
Total	649,402	100	4415	100

Source: Prepared by the researchers based on the data collected from District Secretariat, Amparai 2013 & DCS 2014.

Even in the post-civil war context, issues over land remain in the Eastern province. According to the Provincial Council Act, land is listed as one of the subjects under the provincial council list, and is under the control of the provincial administration. However, in many instances, according to MRGI (2011), the Chief Minister of the Eastern province has tried to intervene on issues where provincial land has been claimed by the State and/or where complaints have been made to him of individual lands taken over by various authorities, where he had failed to have his views considered by the central government authorities. Specific ways in which the central government authorities appears to be involved in land issues in the East were: taking over land for security purposes or under various ministries; and supporting or assisting and, and sponsoring families from the Sinhalese community of the other districts or provinces to settle in the province.

In fact, as Yusoff et al. (2015b) argues, the land policies and land settlement projects have further induced the emergence of territorial-based political claims (territorial autonomy, self-rule and separate state) in Sri Lankan ethnic conflict. Every land settlement in the dry zone of the Eastern province has been a major source of grievance among Tamil-speaking minorities, contributing to the demands of territorial autonomy among the Muslims, and a separate state among the Tamils. A systemic review of the minority demands in the discourse of ethnic conflict reveals that stopping land seizures and land settlements in the Eastern region, and granting more autonomy in terms of land affairs to the Northern and the Eastern provincial councils were the two major claims of ethnic minorities (See: Hasbullah et al. 2005; Uyangoda, 2009; Fonseka & Raheem 2010; Sarjoon 2011; Fonseka & Jegatheeswaran 2013). On the other hand, state-owned and state-controlled colonization programs, in particular, have been heavily criticized and often targeted by the Tamil fighters, accusing these programs as an effort to expand the Sinhala frontier into the so called 'Tamil homeland.' We discuss this matter extensively in the discussion section.

5. POLITICS OF OFFICIAL LANGUAGE, MINORITIES, AND LINGUISTIC DOMINANCE IN PROVINCIAL ADMINISTRATION

Language is one of the leading causes of ethnic conflict in Sri Lanka. The language problem has its roots in the 1956 Official Language Act, which substituted Sinhala alone for English as the official language. Although the 1957 Official Language Special Provision Act allowed public administration to be conducted in Tamil in the Northern and the Eastern provinces, Tamil legally became an official language with the adaptation of 13th and 16th amendments to the present (1978) constitution, in 1987 and 1988, respectively (See: Parliament Secretariat 2015). This status for Tamil is further ensured with the enactment of the Official Languages Commission Act (No.18) of 1991, as well as government directives through the number of gazette notifications and public administration circulars (See: FCE 2006; Yusoff et al. 2015a). However, the functioning of the public administration in Tamil in the Eastern province has always been a contested matter with regard to ethnic politics and provincial autonomy.

It is worth noting that about four-fifths of the regional population in the Eastern province are Tamil-speakers. However, Tamil-speaking public and public officers continue to receive letters, circulars, and letters from the ministries and the departments in Colombo in Sinhala language. In some districts, particularly in Amparai and Trincomalee in Eastern province, the District Secretaries (or Government Agents), who represent the central government in the administrative system and wield considerable authority, are always of Sinhalese with no or poor knowledge of Tamil. This has helped them to control the administrative affairs of Tamil-speaker predominant region in their hands. This clearly shows the violation of constitutional provisions in terms of minority rights accommodation—another means to undermine the linguistic identity and rights of minorities as part of undermining their self-rule or autonomy claims.

The progress increase of Sinhalese population in the region has led to increase their domination over the local administration in the region. The two Tamil-speakers' predominant districts, namely, Amparai and Trincomalee have continued to be administered by the Sinhalese District Secretary. Similarly, the head of the provincial administration, the Governor, was also appointed from the Sinhalese. It is found that six Governors were appointed for the merged North-Eastern province from 1988 to the end of 2006, and two Governors were appointed for the Eastern provincial council from 2007 to up to now, but none of them were appointed from Tamil-speaking communities while there were constant demands and expectations among them. The appointment of District Secretary and other administrative officers from the same ethnic groups (Sinhalese) over representing their ethnic ratio in the district population easily allowed them to violate the linguistic rights of Tamil-speakers in the region. Tamil-speaking minorities find it not only the violation of constitutionally guaranteed linguistic rights but also the rights to administer their affairs in their own or familiar language.

6. POLITICS OF REGIONAL [PROVINCIAL] COUNCILS, MINORITIES, AND THEIR AUTONOMY CONCERNS IN PROVINCIAL GOVERNANCE

The idea of granting autonomy or establishing autonomous political entity to regionally concentrated ethnic groups has evolved in Sri Lanka even before independence. In 1926, SWRD. Bandaranaike, who returned from British education proposed federalism as the best model to accommodate the autonomy claims of ethnic groups in Sri Lanka. After he became the country's Prime Minister, Bandaranaike offered the Tamil leaders the important concession of setting up regional authorities called 'regional councils' with powers on regional development, education, land, healthcare, water schemes, roads and colonization, through the popularly known Banda-Chelva Agreement. This agreement also agreed to adopt provision for establishing one 'Regional Council' for the Northern province, and two or more Councils for the Eastern province. The FP, while repeating its demands for federal autonomy accepted this agreement as 'an interim adjustment' (Nawarathna-Bandara (2000). However, this first initiative for granting regional autonomy for ethnic communities particularly in the Eastern province became unsuccessful due to the vehement opposition emanating from the imperative Sinhalese-Buddhist ethno-nationalism, which had dominated the Sri Lankan politics in 1950s. Although there were some initiatives on establishing territorial based autonomous councils as a political mechanism to resolve ethnic grievances of minorities, most of them have failed due to the oppositions emerged from the negative understanding of the concept of regional autonomy and because of the domination of majoritarian ethno-nationalism in national politics.

From the 1970s, the democratic political system and territorial integrity of the country came under threat. An insurrection in the Southern part of the country by the Sinhalese youth, known as Jantha Vimukthi Peramuna (JVP) and the youth movements in the North-Eastern regions called the Liberation Tigers of Tamil Eelam (LTTE) and others, influenced the state reform process significantly. During this period, there were some proposals for accommodating self-determination claims of Tamil-speaking people based on federal structure within the united Sri Lanka. However, they did not receive the focus of rulers. Therefore, from the early part of the 1980s, Sri Lanka experienced a gradual intensifying of civil war, and Tamil-speakers demanding more autonomy and self-rule, even separation in their traditional homeland. The LTTE and the other movements became increasingly violent due to lack of state mechanism to accommodate their autonomy claims and interest in regional governance structure.

From 1985 onward, the government of Sri Lanka was seen toward a military solution to separatist and terrorist campaigns of the LTTE and other militant groups. This induced the Indian intervention in Sri Lankan ethnic conflict. Faced with the possibility of an active Indian intervention, Sri Lanka government commenced negotiation with the Indian counterpart. This led eventually to the signing of Indo-Sri Lanka Accord on 29th July 1987 (Lakshman 2017). Accordingly, Thirteenth Amendment to the constitution was adopted on 14th November 1987 and provincial councils were established for every province, as specified in the 8th schedule of the constitution. The provincial council was expected to function as a politically decentralized institution.

The Indo-Sri Lanka Accord insisted the merging of the Eastern province with the Northern province to make it into one provincial council as an interim arrangement to accommodate the political autonomy claims of Tamil-speakers. The accord included a provision for a referendum to be conducted within the Eastern province by the end of 1989 in order to decide whether or not the Eastern province should continue to remain merged with the North. The merged North-Eastern province was declared by the President in 1988. Like other provincial councils, election to the newly formed North-Eastern provincial council was held on 19th November 1988. The referendum in the Eastern province, however, was never conducted and the successive Sri Lankan Presidents issued proclamations annually, extending the life of the temperately merged entity (Lackshman 2017).

In fact, the introduction of provincial councils was meant to ameliorate the demands particularly of the Tamil community, who sought a separate State or tangible autonomy for the Northern and Eastern provinces in Sri Lanka. However, the provincial councils, which fell far short of federalism, nevertheless, introduced the devolution of power. However, when it comes to practice, particularly in the Northern and the Eastern regions, the central government authorities strategically put mechanisms to control or undermine the exercise of devolved powers by the provincial council or the council of ministers. It is worth noting that the Provincial Council Act devolved land and police powers to the provincial councils, but the central government authorities denied those powers to exercise by the North-Eastern provincial council, and council of ministers. This was the major reason for the Chief Minister of the merged North-Eastern province and the leaders of Eelam People Revolutionary Liberation Front (EPRLF), A.Waradaraja Perumal to oppose the provincial council system and to pass a resolution in the provincial council in favour of a separate state for Tamils. This was ultimately led to dissolve the North-Eastern provincial council in one year survival.

The merger of Northern and the Eastern provinces together was bitterly opposed and campaigned negatively by the Sinhalese-Buddhist nationalist forces and parties. Ultimately, a Supreme Court ruling in October 2006, made a response to a case filed by the JVP, which eventually produced the de-merger of the two provinces permanently founding it unconstitutional, illegal, and invalid (Asian Tribune 2006). The de-merger came eventually in January 2007 and provision was made to set up the Provincial Council each in the Northern and the Eastern provinces. The Tamils view this as a major challenge to achieve their self-rule or autonomy claims in the traditional homeland of the merged North-East.

After the de-merger, the Eastern province has been functioning with democratically elected political bodies. However, the minorities worry about the dominance and rigid control of central government authorities, Sinhala language, and administrative elites mostly Sinhalese in the administrative, development, and political affairs of the province. This, in turn, in many ways helped undermine the minority expectations for exercising self-rule and autonomy in the region.

Politics of Representation and Regional Autonomy of Tamils and Muslims in the East

Self-determination and self-government have been in the critical demand of minority ethnic groups for over half a century in Sri Lanka. During the ethnic conflict and civil war, there have been attempts by successive Sri Lankan governments to discuss some form of political autonomy for minorities, mainly for the Tamils. However, the status of the Eastern province, and locating it within the power-sharing debates have continued to be a contested matter in the process of state-building and territorial autonomy discourse in Sri Lanka. This issue has continued even after the de-merger of the North-Eastern provinces and its influence in its electoral politics. The electoral politics has made the Eastern province the stage for power competition between the major ethnic groups. The Muslim community has become the special target of two ethnic majorities, the Sinhalese and the Tamils, as the major supporters to achieve control of the Eastern provincial council and experience a kind of self-rule and autonomy in the region.

In the last two decades, following a change in the electoral system to a proportional representation system, the minority political parties have played an influential role in Sri Lankan politics. Sri Lanka Muslim Congress (SLMC), which is the largest Muslim political party, has been in the position to make and break governments. The SLMC has emerged out of the political marginalization and grievances of Muslims of the Eastern [and the Northern] provinces in the early 1980s. The ethnic politics and the vulnerable position of the Muslim community due to violent civil war made the SLMC the major political voice and a representative body for Muslims in the national parliament and provincial councils (Yusoff et al. 2017). Therefore, though the SLMC opposed the merging of the Eastern province with the North, it contested the first election for the merged North-Eastern provincial council held in 1988 and has become the main opposition party in the council. During this election, ethnic sentiments have been highly motivated. Therefore, there have only been ethnic competition among three major ethnic groups. This led the SLMC to secure the highest Muslims votes and representations in the election although the Muslims in the region had a habit of supporting and voting the two major pro-Sinhalese parties, the UNP and the SLFP.

With the opposition leadership, the SLMC voiced the grievances of the Muslim community and advocated for their rights and privileges in the North-Eastern provincial council. Although this council was dissolved in one year period by the President, this electoral victory driven the SLMC became influenced in national politics. In successive elections, with the increase in public support and representations, the SLMC became the major political force that could influence to determine the destiny of national politics. This ultimately made the SLMC as the Queen-maker in 1994 and the successive general elections in the new millennium (Yusoff et al. 2017).

The more ethnic-based demands and their advocacy by the SLMC has brought more criticisms and oppositions to the SLMC in national politics. With the sudden demise of its founder, MHM.Ashraff, in September 2000, the SLMC became fragmented and more Muslims political parties mushroomed. When election was declared to the newly formed Eastern provincial council, it was winning the majority Muslim representations in the council, which has become the major target

of the SLMC. At that time, a tri-polar competition among Muslim political parties was existing. This has helped the-then President Rajapaksa and the UPFA leaders to convince the two major Muslim parties in his alliance while promising the CM post for Muslims. There were huge demands among the Muslim civil society urging all Muslim parties to unite and contest the election under a common symbol. The SLMC was not ready to conceal the tree symbol; therefore, unification failed and as usual it contested with the UNP, the main opposition party at that time. The SLMC leader, Rauff Hakeem, its chairman, Basheer Segu Davood, and its secretary general, Hasan Ali, resigned from their seats in the central parliament and contested the provincial council election as leading candidates under the UNP ticket in three districts of the Eastern province (Yusoff et al. 2014). Although the elections produced results favouring Muslims, due to disagreement and fragmentations within the Muslim parties, they could not achieve the CM post nor receive any influential provincial ministries.

On the other hand, the major Tamil political party, the Tamil National Alliance (TNA), had boycotted the 2008 provincial council election arguing that the de-merger of the North-Eastern provinces had undermined the self-determination rights of the Tamil people. This has helped the newly-formed Tamil Makkal Vidutalaip Puligal (TMVP) headed by Pillaiyan, alias Sivanesathurai Chandrakanthan to make an alliance with the ruling UPFA government. The UPFA had agreement with the TMVP to offer the CM post if they could receive more representatives in the council. Even though eight Muslims and six Tamils were elected from the UPFA list in the election indicating that the Muslims were the majority elected under the UPFA list, the UPFA leader, President Rajapaksa, after a long political turmoil, appointed Pillaiyan as the CM of the Eastern province (See: Yusoff et al. 2014). However, UPFA leaders strategically controlled the Eastern provincial council by appointing Sinhalese to the most important ministries such as land and education, expecting to expand their dominance in the province. This has helped them implement a number of policies and projects in the province favouring the Sinhalese and to extend their dominance in the post-war development and governance process. During this period of provincial council, both the Muslim and Tamil councillors expressed their disappointment in regard to their ministerial positions and expectations in provincial governance. Hisbullah, the then provincial minister of health, openly revealed the inefficiency of his ministerial position at one point. Although the UPFA-led government made number of initiatives for post-civil war development in the region, the control of the entire development and provincial administration was at the hand of central ministers and the provincial Governor, who was appointed by the President.

With the failure to control provincial administration in 2008, there have been continuous discourses among the Eastern Muslims on controlling the provincial council in the forthcoming election. Although election to the Eastern provincial council was due in 2013 only, President Rajapaksa dissolved it early and fixed the election on 8th September 2012. Both major political parties started to make an alliance with the influential parties in the East. An important change of the political context in the Eastern province was the TNA's announcement to contest the provincial council election. The TNA contested the election under The Ilankai Tamil Arasu Kadchi (ITAK).

Since Muslims formed a decisive majority in the provincial population (it was projected as 40 percent in 2007, but actually was 37 percent, according to the 2012 census (DCS, 2014)), both the UPFA and the TNA invited the SLMC for electoral coalition, while there were more demands from the Muslim community to contest the SLMC alone or with other Muslim parties. However, the SLMC was not in favour of conducting the election under a common symbol for the sake of Muslims but only favoured being with the UPFA alliance. When the coalition negotiation with the UPFA failed; mainly due disagreement on the matter of establishing a Muslim predominant administrative district in the coastal belt of Amparai district before the election, the SLMC decided to contest the election alone under its own symbol believing only in its traditional Muslim loyalties, while there were demands for Muslim coalition (Yusoff et al. 2014).

The 2012 provincial council election produced the SLMC again the 'King-maker' in forming the provincial government. While no party received any majority to form the government, the seven seats gained by the SLMC became a decisive number to form the government. The TNA openly announced that they are willing to concede the CM post to the Muslims if the SLMC agreed to form a provincial government with TNA (Colombo Telegraph 2012). However, believing that the consensus reached the UPFA, so as to fulfil the rightful rights of Muslims in the provincial administration, which would enable them to gain autonomy to some extent, the SLMC leaders supported the UPFA to form a provincial government. In fact, the UPFA leaders convinced the SLMC to make an alliance with them in the provincial government. However, not the SLMC nor any Muslim political party have been able to gain any important ministry in the provincial government, although two Chief Ministers were appointed from Muslim members, they acted as rappers, for which the central government authorities had major control over. The Sinhalese ministers with the provincial Governor extended their ultimate dominance in the affairs of the provincial administration, governance and development.

The defeat of Rajapaksa regime in early 2015 tremendously influenced Sri Lanka's national politics. Ethnic minorities played vital roles in defeating President Rajapaksa and his government in the elections held in 2015. This increased the importance of the minority political parties in Sri Lanka's national and regional politics as well. The TNA became the major opposition party in parliament after the 2015 general election. This regime change has also influenced the provincial politics and induced the Sinhalese rulers to initiate a coalition with the minorities, particularly with the Tamils, to survive and control the Eastern provincial council and governance. This time, the UPFA formed a coalition government with the TNA while merely accommodating the Muslims' interests to the so-called positions.

While keeping the SLMC and other Muslim parties as coalition partners in the Eastern provincial council, the UPFA-led central government was able to convince these parties to act in favour of their decisions or to endorse the provincial approval for many legal, political, and policy decisions taken to favouring the regime. Whenever the support of these parties were extended, and decisions were endorsed, these minority parties extended their supports believing on the

promise that they could enjoy a greater level of autonomy and control in the provincial governance and administration. However, up till now, the ethnic minorities' expectations in many matters related to ensuring their interests for autonomy has continued to be side-tracked or unsuccessful. The appointment of the provincial Governor from the Tamil-speaking communities, proper implementation of Tamil as official language, appointment of Tamil-speaking officers as District Secretaries in Amparai and Trincomalee districts, granting police and land power to the provincial council, establishing a Tamil-speakers' predominate administrative district in the coastal belt of the Amparai district for the administrative easiness of Tamil-speakers were some the continuous demands put forward by the Tamils and Muslims in the province, so as to ensure a kind of administrative and political autonomy in their part in the province. However, none of these demands were positively viewed and accommodated by the central government authorities, and therefore are always criticized and opposed on communal ground.

However, in terms of electoral politics in the Eastern province, with the results of the two elections not producing any single party absolute majority to form the provincial government, the Eastern provincial council has become a testing ground for political competency and maturity of any national and minority political party in their effort to establish a provincial government and administration with an absolute majority and to run them without any disruption. The election scenarios have also emphasized the importance of ethnic cohesive politics in the region rather than advocating ethnic group dominance or autonomy in the future.

7. DISCUSSION

The regional politics and governance in Eastern Sri Lanka has continued to be a contested matter due to the competing ethnic composition in the region and the power dominance of the ethnic majority over regional development, administration, and governance. Although the Tamil-speaking minorities, the Tamil and the Muslims, form the majority in the province, the provincial administration and governance continue to be controlled by the Sinhalese and their interests. The continuous claims of ethnic minorities for political autonomy and self-rule in the regional governance and administration were mostly responded negatively. There are fears among the majority Sinhalese and their leaders that granting regional autonomy will be merely a springboard to secession. However, autonomy and decentralization are seen by experts and governments as favourable tools in accommodating minority concerns and grievances in regional governance.

Therefore, there is a need for constitutional reform to provide more political and administrative autonomy for minorities in the Eastern province by examining the limitations of the existing legislative framework and analysing the most recent proposals. Although the existing devolution arrangement under the Thirteenth Amendment of the present constitution provides some level of devolved powers to the provinces [regions], this amendment is limited both on paper and in practice. Therefore, the Thirteenth Amendment is far from sufficient in fulfilling the minorities' aspirations to self-rule in the North and the East and there is a need to think and work beyond this limit so as to share more powers to the regions and to grant more autonomy to the regionally-concentrated ethnic groups in deciding their own regional affairs.

Tamil vs Muslim interests for regional autonomy in the East

There are different motives and aspirations among ethnic groups in terms of claims for regional autonomy and self-rule in the Eastern province. Although the Tamils and Muslims are living together, sharing a number of commonalities in the region, and having been collectively advocating for their rights and privileges from independence, including the equal status to Tamil language and for greater regional autonomy, where the two communities have a different perspective of autonomy for any minority in the region. Even before the independence, Tamils have been arguing that the Eastern province is part of their traditional homeland of merged North-East. In the 1977 election manifesto, the Tamil United Liberation Front declared an area slightly beyond the present borders of the combined Northern and Eastern provinces to be 'the exclusive homeland of the Tamils.' By the 1980s, the East was at the heart of the militant Tamil nationalist struggle to create a separate state of Tamil Eelam.

On the other hand, when the civil war became severe from 1980s onward, it negatively impacted the Muslim community and further increased their grievances as a result of the negligence of Tamil leaders. The government proposal to merge the Eastern province with the North also contributed to an increase in a sense of marginalization in the political settlement process among the Muslims in the East. These factors induced them to conceptualize and call for a Muslim predominant political autonomous unit for their security and ethnic identity. From 1980s onward, Muslim political forces, particularly the Sri Lanka Muslim Congress (SLMC), the party emerged as a response to severe ethnic conflict and ethnic politics, have been proposing a Muslim majority political autonomous unit and articulating it as a political mechanism on the Muslim part in the ethnic conflict resolution process (Yusoff et al. 2014; Sarjoon 2011; McGilvray and Raheem 2007). However, this was viewed by the Tamil nationalists and militant groups as opposed to their long-term demand of self-rule in their traditional homeland covering the entire and contiguous North-Eastern region. Therefore, Muslim autonomy demand was always criticized and challenged by the Tamil nationalists. However, both ethnic groups and their leaders continued to advocate their autonomy claims in the North-Eastern region in which the status of the Eastern region has always been a hot topic of debate during their advocacy.

It is worth noting that as noted earlier, the popular Sinhala and Tamil leaders SWRD.Bandaranaike and SJV.Chelvenayagam, in their agreement in 1957, have made an arrangement to form two or more autonomous units in the Eastern province to ensure the autonomy and self-rule of major ethnic groups living in the region (See: Ghosh 2003). As Jeyaraj (2016) argues, Chelvanayagam's approach is a recognition of regional and sub-national differences within the

North-Eastern region. This further indicates the importance of ensuring shared rule or self-rule for ethnic groups in the region.

When the demerger of the two provinces became successful in 2006, both Tamils and Muslims eagerly engaged in regional politics, expecting to form a provincial government that would give them autonomy in due time. Therefore, when the election was called for the Eastern provincial council, the SLMC, since it has been advocating for Muslim autonomous unit in the region, actively participated in the election. However, the more fragmentations and opportunisms in Muslim politics undermined the ability of Muslim political forces to gain influence in elections and control the provincial governance, as viewed earlier in this paper. However, it is worth noting that although the Tamil nationalist forces and liberal groups undermined the Muslim autonomy in the East, the Muslims leaders have been thorough in not opposing the demands and aspirations of Tamils on the matter of political autonomy. Only in the recent year, the political leaderships of the Tamil community have accepted the self-rule concept of Muslims in the East and expressed their willingness to establish an autonomous unit for Muslims when it comes to resolving the ethnic conflict by merging the Eastern province with the North. Similarly, many Muslims seem to have a realistic perspective that establishing an autonomous unit for Muslims by territorial merging of some kinds in the North-Eastern region must be an inevitable part of a political settlement to address Tamil grievances (McGilvray and Raheem 2007). However, there is a need for more mutual dialogs in this regard between the political and community leaders of both ethnic groups.

The Sinhalese criticisms and opposition to merge the Eastern region with the North, or to grant more autonomy to the Eastern provincial council has also arisen based on the arguments that the East was not always been part of, or under the control of the North. Accordingly, the major territories of the Eastern province are under the control of Sinhalese kingdoms of the so-called Dry Zones centred in Anuradhapura and later in Polonnaruwa. Today's Batticaloa and Amparai districts were under the control of the South-Eastern Sinhalese Ruhuna kingdom 300-200 BCE. However, the Sinhalese and Buddhist presence in the East had all but disappeared by the thirteenth century, except for a small number of widely scattered Sinhala settlements in the forested areas at the foothills of central hill country due to South Indian invasion and the expansion of Jaffna kingdom in the region. As McGilvray (2008) argues, the collapse of the Sinhala dry zone kingdoms in the thirteenth century opened the way for the slow 'Tamilisation' of the Eastern province.

Based on the above argument, in the post-independence era, the successive central governments attempted to equate the ethnic compositions in the districts of the Eastern province by implementing number of state-aided development-cum-land settlement projects. Sinhalese found that granting land to the Sinhalese is a positive process aimed at distributing land to the landless. There is also a perception among the Sinhalese that they are not stealing land from minorities but are merely re-claiming land that they abandoned centuries ago. They further claim that the process of land settlements in the North-Eastern region is to establish inter-racial equity (Marga 1985). Therefore, the settlement of more Sinhalese through state-sponsored land settlement programs, and the control of central government authorities in opposition to autonomy for Tamils and Muslims in the region were justified in this line. In fact, as Yusoff et al. (2015b) argues, the Tamil separate state (homeland) demand and the Muslim demand for an autonomous political unit, to a considerable extent, have challenged the ability of the central government authorities to control land in the Eastern province.

Similarly, the pro-Sinhalese governments have also used land settlement schemes to undermine the Tamils' claims of merged North-East as their traditional homeland. The settlements of more Sinhalese on the borders of districts in the Eastern provinces were motivated towards this line. There was no initial plan to turn the Mahaveli river to the North-Eastern region, but later, the UNP government purposively turned it in two areas to settle more Sinhalese as buffer zones in diving the concept of traditional homelands for Tamils. Settling the Sinhalese at the border of the Eastern province with the North (at Weli Oya), and between the Trincomalee and Batticaloa boarder (at Weliganda area) was designed in this regard. The Tamil nationalists claim that this is an attempt at bifurcating the North from the East with a string of Sinhalese settlements and to undermine their autonomy demands in the East.

On the other hand, there are other motives for government authorities and majority Sinhalese to keep the control of the Eastern province in their hand. Eastern province is enriched with natural resources valuable to the country's national economic benefits. Forests, agricultural lands, wetlands, lagoons, sea ports, and attractive beaches are prominent among these resources. Above all, there has been a well-established ancient irrigation system in the province, which supports the full potential of agricultural production. The Trincomalee district has a natural harbour, which played a strategic role during the world wars, and the civil war period in Sri Lanka. The state-aided settlements of the Sinhalese are mainly located in these resource basins and other strategic locations in the province. These settlers have been controlling the economic and administrative affairs of districts and province to a considerable extent. There is a fear among Sinhalese and rulers that granting more autonomy in the hand of ethnic minorities, the Tamils and the Muslims, may directly and indirectly challenge the interests and dominance of Sinhalese. There is no assurance that the regional autonomy to the Tamils and Muslims will ensure the rights and interests of Sinhalese living as pockets in the regions. This can be one of the major reasons that opposing or unfulfilling the Tamil-speakers' demands to appoint Provincial Governor, and District Secretaries for Amparai and Trincomalee from Tamil-speaking communities. Because these officers are the major pillars and guardians of fulfilling the central government's expectations in the districts of these region.

Similarly, Sinhalese leaders feel that granting autonomy for minorities in the North-East would easily promote regionalism and secession that will ultimately challenge the territorial integrity of the country. This feeling ultimately helps mobilise the Sinhalese masses to challenge any minority demand for autonomy as a threat to territorial integrity through which minorities will attempt to establish new states easily. These feelings and fears progressively motivated

the central government authorities and the Sinhalese easily undermine any claim coming from ethnic minorities in the region for regional autonomy and self-rule.

8. CONCLUSIONS

Self-determination and self-government expecting to exercise more autonomy in political and administrative affairs have been the critical demands of minority groups for over half a century in Sri Lanka. The Eastern province has been a contested region in terms of ethnic and minority politics and politics for autonomy compared to other regions in Sri Lanka. The ethnic composition in the region has been highly influential in ethnic relations, ethnic conflict, ethnic politics, development, and governance in the region. Ethnic minorities, though they possess the majority in the provincial population, could not enjoy autonomy and devolved power in the affairs of regional governance and administration. They have always been controlled by the central government authorities or regimes, which have used them as periodic tools for fulfilling their political interests and agendas in the province. Therefore, from the beginning of independence, the pro-Sinhalese political parties and regimes easily implemented a number of policies and projects to settle more Sinhalese in the region, targeting to undermine ethnic composition of minorities in the region, failing to implement the policy recognizing Tamil as the official language equal to Sinhala in public administration, but allowing the domination of Sinhalese and Sinhala language at an extreme level, refusing to grant constitutionally-guaranteed devolved power in the affairs of provincial police and land, and expanding the dominance of the central regime in the political and administrative apparatuses of the provincial government.

In fact, all of the above identified factors have motivated the intensified ethnic conflict and civil war in the region that has further challenged the influence, power exercise, and autonomy of minorities in the region in one hand, and induced the claims for autonomy, self-rule, and separation on the other hand. Since the civil war has ended, and all the minority political parties and civil forces have abandoned the separatist claims, ensuring regional autonomy for minorities has become important in the process of post-civil war transformation and the political settlement process. Autonomy and decentralization are seen as the best tools to accommodate minority concerns and claims for self- and shared-rule within the unitary system of government. There are a number of successful cases around the world in which minorities are given more autonomy to decide their political and administrative affairs while maintaining their ethnic and regional identities.

When the state faces autonomy demands from competing ethnic groups from a multi-ethnic region, granting more autonomy to the regional-based political council can accommodate the minorities' concerns within the united country, to a considerable extent. Therefore, in the post-civil war context, implementation of the regional autonomy policy is critically important to enhance the relationship of equality, unity, and mutual assistance among different ethnic groups, to uphold national integration, and to accelerate the development of places within the region and prosperity for all ethnic groups. However, in Sri Lanka, political autonomy, power-sharing, and decentralization still remain largely debated subjects. Initiatives for conceptual clarification and understanding among ethnic majority, national political leaders, and regional minorities together with mass education are highly needed in this regard.

REFERENCES

- Asian Tribune. 2006. Judgment on North East demerger. 17 October. Available Online: <http://www.asiantribune.com/index.php?q=node/2578> (Accessed on 30 June 2016).
- Colombo Telegraph. 2012. TNA stake the claim to form the eastern provincial administration together with the SLMC and UNP. Available Online: <https://www.colombotelegraph.com/index.php/tna-stake-the-claim-to-form-the-eastern-provincial-administration-together-with-the-slmc-and-unp/> (Accessed on 10 March 2016)
- DCS (Department of Census and Statistics). 2007. *Special enumeration-Eastern province 2007*. Colombo: DCS.
- DCS (Department of Census and Statistics). 2014. *Census of population and housing-2012 (New) - Final report*. Colombo: DCS. Available Online: <http://www.statistics.gov.lk/PopHouSat/CPH2012Visualization/htdocs/index.php?usecase=indicator&action=Map&indId=10> (Accessed on 20 December 2015).
- District Secretariat, Amparai. 2013. *Annual performance report and budget 2012*. Amparai: District Secretariat.
- FCE (Foundation for Co-Existence). 2006. *Language discrimination to language equality: report of an audit on the status of the implementation of the official language policy in Sri Lanka*. Colombo: FCE.
- Fonseka, B. & Jegatheeswara, D. 2013. *Politics, policies and land acquisition and related issues in the north and the east of Sri Lanka*. Colombo: Center for Policy Alternative.
- Fonseka, B. & Raheem, M. 2010. *Land in the eastern province: politics policy and the conflict*. Colombo: Center for Policy Alternative.
- Ghosh, P.S. 2003. *Ethnicity versus nationalism*. Colombo: Vijitha Publications.
- Hasbullah, S.H., Balasundarampillai, P & Tudor Silva, K. 2005. *Addressing root causes of the conflict: land problems in the north-east Sri Lanka*. Colombo: Foundation for Co-Existence.
- ICG. 2008. *Sri Lanka's eastern province: land, development, conflict*. London: International Crisis Group (ICG).
- Jeyaraj, D.B.S. 2016. Tamil leaders opposed when Sinhalese leaders proposed federalism. *Daily Mirror*. 08-01-2016. Available Online: <http://www.dailymirror.lk/article/tamil-leaders-opposed-when-sinhalese-leaders-proposed-federalism-102393.html> (Accessed on 25 February 2018).
- Lakshman, W.D. 2017. Developmental role and financing of sub-national units of government: the case of provincial councils in Sri Lanka. In Cooray, N.S & Abeyratne, S (eds.). *Decentralization and Development of Sri Lanka within unitary state*. pp.33-60. Singapore: Springer.
- Leelarathne, S. 2012. *Politicizing federalism: Sri Lankan case*. Switzerland: Institute of Federalism.
- Marga, 1985. *Inter-racial equity and national unity in Sri Lanka*. Colombo: Marga Institute.
- McGilvray, D.B. 2008. *Crucible of conflict: Tamil and Muslim society on the east coast of Sri Lanka*. Durham: Duke University Press.
- McGilvray, D.B & Raheem, M. 2007. *Muslim perspectives on the Sri Lankan conflict*. Washington: East-West Center.
- Mohideen, M.I.M. 2001. *Ethnic conflict and devolution of power in Sri Lanka: Muslim demand separate power-sharing unit in the north-*

eastern province. Colombo: Muslim National People's Alliance.

MRGI. 2011. No war, no peace: the denial of minority rights and justice in Sri Lanka. London: MRGI (Minority Rights Group International)

Nawarathne-Bandara, A.M. 2000. Ethnic relations and state crafting in post-independence Sri Lanka. In W.D.Lakshman & C.A.Tisdell. *Sri Lanka's development since independence: socio-economic perspectives and analysis*, pp.113-126. New York: Nova Science Publishers, Inc.

Parliament Secretariat. 2015. *The constitution of the democratic socialistic republic of Sri Lanka (As amended up to 15th May 2015)*. Colombo: Parliament Secretariat, Parliament of Sri Lanka.

Peebles, P.1990. Colonization and ethnic conflict in the dry zone of Sri Lanka. *The Journal of Asian Studies* 49(1):30-55.

Ranasinge, R.A.W. 2014. The role of government agent in local administration in Sri Lanka. *International Journal of Education and Research* 2(2):1-14.

Reddy, L.R. 2002. *Sri Lanka past and present*. New Delhi: APH Publishing Corporation.

Routray, B.P & Singh, A. K. 2006. The Pawns of War. *South Asia Intelligence Review* 5(12) Available Online: http://www.satp.org/satporgtp/sair/Archives/5_12.htm#assessment2 (Accessed on 20 May 2017).

Sarjoon, A. 2011. Changing dynamics of minority rights discourse in Sri Lanka's eastern province: a study of the Muslim demand for autonomy. M.Phil Thesis, Colombo: University of Colombo.

Uyangoda, J. 2009. Sri Lanka: recent shift in the minority rights debate. In R. Manchanda (ed.). *Living on the margins: minorities in South Asia*, pp.99-120. Katmandu: EUROASIA-NET Partners.

Yusoff, M. A., Sarjoon, A., Asrinaldi & Mohd Zain, Z. 2015a. Decentralized administration and minority accommodation in Sri Lanka: analyzing status, issues, challenges and prospects. *Mediterranean Journal of Social Sciences* 6(4S1): 533-542.

Yusoff, M. A., Sarjoon, A., Awang, A & Hamdi, I. H. 2015b. Land policies, land-based development programs and the question of minority rights in eastern Sri Lanka. *Journal of Sustainable Development* 8(8): 223-233.

Yusoff, M.A. Hussin, N. & Sarjoon, A. 2014. Muslim demand for territorial autonomy in the Eastern Sri Lanka: an analysis of its origin, accommodation and the present stance. *Asian Social Science* 10(15): 76-88.

Yusoff, M.A., Sarjoon, A & Abdul Wahab, A.R. 2016b. State-building, power-sharing discourse and political autonomy of minorities within ethno-nationalist gloom in Sri Lanka. *Journal of Politics and Law* 9(1): 88-96.

Yusoff, Mohammad Agus, Sarjoon, Athambawa, Hussin, Nordin & Ahmed, Azhar. 2017. Analyzing the contributions of the Sri Lanka Muslim Congress and its founder-leader to Muslim politics and community in Sri Lanka. *Social Sciences*. 6, 120.

1681 REGENERATIVE LANDSCAPING IN RETROFITTING AND RECREATING TROPICAL CITIES USING COMMUNITY BASED APPROACH

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ABSTRACT

Climate change is a phenomenon that is currently a threat to all the living species on our planet. It particularly poses challenges for cities with frequent flooding, heat waves, droughts and other extreme weather conditions which have direct impact on urban neighbourhoods and infrastructure, and consequently affect the health and mortality of urban population. Due to the unique geographical location, the tropical cities emerge from the life supporting elements such as hills, forests, lakes and rivers. However unplanned urbanisation is bringing biophysical changes in the environment making cities vulnerable to disasters. Understanding the cities and the interactions between natural and built environment help us in making cities more resilient to natural disasters and creating a healthy atmosphere to the urban population. There is a need for regenerative development with the involvement of communities to work with the natural systems through productive landscaping in urban built environment. Urban farming, where food is grown and maintained by the public in various vacant plots, parks, gardens, streets, building rooftops etc. have multiple social, economic and environmental benefits. Transforming the dead spaces into active and productive areas through a regenerative process will conserve the natural ecosystem values and functions and provides associated benefits to urban population. This paper discusses a conceptual review of local and micro scale approaches that incorporate the techniques of modifying the urban fabric and designing vegetative areas in a sustainable approach through the concept of productive and regenerative landscaping and other mitigating strategies to improve urban built environment. The paper focuses on solving the socio-economic and ecological issues concerned with the urban spaces through productive gardening as one approach. A study of the inflow and outflow of energies to the cities in the form of food and waste is presented in the paper discussing the issues that are linked and possible solutions. Various ecological solutions are suggested for improving air quality, conserving the top soil, improving ground water recharge, saving the water bodies from excess nutrient load, providing green patches to act as carbon sinks etc. A case study of the implementation of regenerative landscaping in Indian coastal city, Visakhapatnam is done and the inferences are discussed, identifying the models that were successful on microscale and the possibility of expanding the same on a macro level along with anticipated challenges and solutions. The findings of this paper are hoped to guide the practitioners in architecture, landscape architecture, urban design and policy making to incorporate sustainable landscape design approach towards building resilient cities, improving the microclimate and providing a better quality of life.

INTRODUCTION

Humanity is currently depleting the natural capital stocks of the planet and eroding its resilience. That is evident from the increasing problems and calamities we are facing today. According to WWF Living Planet 2012¹, "We are using 50 per cent more resources than the Earth can provide, and unless we change course that number will grow very fast. By 2030, even two planets will not be enough." Cities and urban areas were major contributors to this trend. It is clear, then, that in order for cities to develop sustainably, they must not only stop their extraction of natural resources faster than ecosystems can recover but reverse the trend by improving the regenerative capacity of ecosystems. This is the only way cities can be sustained in the long term.

Regenerative urban development requires a switch from the old linear metabolic system to a circular metabolic system that can be found in nature. In nature there are no landfills; all waste becomes organic nutrients for new growth. Closing the urban resource cycle means finding value in outputs that are conventionally regarded as waste and using them as resource inputs in local and regional production systems. A regenerative city reintroduces treated water into the hydrology cycle, increasingly sources food from urban and peri-urban producers, captures the nutrients from its waste and reduces its dependence on non-renewable energy. Closing resource loops in this way is the first step toward regenerative development. This entails returning organic nutrients to soils, growing plants and trees, replenishing watersheds and developing ecosystem infrastructures within the city to encourage urban biodiversity. Doing so helps to strengthen the regenerative capacity of ecosystems on the local, regional and global levels.

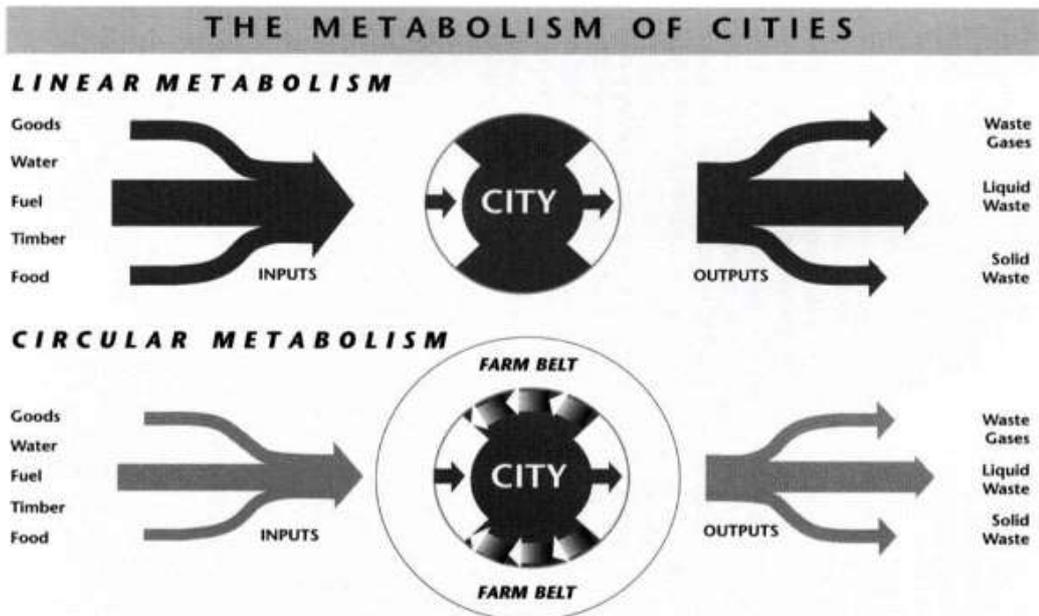


Figure 1: Linear metabolic system vs Circular metabolic system in Cities²

One advantage cities have is high concentration of human capital, that have tremendous potential to be an asset in tackling the pressing challenges we face today. Therefore, involving the community and providing a solution through the community involvement is the way to transform our cities into regenerative cities. Cities that close their resource loops and source an increasing share of the resources they consume from their own territory create social, economic and environmental value in their communities (See figure 1). Promoting urban and peri-urban farming to feed the urban population results in increased efficiency in water and nutrient use as well as have a smaller energy demand through a lesser need for food transportation, storage and packaging.

WHAT IS URBAN FARMING?

Urban farming, refers to growing food in various spaces in the city - the backyards and balconies of houses, vacant lots, parking lots, rooftops, parks, private or public spaces for the urban consumers. Urban farming is a practice that ensures the community where their food comes from, how is it grown, how safe is it to be consumed, and what to do with the food waste. This is a sustainable practice that improves community activity, improves the quality of public and semi-public spaces, decreases the distance that food is transported, increases food security and awareness about healthy food and provides facilities for organic waste recovery through composting.

Urban farming is not an entirely new concept. Since most of our ancestors have agrarian roots, they used to have the practice of maintaining kitchen garden in which they used to grow food. However, over the years due to industrialization and urbanisation, this system has declined. Today, due to various problems the city dwellers are facing like food insecurity, air water and land pollution, food contamination, etc it is important to practice urban farming. Urban farming will help the city to adapt to climate change and reduce its ecological foot print. It contributes to disaster risk reduction and adaptation to climate change by reducing runoff, reducing urban temperatures, sequestering CO₂ etc.

Table 1: Potential areas for growing food based on landuse and land availability

Natural Forest Area	Rural Area	Peri-urban Area	Urban Area	Core Urban Area
	Agriculture	Agriculture	Public Farms	Front yard and backyard
		Industrial Area Farms	Community Farms	Garden Balconies
		Institutional Farms	Institutional Farms	Roof tops
		Green houses	School Farms	Window Sill
			Front yard and backyard gardens	Walls
			Green houses	Vertical farms
			Roof tops	Streets

Growing fresh food close to consumers reduces energy spent in transport, cooling, processing and packaging, and in productive reuse of urban organic wastes and wastewater thereby reducing the load on landfills.

WHY DO WE NEED URBAN FARMING?

- Provide food and nutrition to the community.
- Reduces the distance food has to travel giving access to fresh produce and
- Filter and purify the air and water in the community, especially important in urban areas.
- Provide habitat for local wildlife like birds, rabbits, and butterflies.

- Beautify the community.
- Allow for social interaction within a community. Community gardens also promote intergenerational interactions.
- Provide a location for social activities like gardening demos, harvest parties, and potlucks.
- Remove carbon dioxide and other greenhouse gases from the air.
- Provide opportunities to exercise and engage in physical activity.
- Keep the community active, which encourages social interaction and deters crime.
- Urban revitalisation: Urban farms developed in under-utilized urban spaces such as vacant lots or under-used parks will turn into lush green space and hub of activity for the community and urban farmers.
- Crops: Use of indigenous seeds and native plants and trees will decrease the attraction to pest and disease and increase the resilience in extreme weather conditions in the farm and help in saving and propagating the seeds. Sharing seeds and produce with the neighbours will build the community.

URBAN FARMING AS A SOCIALLY INCLUSIVE ACTIVITY.

The stakeholder in Urban Farming are the government, the NGOs working in this area and citizens who can be divided into active and passive users. Active users refers to those who take active interest in Urban Farming, attend workshops and learn about urban farming and work towards building their community Farm. Passive users are ones who are not keen on learning and developing the farm but will use the spaces after it has been established. It is hoped that once the farm is established and there is activity on the farm, it would attract the passive users to become active users and motivate them to work on the farm. As opposed to formal city parks, urban community farms refers to the leadership and active participation of city residents who take it upon themselves to build healthier sustainable communities through farming and enjoy the ‘socio-ecological spaces’ and the associated flora, fauna, and facilities (See figure 2 and 4).

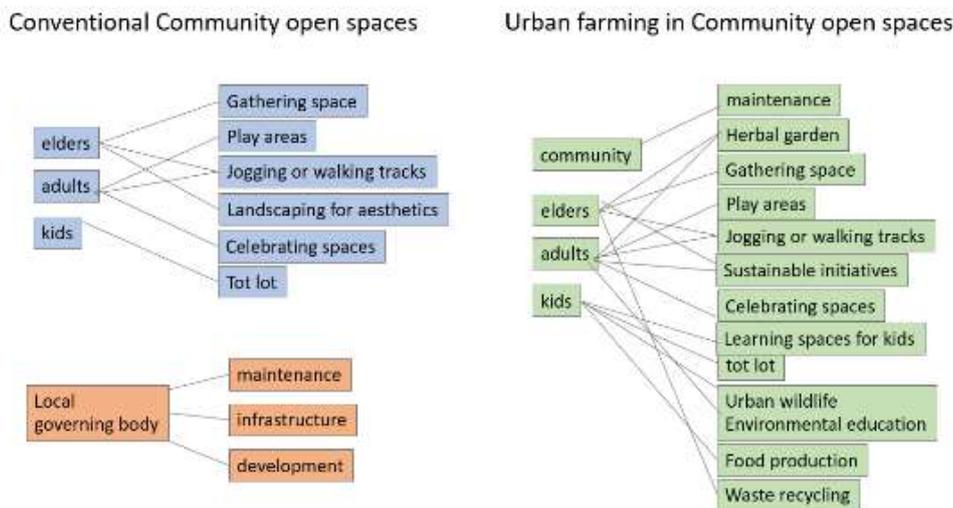


Figure 2: Showing various social-economic activities of Conventional community spaces vs. Urban community farms

Urban farming with community involvement is healthy and socially productive (See figure 3). Linkages in the food chain become stronger when the food is grown locally and sustainably. Farming can be a fun activity that families or communities can do together. Working with soil on the farm connects people with the nature. This outdoor activity allows kids to learn about where food comes from, how is it produced and allows them to learn about bees, butterflies, ladybugs, birds, squirrels etc. Once children start understanding the ecosystem and that they are a part of this ecosystem which has different elements that are interdependent, they will start respecting the environment and grow up to become responsible adults.

Community farms also become a safe space where youth and adults come to socialize, participate in cultural events (e.g. meetings, festival celebrations, harvest celebrations), relax, learn about gardening, exercise, and enjoy nature. Given that individuals engaged in urban community farming organize, and learn together, often gives them a sense of empowerment and self-efficacy therefore it can be viewed as an institution that contributes to social learning related to community development and food security. Children involved in growing their own food will learn about the importance of food, how many resources, work and time it takes to grow they will learn to respect food. A matrix showing the health, social and ecological benefits of Urban Farming are shown in Figure 5.



Figure 3: Showing various social-economic activities of Urban community farms

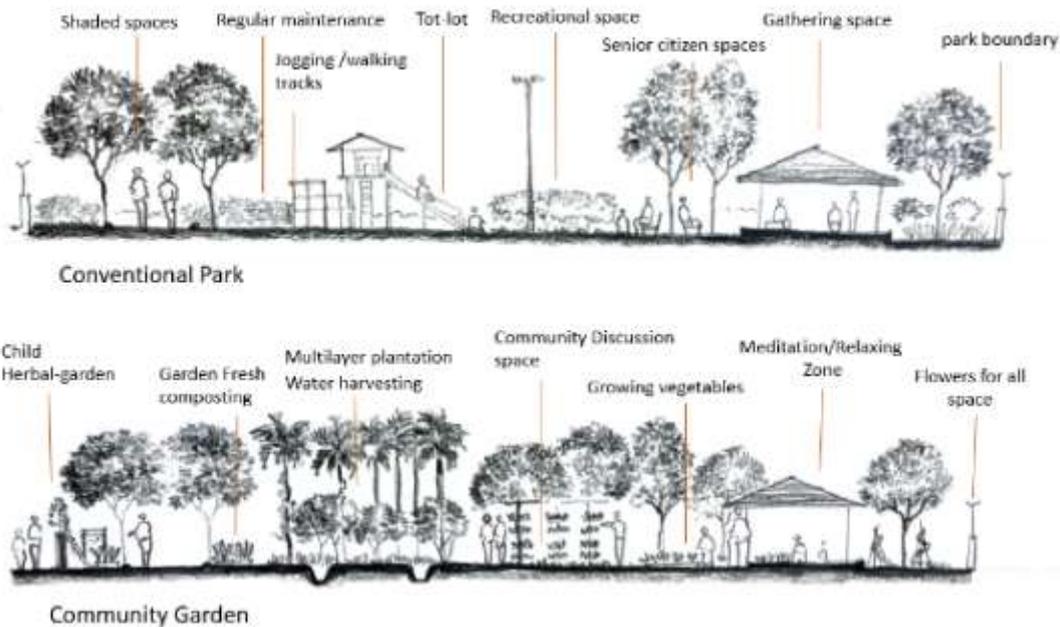
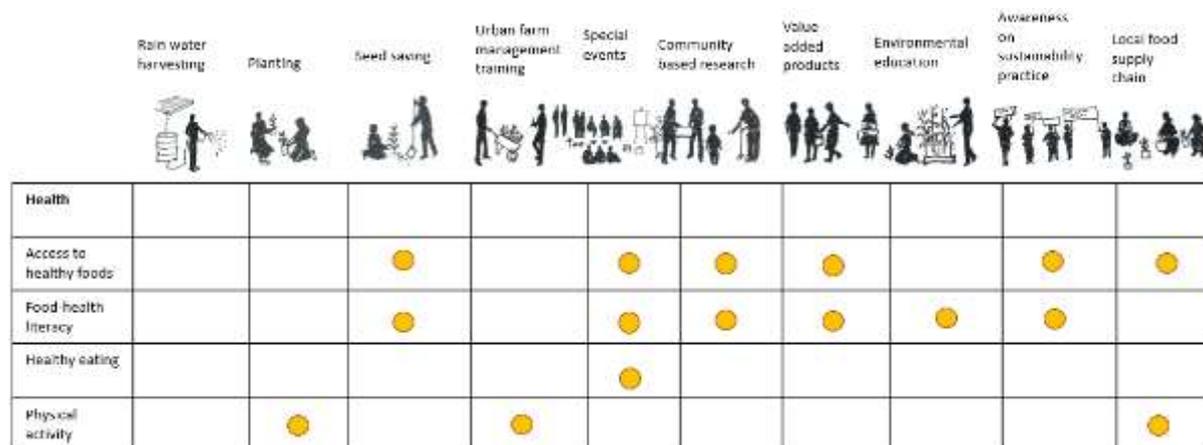


Figure 4: Shows the Conventional park design vs Community Farm design



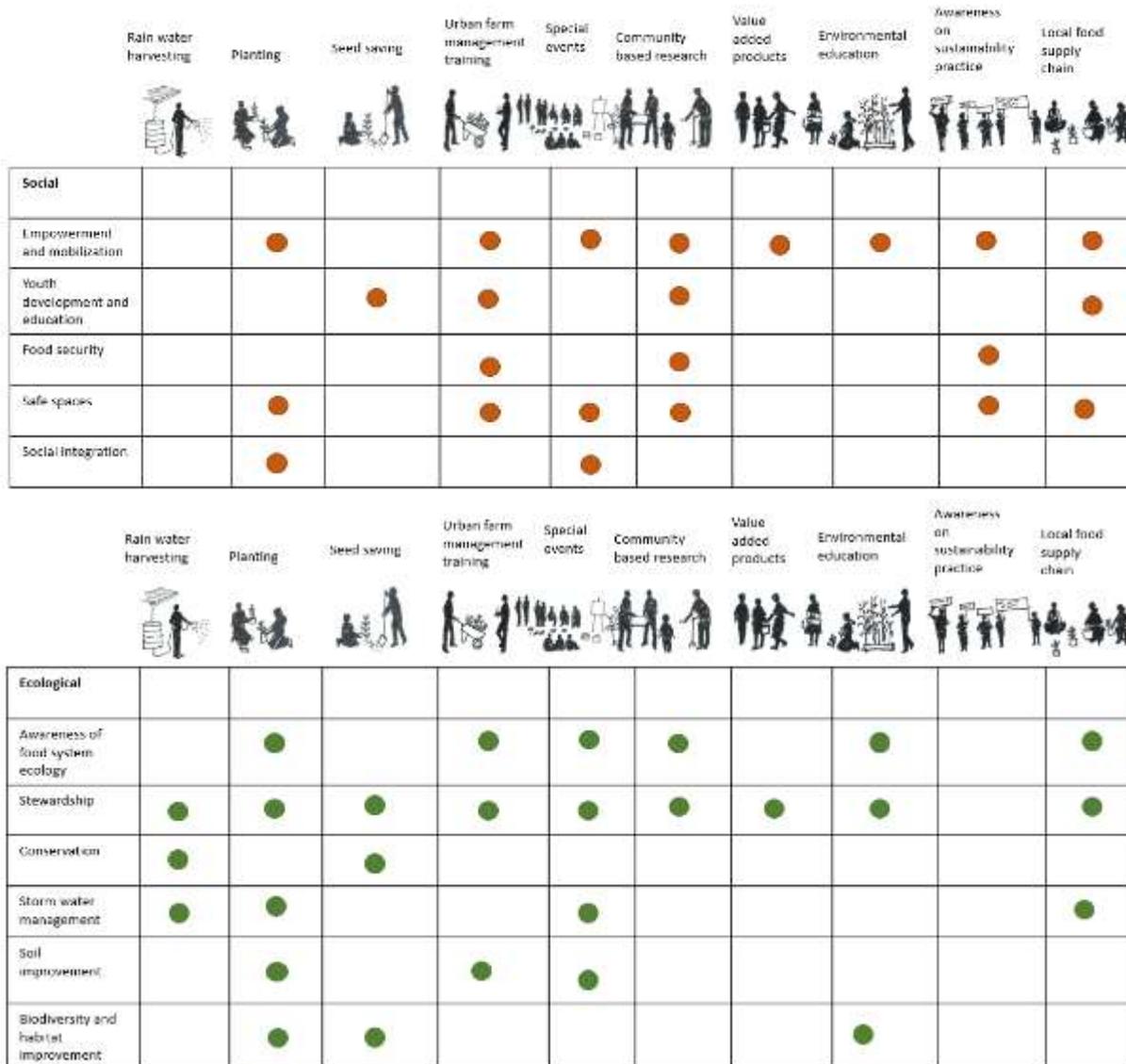


Figure 5: Matrix showing the Health, Social and ecological benefits of various activities in a community farm.

HOW TO DO URBAN FARMING?

Resources required for urban farming:

- Land/space – Open spaces, parks, vacant plots, rooftops, balconies, property setbacks, etc
- Growing medium – soil, cocopeat, compost, water (hydroponics)
- Crops – Seeds and saplings
- Water supply - municipal water, ground water, waste water recovered from household, harvested rainwater
- Electricity – for irrigation and night lighting
- Waste management - The reuse of urban organic solid wastes (composting, vermiculture) and waste water (for irrigation and nutrients)
- Manpower -Community members and helpers - supporting garden organization, leadership, outreach, and maintenance
- Equipment – Handtools, small machinery like tillers
- Facilities – Storage sheds

CASE STUDY - LEARNING FROM THE EXISTING

Urban farming activities in the city of Visakhapatnam, India

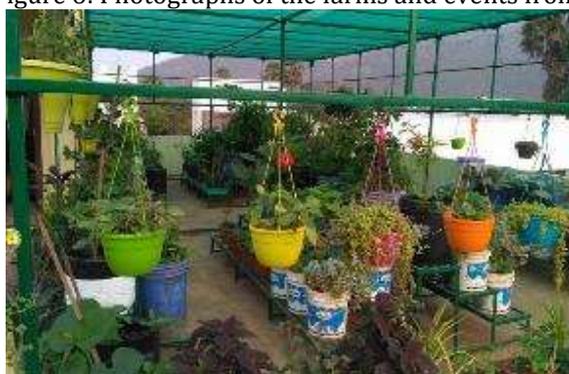
There is a small but active group of urban farmers in the city of Visakhapatnam who have been practicing urban farming in vacant plots, roof tops etc and helping in educating the city dwellers by demonstrating how urban farming can be done in the spaces available to them. A Non-government organisation (NGO) which is an active part of this group aims at educating the city dwellers on how to do farming in their premises in a sustainable way using zero budget natural farming techniques.

The NGO developed a model roof top kitchen garden, a farm on vacant plot and a food park in a semi urban area which they use to conduct workshops and awareness sessions on a weekly basis reaching out to more and more citizens. They

encourage and guide the city dwellers in developing their own farms and also train them in activities like composting on a household level and community level. These spaces help in creating a dialogue, encourage community engagement and empowerment as well as introduce city-dwellers to fresh, safe, healthy home grown produce. They engage with schools and colleges to educate students on farming and healthy eating and encourage institutions to develop urban farms in their premises. The organisation also educates city dwellers about nutrition, healthy eating and treating diseases through herbal plants with a motto 'Eat food as medicine, otherwise you have to eat medicine as food'.

The NGO helps various farmers and gardeners in urban and peri-urban areas of Visakhapatnam in selling their produce through specific stores and arrange local farmers markets over the weekends in public spaces (See figure 6). The organic farmers market has been attracting many city dwellers and encouraging them to shift to natural food and food products and motivating them to start their own kitchen garden. The group uses the web and social media for a wider outreach by sharing pictures of the farming activities and demonstrations videos. Through social media they encourage the members to post their farm updates, queries and share their challenges and problems and help them by providing solutions to their problems. The network on the social media provides a platform for marketing and sharing details of events related to Urban farms. This kind of a motivated group with a strong support system is a great advantage for the city to adopt urban farming on a large scale.

Figure 6: Photographs of the farms and events from the current Urban Farming activities in Visakhapatnam



Roof top farm



Workshop by NGO on Rooftop Farming



Farming in the setbacks



High density farming on the roof



Child watering roof top plants



Family working on the rooftop farm



Organic Farmers Market in the city



Organic Farmers Market in the city



Workshop by NGO on waste segregation and composting



Urban farmers sharing the pictures of their farm produce

Lessons learnt from the existing urban farming activities in Visakhapatnam.

The experience of the group of urban farmers confirmed that urban farming has a number of benefits. Apart from food production for the urban population, the social value of bringing a community together, education and training on how food is produced and provision of space for recreation and physical activity remains important. The following are the take-aways from the case study.

- A voluntary organisation having a good knowledge in Farming is an advantage for the city
- There are a few motivated citizens in the city who are interested to learn urban farming and start their own farms based on the space available to them.
- Organic Urban Farmers market is getting good response from the city dwellers which means that there is an increase in awareness about food adulteration and health safety.
- Urban farmers with small growing spaces are coming up with innovative ideas on how to produce high yields in small spaces. They are trying to adopt models such as aquaponics, vertical farming, micro-green operations, greenhouses on rooftops etc. in their own way.

- Intermittent workshops on organic waste composting and urban farming are increasing awareness among citizens and motivating them towards urban farming.
- Web and networking in Social media is acting as a powerful tool in bringing all the urban farmers in the city onto a single platform and is facilitating the learning process.

Challenges

The risks that are said to be associated with the promotion of urban agriculture must be recognised and addressed.

- Food produced in cities may be detrimental to human health if soils or irrigation water are contaminated by industries, if untreated urban waste water is used for irrigation of food crops or if hygiene is lacking in the processing and marketing of food.
- Cultivated areas in cities may attract or provide breeding grounds for rodents, mosquitoes and flies and therefore can contribute to the spread of diseases if proper precautions are not taken.
- Neighbours may complain of the dust, smell and noise created by urban farms.
- Lack of knowledge intimidates most city dwellers in setting up their own kitchen garden/farm.

However, such risks can be prevented and managed by proper knowledge and appropriate urban policies, including the provision of adequate support to urban farmers.

DEVELOPING A ROAD MAP FOR URBAN FARMS

Scope encompasses vision, goals, methodologies, boundaries and constraints. Scoping the study can be a powerful tool for engaging stakeholders in a common vision for understanding Urban Farming, working on the challenges and maximizing its benefits. From the case study we learnt how urban farming is being practiced in fragments. Now for a wholesome effort to expand it on a bigger scale, we can bring all the stakeholders onto one platform and work together. When the policy makers, urban planners, architects, urban farmers, enthusiastic citizens etc. come together and come up with a plan we can have great results (See figure 7).



Figure 7: Road map for decision making in Community-led urban farms

Before undertaking urban farming in any city a preliminary survey regarding the interest for it among the residents has to be conducted. Once some interest has been identified the availability of resources including the need and feasibility to set up waste water treatment facilities, composting facilities, etc has to be looked into. Identifying the sections of residents who are seriously interested in farming and providing them with support will ensure the success of the project. Availability of resources namely land, water for irrigation and support services including garden supplies, expert advice and support system are the prerequisites for success in urban agriculture in that city. Strategies and benefits of community farms in open areas is shown in figure 8 and 9.

Steps for designing a community farm in a neighbourhood.

- Identifying the variety of uses and amenities desired, including the potential to accommodate alternative uses in the garden such as hosting community events etc.
- Locating and allocating adequate space for the desired uses, and integrating those uses effectively
- Identifying key access points and predicted circulation through and around the farm,
- Integrating the neighborhood's unique history and character into the theme of the park
- Adding elements that enhance the space such as murals, sculptures, bird baths, etc.
- Designing boundary fence, entry and exit gates, walking tracks, space allocated for farm and other onsite activities.
- Designing the space allocated for farm dividing the area into smaller plots with workaround space.
- Test the soil for its fertility and treat it if required before cropping.
- Work out the water supply and drainage system. Considering the need for drip irrigation for some zones
- Find a convenient location for the garden's storage shed for tools, equipment and produce.
- Locating the community compost bin area in an accessible and functional location
- Considering the type, size and location for community gathering spaces such as areas for benches for relaxing, picnic tables, platform for farmers' market, a children's play area, a display and exhibition space, etc.)
- Identifying a location for shade elements in the garden (i.e. pergola, shade trees, etc.)
- A cabin or room for the gardener with toilets.
- Determine the need for security lighting
- Adding farm animals will enhance the dynamics of the space.

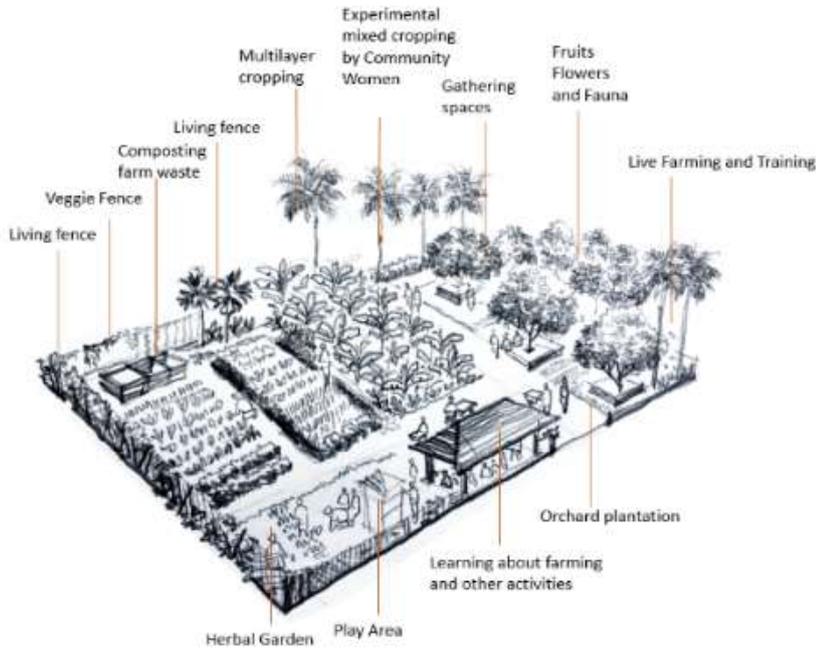


Figure 8: Showing a productive community farm along with the interactive social spaces and activities.

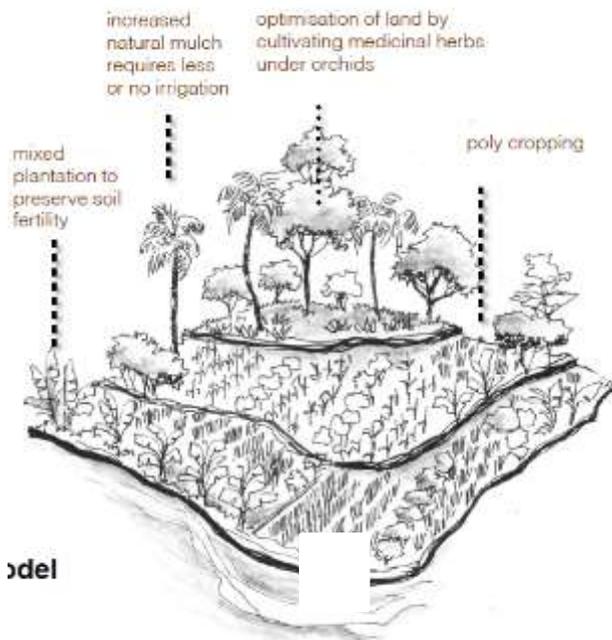


Figure 9: Diagram showing multi-layered cropping techniques for urban farming on vacant lands.

CONCLUSION

Urban farming is as an effective means to address global warming—by reducing the effects of UHIs and reducing flood risks while also fostering urban transitions to sustainability in many ways, such as creating common amenities, ecosystem services, reinventing urbanity and encouraging community building by growing local food, etc. Urban farming is and will continue to be a small but potential dimension of local food systems. One of the most direct benefits of growing food in or near towns and cities is the new source of products and people that adds value to local communities. Although it is not expected that urban farms have the potential to feed a whole city, they have great potential for increasing community health through providing secure access to fresh food for the community wellbeing. Urban farms have great potential for collaboration within the community by building partnerships with developers, the food service industry, schools, community organizations, and local governments. Some can also become educational hubs for growing and eating healthy food. Urban farms align with many of the food systems, green economy, and community development strategies being adopted by local governments. The findings of this paper are hoped to encourage city-dwellers, architects, urban designers and policy makers to adopt/incorporate urban farms and productive landscapes for building resilient cities and providing a better quality of life to the urban population.

REFERENCES:

1. World Wide Fund, Living Planet Report 2012, www.awsassets.panda.org/downloads/1_lpr_2012_online_full_size_single_pages_final_120516.pdf
2. Girardet, H. Cities, People, and Planet. Urban Development and Climate Change, 2nd ed.; Wiley & Sons: Oxford, UK, 2008.

SS04.1. Spatial Econometric Interaction Modelling

1019 CROSS-SECTIONAL DEPENDENCE MODEL SPECIFICATIONS IN A STATIC TRADE PANEL DATA SETTING

ABSTRACT

The focus is on cross-sectional dependence in panel trade flow models. We propose alternative specifications for modeling time invariant factors such as socio-cultural indicator variables, e.g., common language, common currency. These are typically treated as a source of heterogeneity eliminated using fixed effects transformations, but we find evidence of cross-sectional dependence after eliminating country-specific effects. These findings suggest use of alternative model specifications that accommodate cross-sectional dependence, which we set forth along with Bayesian estimation methods. Ignoring cross-sectional dependence implies biased estimates from panel trade flow models that rely on fixed effects.

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1021 THE GRAVITY MODEL FOR INTERNATIONAL TRADE: SPECIFICATIONS AND ESTIMATION ISSUES

ABSTRACT

The Poisson gravity model along with pseudo maximum likelihood (ML) methods has become a popular way to model international trade flows. This approach has several econometric advantages that we outline in the paper. We argue that estimating the parameters by ML would only be justified statistically if the trade flows were independent. Such an assumption, however, is generally not valid, and a failure to account for spatial dependence may lead to biased parameter estimates and misleading inferences. To overcome this estimation problem we suggest eigenvector spatial filtering variants of the Poisson gravity model (without and with zero-inflation) along with pseudo ML estimation.

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1023 A SPATIAL-FILTERING ZERO-INFLATED APPROACH TO THE ESTIMATION OF THE GRAVITY MODEL OF TRADE

ABSTRACT

Nonlinear estimation of the gravity model with Poisson/negative binomial methods has become popular to model international trade flows, because it permits a better accounting for zero flows and extreme values in the distribution tail. Nevertheless, as trade flows are not independent from each other due to spatial autocorrelation, these methods may lead to biased parameter estimates. To overcome this problem, eigenvector spatial filtering variants of the Poisson/negative binomial specification have been proposed in the literature of gravity modelling of trade. However, no specific treatment has been developed for cases in which many zero flows are present. This paper contributes to the literature in two ways. First, by employing a stepwise selection criterion for spatial filters that is based on robust (sandwich) p-values and does not require likelihood-based indicators. In this respect, we develop an ad hoc backward stepwise function in R. Second, using this function, we select a reduced set of spatial filters that properly accounts for importer-side and exporter-side specific spatial effects, both at the count and the logit processes of zero-inflated methods. Applying this estimation strategy to a cross-section of bilateral trade flows between a set of worldwide countries for the year 2000, we find that our specification adds further explanatory power to the benchmark models.

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1044 HOW DOES ECONOMIC GROWTH AFFECT VENTURE CAPITAL INVESTMENT: EVIDENCE FROM DYNAMIC PANEL DATA ESTIMATES

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ABSTRACT

Using dynamic panel data estimation, this paper examines the effect of economic growth on venture capital investments in presence of other macroeconomic variables like innovation, R&D expenditure, tax rate, financial development, inflation rate and unemployment rate. The paper shows that economic growth has a positive effect on venture capital investment and hence, the results confirm that economic growth plays an important role for achieving high venture capital investment.

Keywords: Venture capital investment, economic growth, dynamic panel data estimates

1 INTRODUCTION

Venture capital³³⁰ investment (VCI) shows an important role in economic development (Pradhan et al., 2017; Gompers and Lerner, 2001; Florida et al., 1990). VCI is the source of funds that characteristically finance the new rapidly growing companies through equity participation (Gompers and Lerner, 2001, 1998; Wonglimpiyarat, 2009). It is also equally useful for many socio-economic activities such as innovation, job creation, industrial growth like small and medium-sized enterprises (SMEs), service sector growth (Carvell et al., 2013), financial development, infrastructure, and so forth (Hellmann and Puri, 2002). However, despite the vast utility of venture capital investment and especially for the attainment of economic development, little empirical research has examined the validity of these claims (Hasan and Wang, 2006). Hence, more empirical research on the relationship between VC investment and economic growth is urgently required.

In this study, we investigate the determinants of VC investment on economic growth in presence of other macroeconomic variables, which have both substitute and complementary effects on the VCI-growth nexus.

The paper is organized as follows. *Section II* describes our model and data. *Section III* describes the results. *Section IV* offers conclusion.

2 METHODS OF STUDY AND DATA

This paper arrays dynamic panel data modelling, suggested by Arellano and Bover [1991] and Blundell and Bond [1998], to investigate the effect of economic growth on VC investment.

The following regression model is set for this investigation

$$VCI_{it} = \lambda_1 VCI_{it-1} + \lambda_2 INN_{it} + \lambda_3 PEG_{it} + \sum_{j=1}^p \rho_j X_{jit} + \varepsilon_{1it} \quad (1)$$

Where, $\varepsilon_{1it} = \eta_i + \nu_t + \zeta_{it}$; η_i is country effect; ν_t is time effect and ζ_{it} is independent and identically distributed among countries (i) and years (t).

where, $i = 1, \dots, N$; $t = 1, \dots, T$; VCI_{it} is venture capital investments for country i over period t and is used as a proxy for VCE, VCL, and VCT; VCI_{it-1} entails the lagged value of venture capital investments for country i over period t ; INN_{it} is innovation activities for country i over period t and is used as a proxy for PAR, PAN, and RDE; PEG_{it} is per capita economic growth for country i over period t ; X_{jit} is the other determinants included in the model for country i over period t and for venture capital investments³³¹; λ_2 captures the effects of innovation activities on venture capital investments; λ_3 captures the effect of per capita economic growth on venture capital investments; λ_1 captures the lag of venture capital investments, ρ_j captures the impact of other macroeconomic variables on venture capital investments, and ε_{1it} is the error term.

We expect that venture capital investment is having a positive impact with economic growth and other macroeconomic determinants.

³³⁰ This is a specialized form of financial intermediation that provides funding to innovative new ventures with high-growth prospects (Da Rin et al., 2013).

³³¹ These macroeconomic determinants are per capita economic growth (PEG), patent by residents (PAR), patent by non-residents (PAN), R&D expenditure (RDE), long term interest rate (LIR), stock market capitalization (MAC), unemployment rate (UNE), income tax rate (ITR), and inflation rate (INF). These determinants are identified on the basis of past literature on venture capital investments.

The study uses a panel dataset covering the selected 19 countries for the period 1989-2016. The countries include in the analysis are Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Norway, Poland, Portugal, Romania, Spain, Sweden, the Netherlands, and the United Kingdom.

The data were obtained from the EVCA and *World Development Indicators* and Financial Development and Structure Dataset, published by the World Bank, Washington DC.

3 EMPIRICAL RESULTS

The dynamic panel data model specified in Eq. (1) is positioned to estimate the impact of venture capital investment on per capita economic growth. The estimated results are shown in Table 1. There are three specific model outcomes in Table 1 and it is different by the use of various VC investment indicators, namely, VCIE, VCIL, and VCIT.

From the estimated results, the study finds that the impact of economic growth on venture capital investments is positive and statistically significant, as expected, implying that higher level of economic growth promotes venture capital investments. For instance, a 1% increase in economic growth brings about the promotion of VC investments of about 8.0-26.2%. This finding is almost uniform for all the three models, particularly for all the three VC investment indicators, namely VCE, VCL, and VCT. The impact of innovation (particularly for PAR and PAN) on venture capital investments is statistically significant and positive, as expected, for the sample of 19 EEA countries and for all the three VC indicators. This implies that the higher level of innovation promotes VC investments in the EEA countries.

In case of R&D expenditure, the study finds a positive impact on VC investments; however, it is not statistically significant. The impact of stock market capitalization on VC investments is statistically significant and positive, as expected, implying that high level of stock market development promotes VC investments. For instance, a 1% increase in stock market capitalization brings about the promotion of VC investments of about 4.2-12.2%. The impact of lagged VC investments is also having significant positive impact on VC investments and is true for all the three models. It is observed that a 1% increase in lagged VC investments brings about the promotion of VC investments of about 0.4-3.8%. The impact of other macroeconomic determinants on VC investments are more or less non-uniform and have both positive and negative impact on VC investments. However, these are all not statically significant and is true for all the three models.

Over and above, the consistency of the model outputs depends upon the soundness of the instruments. The study employed three specification tests in order to justify the consistency of system GMM estimations. First, the Hansen test to know the over-identifying restrictions that report the p-values for the null hypothesis of validity of instrument set used by the estimator. The null hypothesis of this test is not rejected for any of the three estimations. Second, the Sargan test to verify independence between the instruments and the error term. The null hypothesis in this case is that the instruments and the error term are independent. Like the first case, the null hypothesis of this test is not rejected for any of the three estimations. Third, the Arellano-Bond test for serial correlations [i.e. the AR (2) test]. The null hypothesis of this test is that the errors in the first- difference regression exhibit no second-order serial correlation. As anticipated, the values of the test of second- order correlation present no evidence of model misspecification, indicating the acceptance of the null hypothesis of serial correlation in the first-differenced errors at order 2. The failure to reject the null hypothesis of all tests provides an evidence in support of the fact that the instruments are indeed valid. In brief, the overall performance of these model outputs are robust and consistent in terms of validity of instruments and the coefficients on variables.

To sum up, the effect of economic growth on per capita venture capital investment is positive and significant across the three selected venture capital indicators, namely VCIE, VCIL, and VCIT. Furthermore, the regression coefficients of other macroeconomic variables are mostly consistent with the standard results in the existing literature. That means the findings are consistent with theoretical arguments and quite robust to different measures of venture capital investment including the country and year fixed effects.

4 CONCLUSION AND POLICY IMPLICATIONS

The paper started with a conceptual question, "Does economic growth affect venture capital investment?" Our answer to this question is very much certain, as it affects the venture capital investment positively and is consistent with the earlier findings of Jeng and Well (2000) and Gompers and Lerner (1998). This study has examined the effect of economic growth on venture capital investment, a subject that has largely been neglected in the development literature. The findings of this study can give some clarity in existing debate on the causality between venture capital investments and economic growth.

REFERENCES

- Agbloyor, E. K., Abor, J. Y., Adjasi, C. K. D. and Yawson, A. (2014). Private Capital Flows and Economic Growth in Africa: The Role of Domestic Financial Markets. *Journal of International Financial Markets, Institutions and Money*, 30 (3): 137-152.
- Cherif, M. and Gazdar, K. (2011). What Drives Venture Capital Investments in Europe? New Results from a Panel Data Analysis. *Journal of Applied Business and Economics*, 12 (3): 122-139.
- Cumming, D. J. (2010). *Venture Capital: Investment Strategies, Structures and Policies*. Wiley Press, Hoboken, NJ.
- Da Rin, M., Nicodano, G. and Sembenelli, A. (2013). Public Policy and the Creation of Active Venture Capital Markets. *Journal of Public Economics*, 90 (8), 1699-1723.
- Florida, R. L. and Smith, D. F. (1990). Venture Capital, Innovation, and Economic Development. *Economic Development Quarterly*, 4 (4): 345-360.
- Florida, R.L. and Kenney, M. (1988). *Venture Capital, High Technology and Regional Development*. *Regional Studies*, 22 (1):33- 48.

Fuss, R. and Schweizer, D. (2012). Short and Long-term Interactions between Venture Capital Returns and the Macroeconomy: Evidence for the United States. *Review of Quantitative Finance and Accounting*, 38 (3): 391-410.

Gilson, R. J. (2003). Engineering a Venture Capital Market: Lessons from the American Experience, *Stanford Law Review*, 55 (4): 1067-1104.

Gompers, P. and Lerner, J. (1998). Venture Capital Distributions: Gompers, P. A. (1995). Optimal Investment, Monitoring, and the Staging of Venture Capital. *The Journal of Finance*, 50 (5): 1461-1489.

Gompers, P. A. and Lerner, J. (2001). The Venture Capital Revolution.

Grilli, L. and Murtinu, S. (2014). Government, Venture Capital and the Growth of European High-Tech Entrepreneurial Firms. *Research Policy*, 43 (9): 1523-1543.

Hasan, I. and Wang, H. (2006). The Role of Venture Capital on Innovation, New Business Formation, and Economic Growth. Paper presented at the 2006 FMA Annual Meeting, Salt Lake City, Utah.

Jeng, L. A. and Wells, P. C. (2000). The Determinants of Venture Capital Funding: Evidence across Countries. *Journal of Corporate Finance*, 6 (3): 241-289.

Journal of Economic Perspectives, 15 (2): 145-168.

M. (2016b). Nexus between Venture Capital and Economic Growth in European Economic Area Countries: The Granger Causality Approach. *Journal of Developing Areas* (forthcoming).

Pradhan, R. P., Arvin, M. B., Hall, J. H. and Nair, M. (2016a). Innovation, Financial Development and Economic Growth in Eurozone Countries. *Applied Economics Letters* (forthcoming).

Pradhan, R. P., Arvin, M. B., Nair, M. and Bennett, S. E. (2017a). Venture Capital Investment, Financial development, and Economic Growth: the Case of European Single Market Countries. *Venture Capital* (forthcoming).

Pradhan, R. P., Maradana, R. P., Zaki, D. B., Dash, S. and Jayakumar, Schertler, A. and Tykvova, T. (2011). Venture Capital and Internationalisation. *International Business Review*, 20 (4): 423-439.

Schumpeter, J. A. (1911). *The Theory of Economic Development*. Harvard University Press, Cambridge, MA.

Schumpeter, J. A. (1911). *The Theory of Economic Development*. Harvard University Press, Cambridge, MA.

Schumpeter, J. A. (1932). *Capitalism, Socialism, and Democracy*. Harper and Brothers, New York.

Short-run and Long-run Reactions. *The Journal of Finance*, 53 (6): 2161-2183.

Solow, R. M. (1956). A Contribution to the Theory of Economic Growth. *Quarterly Journal of Economics*, 70 (1): 65-94.

Timmons, J. A. and Bygrave, W. D. (1986). Venture Capital's Role in Financing Innovation for Economic Growth. *Journal of Business Venturing*, 1 (2): 161-176.

Table 1. Arellano-Bond Dynamic Panel Data Estimates

Indepent Variables	DV: Venture Capital Investments		
	Case 1: VCE	Case 2: VCL	Case 3: VCT
PEG	0.80/0.10/1.76***	19.95/1.93/1.83***	2.62/2.89/1.91***
PAR	0.09/0.03/3.555*	0.18/0.05/3.45*	0.25/0.07/3.33*
PAN	0.03/0.03/1.83***	0.08/0.05/1.710***	0.06/0.07/1.820***
RDE	0.77/1.56/0.50	2.10/2.87/0.73	0.38/0.44/0.50
LIR	26.3/23.1/1.14	29.8/42.1/0.71	6.55/0.63/0.87
MAC	1.42/1.03/1.87***	2.32/1.97/1.78***	0.42/0.29/2.82**
UNE	-11.2/12.1/-0.93	-24.4/22.4/-1.09	-0.27/0.53/-0.52
ITR	6.80/9.25/0.74	-3.10/15.6/-0.20	9.92/23.2/0.43
INF	-5.80/19.5/-0.30	-21.2/35.7/-0.60	-27.8/53.9/-0.52
VCL _{t-1}	0.04/0.006/5.20*	0.38/0.06/5.92*	0.29/0.06/4.37*
Constant	-998/521/1.92	-690/843/-0.82	-1359/1272/-1.07
χ^2	29.92*	113.67*	74.17*

Note 1: PEG is per capita economic growth, PAR is the number of patents residents; PAN is the number of patents non-residents; RDE is research and development expenditure; LIR is long-term interest rate; MAC is stock market capitalization; ITR is income tax rate; UER is unemployment rate; and INF is inflation rate.

Note 2: The reported figures are estimated coefficients, standard errors of the estimates, and the t- statistics, respectively.

Note 3: *, ** and *** indicate the statistical significance 1%, 5%, and 10% levels, respectively.

Note 4: Some of the other variables like start-up procedures to start a business, short-term interest rate, corruption perception index, and rule of law index are excluded due to lower sample size.

SS04.2. Spatial Econometric Interaction Modelling

1148 INNOVATION, ICT INFRASTRUCTURE AND ECONOMIC GROWTH: THE CAUSAL NEXUS IN G-20 COUNTRIES

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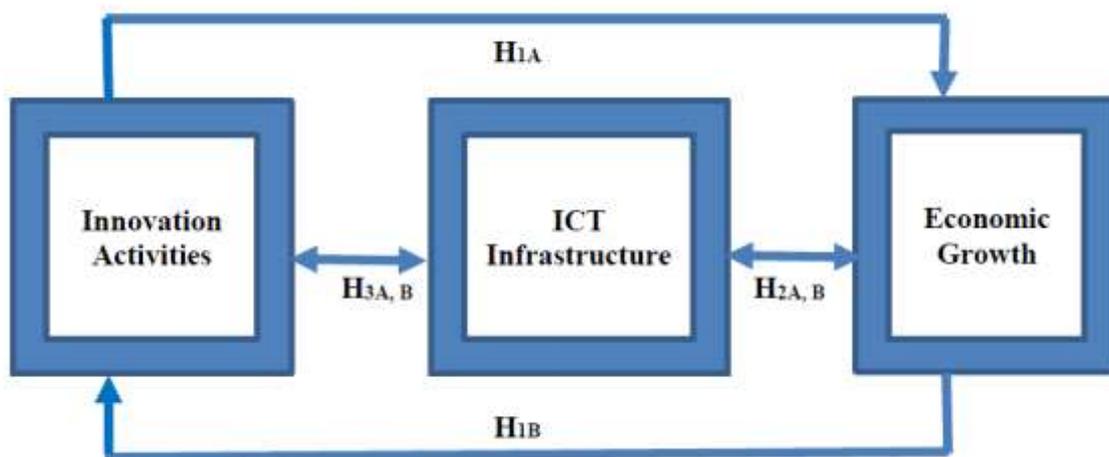
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RESEARCH HIGHLIGHTS

- Establishes the relationship between innovation, ICT infrastructure, and growth.
- The motivation is on G-20 countries from 1961 to 2016.
- Panel vector error correction model is used for establishing these relationships.
- Findings exhibit the presence of Granger causality between these variables.

GRAPHICAL ABSTRACT FOR REVIEW



Note: H1A, B: Innovation activities Granger-causes per capita economic growth, and vice versa. H2A, B: ICT infrastructure Granger-causes per capita economic growth, and vice versa. H3A, B: ICT infrastructure Granger-causes innovation activities, and vice versa.

ABSTRACT

This paper investigates the relationships among innovation, information and communication technology (ICT) infrastructure and economic growth for G-20 countries from 1961 to 2016. Using panel vector error-correction model, the study finds that in the long run both innovation and economic growth stimulate ICT infrastructure. However, in the short run, the causal links are mostly non-uniform and particularly due to different proxies that we use for both innovation and ICT infrastructure.

Keywords: Innovation, ICT infrastructure, economic growth, vector error-correction model

JEL Classification : O43, O16, E44, E31

1 INTRODUCTION

The nexus between information and communication technology (ICT) and economic growth provides an extensive literature for a large number of cases across the globe (see, for instance, Pradhan et al., 2016a). The previous studies have focused on different countries, time periods, modelling techniques, and proxies for innovation. The Granger causality test has been extensively utilized to study the direction of causality between the two. However, studies on the ICT infrastructure-growth nexus produced inconclusive results. These studies do not show consensus on either the existence or the direction of the Granger causality between the variables. One of the major reasons for the absence of consensus in the results of past studies is that the Granger causality test, in a bivariate framework, is likely to be biased due to the omission of relevant variables affecting the ICT infrastructure-growth nexus (see, for instance Pradhan et al., 2017a).

Similarly, the nexus between innovation and economic growth provides an extensive literature for a large number of cases across the globe (see, for instance, Pradhan et al., 2016b). Most of the studies have focused on different countries, time periods, modelling techniques, and proxies for innovation. The Granger causality test has been extensively utilized to study the direction of causality between the two. However, studies on the innovation-growth nexus produced inconclusive results. These studies do not show consensus on either the existence or the direction of the Granger causality between the variables. One of the major reasons for the absence of consensus in the results of past studies is that the Granger causality test, in a bivariate framework, is likely to be biased due to the omission of relevant variables affecting the innovation-growth nexus (see, for instance Maradana et al., 2017).

However, in reality, there is nexus among these three, i.e., the relationship between ICT infrastructure, innovation and economic growth. The importance and relevance of the innovation activities, ICT infrastructure and economic growth nexus arise from the potential high impact that ICT infrastructure might have on social and economic development (see, for instance, Cuervo and Menendez, 2006; OECD, 2005). Given this potential, ICT infrastructure might be valuable as innovation becomes increasingly important in modern economies, thus heightening the performance or prosperity of firms, industries, and nations (Arvanitis et al., 2013; OECD, 2010). The above discussion and reasoning indicate that ICT infrastructure¹ can enhance innovation and economic growth of an economy. In addition, the possibility of the existence of joint interdependence between these three variables needs to be researched.

The paper contains of six sections including introduction. The second section provides a concise survey of the related empirical literature and highlights the contributions of this study. The third section presents methodology. The fourth section presents the empirical results. The final section provides the derived conclusions.

2 LITERATURE REVIEW

The objective of the paper is to know the direction of causality among innovation, ICT infrastructure and economic growth. Hence, we can here three strands of literature.

The first strand of literature is between innovation and economic growth. There are four different ways we can explore this relationship: the *supply-leading hypothesis* (SLH³³²) of innovation-growth nexus, where innovation Granger causes economic growth; the *demand-following hypothesis* (DFH¹) of innovation-growth nexus, where economic growth Granger causes innovation; third, the *feedback hypothesis* (FBH¹) of innovation- growth nexus, suggests that both innovation and economic growth Granger cause each other; and the *neutrality hypothesis* (NEH¹) of innovation-growth nexus, where both innovation and economic growth do not Granger cause each other. Table 1 provides the brief summary of the studies where we find the support of these four hypotheses.

Table 1. Nexus between Innovation, ICT infrastructure, and Economic Growth

Study	Study Area	Time Period	Inferences
Part A : Innovation Activities and Economic Growth			
Pradhan et al. (2017a)	OECD Countries	1970-2016	SLH ¹ , DFH ¹ , FBH ¹
Pradhan et al. (2016a)	Eurozone countries	1961-2013	SLH ¹ , DFH ¹ , FBH ¹ , NEH ¹
Guloglu and Tekin (2012)	13 OECD countries	1991-2007	SLH ¹ , DFH ¹ , FBH ¹
Hasan and Tucci (2010)	58 countries	1980-2003	FBH ¹
Agenor and Neamidis (2015)	38 countries	1981-2008	SLH ¹
Sadraoui et al. (2014)	32 countries	1970-2012	FBH ¹
Galindo and Mendez (2014)	13 developed countries	2002-2007	FBH ¹
Kirchhoff et al. (2012)	USA	1990-1989	SLH ¹ , DFH ¹ , FBH ¹ , NEH ¹
Part B : ICT Infrastructure and Economic Growth			
Pradhan et al. (2017b)	21 Asian Countries	2001-2012	SLH ² , DFH ² , FBH ²
Pradhan et al. (2016b)	Eurozone countries	1961-2013	SLH ² , DFH ² , FBH ² , NEH ²
Pradhan et al. (2015)	21 Asian Countries	2001-2012	SLH ² , DFH ² , FBH ²
Chakraborty and Nandi (2009)	DCs	1980-2001	FBH ²
Chakraborty and Nandi (2011)	93 countries	1985-2007	FBH ²
Dutta (2001)	15 DCs & 15 ICs	1960-1993	SLH ²
Mehmood and Siddiqui (2013)	23 ACs	1990-2010	SLH ²
Ramlan and Ahmed (2009)	Malaysia	1965-2005	NLH ²
Shiu and Lam (2008)	China	1978-2004	SLH ² , DFH ² , NLH ²
Yoo and Kwak (2004)	Korea	1965-1998	SLH ²
Zahra et al. (2008)	23 countries	1990-2007	FBH ²
Part C : Innovation Activities and ICT Infrastructure			
Pradhan et al. (2017a)	OECD Countries	1970-2016	SLH ³ , DFH ³ , NEH ³

Note 1: SLH1: Supply-leading hypothesis: unidirectional causality from activities to economic growth; DFH1: Demand-following hypothesis: unidirectional causality from economic growth to innovation; FBH1: Feedback hypothesis: bidirectional causality between innovation and economic growth; and NLH1: Neutrality hypothesis: no causality between innovation and economic growth.

Note 2: SLH2: Supply-leading hypothesis: unidirectional causality from ICT infrastructure to economic growth; DFH2: Demand-following hypothesis: unidirectional causality from economic growth to ICT infrastructure; FBH2: Feedback hypothesis: bidirectional causality between ICT infrastructure and economic growth; and NLH2: Neutrality hypothesis: no causality between ICT infrastructure and economic growth.

Note 3: SLH3: Supply-leading hypothesis: unidirectional causality from ICT infrastructure to innovation; DFH3: Demand-following hypothesis: unidirectional causality from innovation to ICT infrastructure; FBH3: Feedback hypothesis: bidirectional causality between ICT infrastructure and innovation; and NLH3: Neutrality hypothesis: if no causality between ICT infrastructure and innovation.

Note 4: OECD is the organization for economic cooperation and development, DCs: Developing Countries; ACs: Asian Countries; and ICs: Industrialized Countries.

Note 5: ICT infrastructure does not have a uniform definition. It is captured by telephone mainlines, mobile phones, internet users, internet servers, or fixed broadband, depending on the study.

Note 6: Innovation activities is captured by patents, R&D expenditure, researchers in R&D activities, high technology exports, scientific and technical journal articles, or trademarks, depending on the study.

332 ICT mutually affects innovation and economic growth both at a micro-level and macro-level (Pradhan et al., 2017b; Zhang and Li, 2017; Sassi and Goaid, 2013; Vu, 2013).

The second strand of literature is between ICT infrastructure and economic growth. There are four different ways we can explore this relationship: the *supply-leading hypothesis* (SLH2) of ICT infrastructure-growth nexus, where ICT infrastructure Granger causes economic growth; the *demand-following hypothesis* (DFH2) of ICT infrastructure-growth nexus, where economic growth Granger causes ICT infrastructure; third, the *feedback hypothesis* (FBH2) of ICT infrastructure -growth nexus, suggests that both ICT infrastructure and economic growth Granger cause each other; and the *neutrality hypothesis* (NEH2) of ICT infrastructure -growth nexus, where both ICT infrastructure and economic growth do not Granger cause each other. Table 1 (Section B) provides the brief summary of the studies where we find the support of these four hypotheses.

The third strand of literature is between innovation and ICT infrastructure. There are four different ways we can explore this relationship: the *supply-leading hypothesis* (SLH3) of innovation- ICT infrastructure nexus, where ICT infrastructure Granger causes innovation; the *demand-following hypothesis* (DFH3) of innovation- ICT infrastructure nexus, where innovation Granger causes ICT infrastructure; third, the *feedback hypothesis* (FBH3) of innovation- ICT infrastructure nexus, suggests that both innovation and ICT infrastructure Granger cause each other; and the *neutrality hypothesis* (NEH3) of innovation- ICT infrastructure nexus, where both innovation and ICT infrastructure do not Granger cause each other. Table 1 (Section C) provides the brief summary of the studies where we find the support of these four hypotheses.

3 METHODS OF STUDY

The study deploys the following vector error correction modelling (VECM) to inspect the possible directions of causality among ICT infrastructure and innovation activities, and per capita economic growth.

$$\begin{bmatrix} \Delta PCEG_{it} \\ \Delta INNI_{it} \\ \Delta ICTI_{it} \end{bmatrix} = \begin{bmatrix} \eta_{1j} \\ \eta_{2j} \\ \eta_{3j} \end{bmatrix} + \sum_{k=1}^n \begin{bmatrix} \mu_{11ik}(L)\mu_{12ik}(L)\mu_{13ik}(L) \\ \mu_{21ik}(L)\mu_{22ik}(L)\mu_{23ik}(L) \\ \mu_{31ik}(L)\mu_{32ik}(L)\mu_{33ik}(L) \end{bmatrix} \begin{bmatrix} \Delta PCEG_{it-k} \\ \Delta INNI_{it-k} \\ \Delta ICTI_{it-k} \end{bmatrix} + \begin{bmatrix} \delta_{1i}ECT_{it-1} \\ \delta_{2i}ECT_{it-1} \\ \delta_{3i}ECT_{it-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1it} \\ \varepsilon_{2it} \\ \varepsilon_{3it} \end{bmatrix} \tag{1}$$

where,

Δ is the first difference filter; i is country specification in the panel; t is time period; ε is the error term; *ICTI* is ICT infrastructure and represented by TELL, MOBP, INTU, INTS, FIXB or CIII; *INNI* is innovation activities and represented by PATE, RDEX, RRDA, HTEX, STJA, TRAD, or CIII; and PCEG is per capita economic growth.

The ECT-1's are the lagged error-correction terms. The above model provides robust results if the variables are integrated of order one [i.e. I (1)] and cointegrated³³³. The lagged error-correction terms are removed in the estimation process, if the variables used in the VECM are not cointegrated.

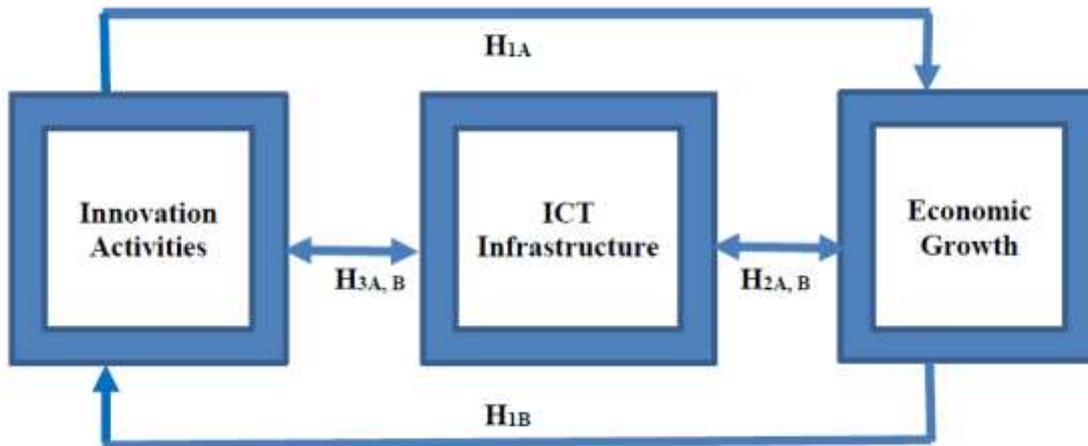
The study intends to test the followings:

- $H_{1A}^0: \mu_{12ik} = 0; \text{ and } \delta_{1i} = 0 \quad \text{for } k = 1, 2, \dots, m$
- $H_{1B}^0: \mu_{21ik} = 0; \text{ and } \delta_{2i} = 0 \quad \text{for } k = 1, 2, \dots, m$
- $H_{2A}^0: \mu_{13ik} = 0; \text{ and } \delta_{1i} = 0 \quad \text{for } k = 1, 2, \dots, m$
- $H_{2B}^0: \mu_{31ik} = 0; \text{ and } \delta_{3i} = 0 \quad \text{for } k = 1, 2, \dots, m$
- $H_{3A}^0: \mu_{32ik} = 0; \text{ and } \delta_{3i} = 0 \quad \text{for } k = 1, 2, \dots, m$
- $H_{3B}^0: \mu_{23ik} = 0; \text{ and } \delta_{2i} = 0 \quad \text{for } k = 1, 2, \dots, m$

333 It is claimed that long-run parameters are likely to demonstrate cointegrating relationships among a set of I (1) variables. In other words, it is anticipated that the macroeconomic variables in the model will be characterized by a unit root process. So examining the order of integration of the variables is the high priority in VECM estimation process and conducting unit root tests of all variables can achieve this objective.

There are numerous possible scenarios with respect to the direction of causality between ICT infrastructure, innovation activities, and per capita growth. For instance, if neither μ_{12ik} , μ_{13ik} , μ_{21ik} , nor μ_{31ik} are significantly different from zero, then we can deduce that ICT infrastructure, innovation activities, and per capita growth are not causally related. If only μ_{12ik} is statistically different from zero, then only innovation activities Granger-causes per capita economic growth. If only μ_{13ik} is statistically different from zero, then only ICT infrastructure Granger-causes per capita economic growth. If all μ_{12ik} , μ_{13ik} , μ_{21ik} , and μ_{31ik} are statistically different from zero, then this suggests feedback association between ICT infrastructure, innovation activities, and per capita growth.

Figure 1 presents a synopsis of the hypotheses that are tested in this empirical investigation.



Note: H1A, B: Innovation activities Granger-causes per capita economic growth, and vice versa. H2A, B: ICT infrastructure Granger-causes per capita economic growth, and vice versa. H3A, B: ICT infrastructure Granger-causes innovation activities, and vice versa.

Figure 1: Possible Causal Nexus among Innovation, ICT Infrastructure, and Economic Growth.

The choice of the lag length is an important consideration in a VECM estimation process, as the causality test results depend on the lag specification. This study uses Akaike information criterion to fix the optimum lag length. We use annual time series data obtained from *World Development Indicators* of the World Bank for the selected European countries over the period 1961-2016.³³⁴

The study uses six indicators for innovation (INNI), namely the number of patents by both residents and non-residents (PATE), research and development expenditure (RDEX), researchers in research and development activities (RRDA), high-technology exports (HTEX), scientific and technical journal articles (STJA), and trademark applications by both residents and non-residents (TRAD); five indicators of ICT infrastructure, namely, telephone landlines (TELL), mobile phones (MOBP), internet users (INTU), internet servers (INTS), and fixed broadband (FIXB); and real per capita economic growth (PCEG). Table 2 provides a detailed description of these variables.

Table 2. Definition of Variables

³³⁴ We have an unbalanced panel since data on the variables is not uniformly available for all the countries and for all the years over the period of our investigation.

Variable Acronym	Variable Definition
INNOVATION INDICATORS	
<i>PATE</i>	Patents total filed by both residents and non-residents: expressed in numbers per thousand population.
<i>RDEX</i>	Research and development expenditure: expressed as a percentage of gross domestic product.
<i>RRDA</i>	Researchers in research and development activities: expressed in numbers per thousand population.
<i>HTEX</i>	High-technology exports: expressed a percentage of gross domestic product.
<i>STJA</i>	Scientific and technical journal articles: expressed in numbers per thousand population.
<i>TRAD</i>	Trademark applications total filed by both residents and non-residents: expressed in numbers per thousand population.
<i>CIIA</i>	Composite index of innovation activities: a composite index using PAT, RDE, RRD, HTX, STJ, and TRM – derived through principal component analysis (see Appendix C).
ICT INFRASTRUCTURE INDICATORS	
<i>TELL</i>	Telephone landlines: telephone landlines per thousand of population.
<i>MOBP</i>	Mobile phones: mobile phone subscribers per thousand of population.
<i>INTU</i>	Internet users: internet users per thousand of population.
<i>INTS</i>	Internet servers: internet servers per thousand of population.
<i>FIXB</i>	Fixed broadband: Fixed broadband per thousand of population.
<i>CIII</i>	Composite index of ICT infrastructure: a composite index using TEL, MOB, INU, INS, and FIB– derived through principal component analysis (see Appendix C).
ECONOMIC GROWTH INDICATOR	
<i>PCEG</i>	Per capita economic growth: defined as the percentage change in real per capita gross domestic product.

Note 1: ICT is information and communication technologies.

Note 2: Variables above are defined more fully in the *World Development Indicators* of the World Bank.

The study also uses two composite indices, namely, composite index of innovation activities (CIIA³³⁵), and composite index of ICT infrastructure (CIII³³⁶), using principal component analysis (PCA). The advantage of using these indices is that they can harness the richness of information and can capture multiple aspects of the subject at hand. The present study considers seven different samples and six cases on the basis of seven innovation activities and six ICT infrastructure indicators. The seven samples are based on different measures of innovation activities while the six cases are based on different measures ICT infrastructure.³³⁷ All the variables are converted into their natural logarithms for our estimation. Table 3 provides the descriptive statistics and the correlations. The results of the correlation matrix indicate that the individual indicators of innovation and the five individual indicators of ICT infrastructure (i.e., *TELL*, *MOBP*, *INTU*, *INTS*, and *FIXB*) are highly correlated. Hence, the problem of multicollinearity would exist if these variables are used individually at the same time in one’s empirical equation.

Table 3. Descriptive Statistics, Unit Root Statistics, and Correlation Matrix

335 CIIA is the weighted average of six innovation activities, namely, PATE, RDEX, RRDA, HTEX, STJA, and TRAD.

336 CIII is the weighted average of five ICT infrastructure indicators, namely TELL, MOBP, INTU, INTS, and FIXB.

337 The subset of countries and the years covered under each of these set ups and cases are on the basis of data availability for the selected variables. We have an unbalanced panel in this study.

Variable	Descriptive Statistics						Unit Root Statistics at FD			
	Mea	Max	Min	Std	Ske	Kur	IPS	ADF	PP	Inference

Part A: Descriptive Statistics and Unit Root Statistics

PATE	-0.47	0.61	-1.90	0.60	0.001	2.38	-13.9*	276.4*	483.9*	I[1]
RDEX	0.13	0.62	-1.32	0.31	-1.10	5.17	-5.57*	96.31*	161.9*	I[1]
RRDA	3.23	3.81	1.95	0.46	-0.65	2.11	-5.83*	97.84*	144.8*	I[1]
HTEX	1.12	1.53	0.17	0.32	-1.15	3.93	-8.41*	147.6*	241.5*	I[1]
STJA	-0.40	0.26	-2.87	0.52	-1.07	5.10	-1.22+	44.61+	80.1*	I[1]
TRAD	-0.06	0.50	-1.13	0.27	-0.39	4.24	-19.5*	385.3*	595.0*	I[1]
CIIA	0.50	1.01	-0.17	0.28	-0.24	1.88	-11.0*	216.5*	520.4*	I[1]
TELL	1.51	1.83	0.46	0.27	-1.08	4.20	-2.46*	67.79*	141.9*	I[1]
MOBP	1.88	2.22	0.49	0.25	-1.92	8.99	-4.53*	89.3*	242.3*	I[1]
INTU	1.57	1.95	0.31	0.37	-1.21	3.81	-1.87**	52.7**	140.9*	I[1]
INTS	1.83	3.44	-0.85	1.01	-0.48	2.52	-4.13*	81.19*	122.2*	I[1]
FIXB	0.85	1.59	-2.15	0.74	-1.53	5.31	-20.9*	420.6*	361.6*	I[1]
CIII	0.38	0.84	-0.91	0.32	-0.97	3.94	-4.38*	81.61*	144.5*	I[1]
PCEG	1.46	1.61	1.28	0.06	-0.46	4.06	-33.7*	747.9*	471.0*	I[1]

Part B: Correlation Matrix

Variables	PATE	RDEX	RRDA	HTEX	STJA	TRAD	TELL	MOBP	INTU	INTS	FIXB	PCEG
PATE	1.00											
RDEX	0.83*	1.00										
RRDA	0.81*	0.84*	1.00									
HTEX	0.64*	0.51*	0.44*	1.00								
STJA	0.69*	0.84*	0.87*	0.28*	1.00							
TRAD	0.50*	0.39*	0.45*	0.13**	0.53*	1.00						
TELL	0.69*	0.75*	0.89*	0.46*	0.86*	0.51*	1.00					
MOBP	0.29*	0.36*	0.44*	0.14**	0.56*	0.36*	0.38*	1.00				
INTU	0.69*	0.69*	0.78*	0.31*	0.85*	0.60*	0.76*	0.71*	1.00			
INTS	0.63*	0.63*	0.70*	0.16**	0.85*	0.51*	0.67*	0.57*	0.83*	1.00		
FIXB	0.61*	0.65*	0.71*	0.29*	0.78*	0.58*	0.70*	0.72*	0.93*	0.72*	1.00	
PCEG	0.16*	0.10**	0.16**	0.01	0.27*	0.10**	0.22*	0.22*	0.27*	0.42*	0.16**	1.00

Note 1: PATE is total patents filled by both residents and non-residents, RDEX is research and development expenditure, RRDA is researchers in research and development activities, HTEX is high-technology exports, STJ is scientific and technical articles, TRAD is total trademark applications filled by both residents and non-residents, CIIA is composite index of innovation activities, TELL is telephone land lines, MOBP is mobile phones, INTU is internet users, INTS is internet servers, FIXB is fixed broadband, CIII is composite index of ICT infrastructure, and PCEG is per capita economic growth.

Note 2: Mea is mean, Max is maximum, Min is minimum, Std is standard deviation, Ske is skewness, Kur is Kurtosis, LD is level data, FD is first difference data, and I [1] is integrated of order one.

Note 3: *, **, and + indicate that parameter estimates are significant at the 1%, 5%, and 10% levels, respectively.

4 EMPIRICAL RESULTS AND DISCUSSION

The empirical analysis starts with finding the order of integration and presence of cointegration³³⁸ among ICT infrastructure and innovation activities, and per capita economic growth.

We use three-unit root tests (IPS, ADF and PP) to observe the order of integration of the variables in our panel setting. The test ensures that all the variables are integrated of order one (see Table 2). This finding suggest the likelihood of cointegration among innovation, ICT infrastructure, and economic growth. The Johansen panel cointegration test is subsequently deployed to observe the hypothesis that there is a long-run relationship among these three variables (see Table 4). The results from this test validate the existence of a long-run equilibrium relationship among innovation, ICT infrastructure, and economic growth in the seven samples and six cases of each sample.

Table 4. Empirical Results of Panel Cointegration Tests

³³⁸ Cointegration entails a long-run equilibrium relationship that ties the three-time series variables even though short-term departures from equilibrium may exist.

Sample 1: PATE, ICTI, PCEG

	Case 1		Case 2		Case 3		Case 4		Case 5		Case 6	
	Tra	Max	Tra	Max	Tra	Max	Tra	Max	Tra	Max	Tra	Max
None	231.2	152.9	518.5	446.8	454.7	301.2	369.3	256.1	635.6	353.1	193.5	134.5
At most 1	116.3	91.66	108.4	89.2	111.6	93.77	94.04	71.93	124.3	94.07	97.76	87.25
At most 2	64.82	64.82	57.75	57.75	58.6	58.6	55.82	55.82	71.22	71.22	47.93	47.93
NOC	3		3		3		3		3		3	
Inferences	Cointegrated		Cointegrated		Cointegrated		Cointegrated		Cointegrated		Cointegrated	

Sample 2: RDEX, ICTI, PCEG

	Case 1		Case 2		Case 3		Case 4		Case 5		Case 6	
	Tra	Max	Tra	Max	Tra	Max	Tra	Max	Tra	Max	Tra	Max
None	375.5	342.8	722.4	473.8	735.9	454.0	851.0	803.3	1113	908.5	287.4	118.4
At most 1	79.83	65.4	124.7	103.3	169.0	139.2	89.94	68.33	124.7	94.92	103.3	76.90
At most 2	46.34	46.34	56.38	56.38	65.92	65.92	51.62	51.62	66.36	66.36	60.51	60.51
NOC	3		3		3		3		3		3	
Inferences	Cointegrated		Cointegrated		Cointegrated		Cointegrated		Cointegrated		Cointegrated	

Sample 3: RRDA, ICTI, PCEG

	Case 1		Case 2		Case 3		Case 4		Case 5		Case 6	
	Tra	Max	Tra	Max	Tra	Max	Tra	Max	Tra	Max	Tra	Max
None	168.1	129.5	722.4	473.8	735.9	454.0	851.0	803.3	1113	908.5	287.4	118.4
At most 1	93.75	75.21	124.7	103.3	169.0	139.2	89.94	68.33	124.7	94.92	103.3	76.9
At most 2	51.72	51.72	56.38	56.38	65.92	65.92	51.62	51.62	66.36	66.36	60.51	60.51
NOC	3		3		3		3		3		3	
Inferences	Cointegrated		Cointegrated		Cointegrated		Cointegrated		Cointegrated		Cointegrated	

Sample 4: HTEX, ICTI, PCEG

	Case 1		Case 2		Case 3		Case 4		Case 5		Case 6	
	Tra	Max	Tra	Max	Tra	Max	Tra	Max	Tra	Max	Tra	Max
None	139.9	118.5	244.3	178.8	244.3	178.8	251.1	186.1	220.0	157.5	231.0	183.5
At most 1	56.8	54.89	107.9	80.06	107.9	80.06	110.6	78.23	112.1	90.6	100.3	81.19
At most 2	32.31	32.31	68.3	68.3	68.3	68.3	75.45	75.45	62.05	62.05	59.93	59.93
NOC	2		3		3		3		3		3	
Inferences	Cointegrated		Cointegrated		Cointegrated		Cointegrated		Cointegrated		Cointegrated	

Sample 5: STJA, ICTI, PCEG

	Case 1		Case 2		Case 3		Case 4		Case 5		Case 6	
	Tra	Max	Tra	Max	Tra	Max	Tra	Max	Tra	Max	Tra	Max
None	304.8	219.2	704.9	294.8	748.8	451.0	2383	2383	836.5	571.3	349.7	232.0
At most 1	94.81	72.45	137.2	93.66	165.4	123.1	210.8	182.6	139.6	103.9	120.2	95.54
At most 2	62.3	62.3	90.26	90.26	88.91	88.91	76.67	76.67	79.89	79.89	65.39	65.39
NOC	3		3		3		3		3		3	
Inferences	Cointegrated		Cointegrated		Cointegrated		Cointegrated		Cointegrated		Cointegrated	

Sample 6: TRAD, ICTI, PCEG

	Case 1		Case 2		Case 3		Case 4		Case 5		Case 6	
	Tra	Max	Tra	Max	Tra	Max	Tra	Max	Tra	Max	Tra	Max
None	166.2	119.1	540.9	355.9	191.5	127.8	1355	950.8	713.2	428.8	145.4	125.2
At most 1	81.34	73.37	113.8	96.65	100.3	78.00	171.3	124.7	166.8	145.9	57.99	48.74
At most 2	40.02	40.02	57.18	57.18	61.14	61.14	92.77	92.77	66.56	66.55	39.17	39.17
NOC	2		3		3		3		3		2	
Inferences	Cointegrated		Cointegrated		Cointegrated		Cointegrated		Cointegrated		Cointegrated	

Sample 7: CHIA, ICTI, PCEG

	Case 1		Case 2		Case 3		Case 4		Case 5		Case 6	
	Tra	Max	Tra	Max	Tra	Max	Tra	Max	Tra	Max	Tra	Max
None	150.8	117.3	398.6	401.9	190.8	153.7	227.9	166.5	581.5	433.1	174.5	124.7
At most 1	69.77	73.1	81.19	78.62	78.37	72.27	103.1	89.91	106.9	86.68	87.05	76.98
At most 2	28.75	28.75	36.94	36.94	41.01	41.01	50.98	50.98	58.37	58.37	45.78	45.78
NOC	2		2		2		3		3		2	
Inferences	Cointegrated		Cointegrated		Cointegrated		Cointegrated		Cointegrated		Cointegrated	

Note 1: PATE is total patents filled by both residents and non-residents, RDEX is research and development expenditure, RRDA is researchers in research and development activities, HTEX is high-technology exports, STJ is scientific and technical articles, TRAD is total trademark applications filled by both residents and non-residents, CHIA is composite index of innovation activities, TELL is telephone land lines, MOBP is mobile phones, INTU is internet users, INTS is internet servers, FIXB is fixed broadband, CIII is composite index of ICT infrastructure, and PCEG is per capita economic growth.

Note 2: ICTI stands for ICT infrastructure and the inclusion of TELL, MOBP, INTU, INTS, FIXB, or CIII.

Note 3: Tra is trace statistics; Max is maximum Eigenvalue statistics; and NOC is number of cointegrating vector.

Note 4: Statistical significance is checked at the 5% level.

The findings of cointegration supports the positioning of vector error correction model to detect the Granger causal relationship among innovation, ICT infrastructure, and economic growth. The study first observes the long-run Granger causality results, detected by examining the statistical significance of ECT-1 coefficients. We find that when Δ ICTI is the dependent variable, the coefficients for ECT terms are statistically significant at 1 to 5% levels. This implies that ICT infrastructure converges to its long-run equilibrium path in response to changes in both economic growth and innovation activities. This is true for only case 2, where mobile phone is deployed as a proxy to ICT infrastructure (see Table 5).

Table 5. Empirical Results of Panel Granger Causality Test

Dependent Variable	Independent variables and ECT ₋₁											
--------------------	---	--	--	--	--	--	--	--	--	--	--	--

Sample 1: PATE, ICTI, and PCEG

	Case 1				Case 2				Case 3			
	$\Delta PATE$	$\Delta TELL$	$\Delta PCEG$	ECT_{-1}	$\Delta PATE$	$\Delta MOBP$	$\Delta PCEG$	ECT_{-1}	$\Delta PATE$	$\Delta INTU$	$\Delta CPEG$	ECT_{-1}
$\Delta PATE$	----	0.919	10.4*	-0.003**	----	4.11***	6.84*	-0.0001+	----	7.63*	0.684	-0.003
$\Delta ICTI$	0.72	----	1.33	-0.0001	14.2*	----	10.6*	-0.003*	14.9*	----	5.39*	-0.031
$\Delta PCEG$	1.28	8.08*	----	-0.004	19.4*	14.5*	----	-0.001*	6.14*	2.30	----	-0.013
	Case 4				Case 5				Case 6			
	$\Delta PATE$	$\Delta INTS$	$\Delta PCEG$	ECT_{-1}	$\Delta PATE$	$\Delta FIXB$	$\Delta PCEG$	ECT_{-1}	$\Delta PATE$	$\Delta CIII$	$\Delta PCEG$	ECT_{-1}
$\Delta PATE$	----	10.5*	1.45	-0.003	----	9.04*	4.35***	-0.007	----	0.26	15.3*	-0.005
$\Delta ICTI$	5.62**	----	17.7*	-0.029	3.26	----	12.3*	-0.001	0.85	----	1.86	-0.008
$\Delta PCEG$	25.4*	2.71	----	-0.003	3.09	6.86*	----	-0.026*	2.34	13.2*	----	-0.007

Sample 2: RDEX, ICTI, and PCEG

	Case 1				Case 2				Case 3			
	$\Delta RDEX$	$\Delta TELL$	$\Delta PCEG$	ECT_{-1}	$\Delta RDEX$	$\Delta MOBP$	$\Delta PCEG$	ECT_{-1}	$\Delta RDEX$	$\Delta INTU$	$\Delta CPEG$	ECT_{-1}
$\Delta RDEX$	----	0.20	11.9*	-0.031	----	0.79	4.90***	-0.001	----	2.90	6.28**	-0.009
$\Delta ICTI$	3.62	----	1.93	-0.003	2.25	----	1.86	-0.009*	0.416	----	0.238	-0.039
$\Delta PCEG$	5.96**	6.07**	----	-0.052	5.66*	5.38**	----	-0.003	6.01**	16.5*	----	-0.023
	Case 4				Case 5				Case 6			
	$\Delta RDEX$	$\Delta INTS$	$\Delta PCEG$	ECT_{-1}	$\Delta RDEX$	$\Delta FIXB$	$\Delta PCEG$	ECT_{-1}	$\Delta RDEX$	$\Delta CIII$	$\Delta PCEG$	ECT_{-1}
$\Delta RDEX$	----	0.78	15.8*	-0.102	----	3.052	7.16*	-0.015	----	17.9*	5.98**	-0.009
$\Delta ICTI$	0.67	----	11.7*	-0.025	1.054	----	11.22*	-0.058	1.26	----	16.1*	-0.009
$\Delta PCEG$	4.38***	7.21*	----	-0.082	4.81***	4.73***	----	-0.018*	5.39**	6.19**	----	-0.004

Sample 3: RRDA, ICTI, and PCEG

	Case 1				Case 2				Case 3			
	$\Delta RRDA$	$\Delta TELL$	$\Delta PCEG$	ECT_{-1}	$\Delta RRDA$	$\Delta MOBP$	$\Delta PCEG$	ECT_{-1}	$\Delta RRDA$	$\Delta INTU$	$\Delta CPEG$	ECT_{-1}
$\Delta RRDA$	----	8.28*	2.85	-0.006	----	7.03*	3.75***	-0.001	----	5.87**	3.91***	-0.001
$\Delta ICTI$	3.09	----	3.04	-0.001	4.84***	----	8.76*	-0.001*	3.19	----	10.0*	-0.029
$\Delta PCEG$	2.76	7.18*	----	-0.038	1.95	13.6*	----	-0.001	3.07	10.4*	----	-0.001
	Case 4				Case 5				Case 6			
	$\Delta RRDA$	$\Delta INTS$	$\Delta PCEG$	ECT_{-1}	$\Delta RRDA$	$\Delta FIXB$	$\Delta PCEG$	ECT_{-1}	$\Delta RRDA$	$\Delta CIII$	$\Delta PCEG$	ECT_{-1}
$\Delta RRDA$	----	3.209	1.671	-0.002	----	9.13*	3.81***	-0.002	----	8.18*	4.31***	-0.001
$\Delta ICTI$	2.19	----	14.1*	-0.005	1.56	----	4.21***	-0.076	1.68	----	2.32	-0.022
$\Delta PCEG$	3.97***	5.98**	----	-0.016	3.26	2.54	----	-0.023	2.37	8.70*	----	-0.019

Sample 4: HTEX, ICTI, and PCEG

	Case 1				Case 2				Case 3			
	Δ HTEX	Δ TELL	Δ PCEG	ECT ₋₁	Δ HTEX	Δ MOBP	Δ PCEG	ECT ₋₁	Δ HTEX	Δ INTU	Δ CPEG	ECT ₋₁
Δ HTEX	----	9.36*	2.976	-0.002	----	15.7**	3.26	-0.017	----	2.851	6.759**	-0.006
Δ ICTI	2.134	----	1.869	-0.002	21.6*	----	7.74*	-0.028*	3.46***	----	2.071	-0.024
Δ PCEG	14.4*	3.011	----	-0.017	12.3*	5.91**	----	-0.003	12.7*	8.65*	----	-0.002*
	Case 4				Case 5				Case 6			
	Δ HTEX	Δ INTS	Δ PCEG	ECT ₋₁	Δ HTEX	Δ FIXB	Δ PCEG	ECT ₋₁	Δ HTEX	Δ CIII	Δ PCEG	ECT ₋₁
Δ HTEX	----	2.327	2.538	-0.001	----	1.01	5.97**	-0.003	----	3.54***	6.38*	-0.0002*
Δ ICTI	5.307**	----	26.8*	-0.039	5.99**	----	8.20*	-0.022	4.19***	----	6.58**	-0.001
Δ PCEG	3.58***	4.87***	----	-0.004	14.4*	2.87	----	-0.006	15.4*	5.16**	----	-0.002*

Sample 5: STJA, ICTI, and PCEG

	Case 1				Case 2				Case 3			
	Δ STJA	Δ TELL	Δ PCEG	ECT ₋₁	Δ STJA	Δ MOBP	Δ PCEG	ECT ₋₁	Δ STJA	Δ INTU	Δ CPEG	ECT ₋₁
Δ STJA	----	27.6*	0.54	-0.001	----	14.6*	0.30	-0.001	----	8.37*	1.046	-0.003
Δ ICTI	1.45	----	0.288	-0.0002	3.82***	----	31.5*	-0.001	5.41**	----	2.37	-0.001
Δ PCEG	10.8*	6.03*	----	-0.005	11.3*	4.17***	----	-0.003	19.8*	2.93	----	-0.023
	Case 4				Case 5				Case 6			
	Δ STJA	Δ INTS	Δ PCEG	ECT ₋₁	Δ STJA	Δ FIXB	Δ PCEG	ECT ₋₁	Δ STJA	Δ CIII	Δ PCEG	ECT ₋₁
Δ STJA	----	0.61	3.48***	-0.009	----	25.4*	0.211	-0.006	----	22.7*	0.13	-0.001
Δ ICTI	13.7*	----	1.516	-0.024	5.87**	----	5.33**	-0.081	1.12	----	1.65	-0.003
Δ PCEG	19.3*	2.573	----	-0.039	4.15***	3.919***	----	-0.028	16.4*	0.37	----	-0.021

Setup 6: TRAD, ICTI, and PCEG

	Case 1				Case 2				Case 3			
	Δ TRAD	Δ TELL	Δ PCEG	ECT ₋₁	Δ TRAD	Δ MOBP	Δ PCEG	ECT ₋₁	Δ TRAD	Δ INTU	Δ CPEG	ECT ₋₁
Δ TRAD	----	10.3*	2.100	-0.001	----	5.49**	0.88	-0.001	----	7.49*	5.69**	-0.004
Δ ICTI	0.44	----	1.90	-0.0001	4.69***	----	11.6*	-0.010*	6.65**	----	22.1*	-0.094
Δ PCEG	4.25***	8.52*	----	-0.004	4.59***	12.8*	----	-0.001**	10.6*	13.9*	----	-0.003
	Case 4				Case 5				Case 6			
	Δ TRAD	Δ INTS	Δ PCEG	ECT ₋₁	Δ TRAD	Δ FIXB	Δ PCEG	ECT ₋₁	Δ TRAD	Δ CIII	Δ PCEG	ECT ₋₁
Δ TRAD	----	0.04	9.87*	-0.001	----	2.65	5.66**	-0.011	----	2.33	1.17	-0.006
Δ ICTI	0.071	----	5.624**	-0.003	2.59	----	10.6*	-0.053	2.37	----	1.63	-0.009
Δ PCEG	3.73***	0.207	----	-0.009	2.51	5.09***	----	-0.028	4.74***	4.40***	----	-0.001

Setup 7: CIAA, ICTI, and PCEG

	Case 1				Case 2				Case 3			
	Δ CIAA	Δ TELL	Δ PCEG	ECT ₋₁	Δ CIAA	Δ MOBP	Δ PCEG	ECT ₋₁	Δ CIAA	Δ INTU	Δ CPEG	ECT ₋₁
Δ CIAA	----	30.6*	0.84	-0.01	----	8.50*	8.85*	-0.02	----	5.11***	4.81***	-0.01
Δ ICTI	6.07**	----	4.36***	-0.001	0.75	----	16.8*	-0.003*	1.00	----	0.71	-0.03
Δ PCEG	4.20***	5.52***	----	-0.01	5.41**	5.15**	----	-0.001**	5.56**	6.79**	----	-0.004
	Case 4				Case 5				Case 6			
	Δ CIAA	Δ INTS	Δ PCEG	ECT ₋₁	Δ CIAA	Δ FIXB	Δ PCEG	ECT ₋₁	Δ CIAA	Δ CIII	Δ PCEG	ECT ₋₁
Δ CIAA	----	8.72*	1.793	-0.053	----	15.9*	1.57	-0.017	----	13.4*	2.30	-0.001
Δ ICTI	1.036	----	5.63**	-0.054	2.23	----	13.3*	-0.052	21.3*	----	1.48	-0.002
Δ PCEG	0.383	4.115***	----	-0.041	3.52***	4.31***	----	-0.015	7.04*	6.40*	----	-0.002

Note 1: PATE is total patents filled by both residents and non-residents, RDEX is research and development expenditure, RRDA is researchers in research and development activities, HTEX is high-technology exports, STJ is scientific and technical articles, TRAD is total trademark applications filled by both residents and non-residents, CIAA is composite index of innovation activities, TELL is telephone land lines, MOBP is mobile phones, INTU is internet users, INTS is internet servers, FIXB is fixed broadband, CIII is composite index of ICT infrastructure, and PCEG is per capita economic growth.

Note 2: Case 1 is where TELL is ICT infrastructure; Case 2 is where MOBP is ICT infrastructure; Case 3 is where INTU is ICT infrastructure; Case 4 is where INTS is ICT infrastructure; Case 5 is where FIXB is ICT infrastructure; and Case 6 is where CIII is ICT infrastructure.

Note 3: ICTI stands for ICT infrastructure and the inclusion of TELL, MOBP, INTU, INTS, FIXB, or CIII.

Note 4: ECT-1 is the lagged error-correction term.

Note 5: *, **, and *** indicate that the estimates are significant at the 1%, 5%, and 10% levels, respectively.

Subsequently, the deduction is that ICT infrastructure in G-20 countries is significantly influenced by both innovation activities and economic growth. The implication of this finding is that to stimulate long-run ICT infrastructure, it is imperious to facilitate both innovation activities and economic growth in the G-20 countries. However, the short-run results are mostly non-uniform. A brief summary of the non- uniform short-run Granger causality results is provided in Table 6 and reveals that the short-run adjustment dynamics vary across the nine samples and six cases.

Table 6. Summary of Short-run Granger Causality Results

Setups	Cases	Short-Run Causal Links		
		ICTI and INNI	PCEG and INNI	ICTI and PCEG
1	1	3d	1b	2a
	2	3c	1c	2c
	3	3c	1a	2b
	4	3c	1a	2b
	5	3a	1b	2c
	6	3d	1b	2a
2	1	3a	1b	2a
	2	3d	1b	2a
	3	3d	1c	2a
	4	3d	1c	2c
	5	3d	1c	2c
	6	3a	1c	2c
3	1	3a	1d	2a
	2	3a	1b	2c
	3	3a	1b	2c
	4	3d	1a	2c
	5	3a	1b	2b
	6	3a	1b	2b
4	1	3a	1a	2d
	2	3c	1c	2c
	3	3b	1c	2b
	4	3b	1a	2c
	5	3b	1c	2b
	6	3c	1c	2c
5	5	3a	1a	2a
	2	3c	1a	2c
	3	3c	1a	2d
	4	3b	1c	2d
	5	3c	1a	2c
	6	3a	1a	2d

6	1	3a	1a	2a
	2	3c	1a	2c
	3	3c	1c	2c
	4	3d	1c	2b
	5	3d	1b	2c
	6	3d	1a	2a
7	1	3c	1a	2c
	2	3a	1c	2c
	3	3a	1c	2a
	4	3a	1d	2c
	5	3a	1a	2c
	6	3c	1a	2a

Note 1: PATE is total patents filled by both residents and non-residents, RDEX is research and development expenditure, RRDA is researchers in research and development activities, HTEX is high-technology exports, STJ is scientific and technical articles, TRAD is total trademark applications filled by both residents and non-residents, CIIA is composite index of innovation activities, TELL is telephone land lines, MOBP is mobile phones, INTU is internet users, INTS is internet servers, FIXB is fixed broadband, CIII is composite index of ICT infrastructure, and PCEG is per capita economic growth.

Note 2: Case 1 is where TELL is ICT infrastructure; Case 2 is where MOBP is ICT infrastructure; Case 3 is where INTU is ICT infrastructure; Case 4 is where INTS is ICT infrastructure; Case 5 is where FIXB is ICT infrastructure; and Case 6 is where CIII is ICT infrastructure.

Note 3: INNI stands for innovation activities and indicates PATE, RDEX, RRDA, HTEX, STJ, TRAD, or CIII.

Note 4: Sample 1 is where PATE is innovation activity; Sample 2 is where RDEX is innovation activity; Sample 3 is where RRDA is innovation activity; Sample 4 is where HTEX is innovation activity; Sample 5 is where STJA is innovation activity; Sample 6 is where TRAD is innovation activity; and Sample 7 is where CIII is innovation activities.

Note 5: Case 1 is where TEL is ICT infrastructure; Case 2 is where MOB is ICT infrastructure; Case 3 is where INU is ICT infrastructure; Case 4 is where INS is ICT infrastructure; Case 5 is where FIB is ICT infrastructure; and Case 6 is where CII is ICT infrastructure.

Note 6: 1a is INNI to PCEG, 1b is PCEG to INNI, 1c is feedback for PCEG and INNI, 1d is neutrality for PCEG and INNI; 2a is ICTI to PCEG, 2b is PCEG to ICTI, 2c is feedback for PCEG and ICTI, 2d is neutrality for PCEG and ICTI; and 3a is ICTI to INNI, 3b is INNI to ICTI, 3c is feedback for ICTI and INNI, and 3d is neutrality for ICTI and INNI.

Some additional results, though not described in detail, warrant a brief note. Firstly, the deployment of we apply the cross-section dependence (CD) test developed by Pesaran (2004) to check the cross sectional dependency of the data. The CD test results ensure that the variables are not cross-sectionally correlated and hence, justified the use of our first generation panel unit root tests, such as IPS, ADF and PP. The results of these tests are not reported here and can be made available on demand.

Secondly, we performed couple of sensitivity analysis by changing the order of the VECM, deploying separate sample for G-20 countries developed group and developing group separately. There were no significant changes to the earlier results reported in Tables 4 and 5.

Thirdly, we deployed the generalized forecast error variance decomposition method to test the strength of the causal relationship between innovation, ICT infrastructure and economic growth. Variance decomposition shows the expected percentage variation in the dependent variable explained by the expected percentage variations in the independent variables over a forecasting horizon beyond the sample period of our study. The results of this section are not reported here and can be made available on demand. This analysis provides additional sustenance for the argument that there is causality among innovation, ICT infrastructure, and economic growth, as outlined above for seven samples and six cases in each sample of the present study.

4 CONCLUSIONS

This study explores the causal relationships among innovation, ICT infrastructure, and economic growth in the G-20 countries over the period 1961-2016. We find that these variables are cointegrated, depending upon the particular innovation activities and ICT infrastructure indicators that we consider. Most importantly, there is clear evidence that both innovation and economic growth matter in the determination of long-run ICT infrastructure. In some occasions, the effect is bidirectional, while it is unidirectional (either direction) in other occasions, depending upon the types of innovation and ICT infrastructure we incorporate in the estimation process.

The empirical results suggest that in order to stimulate ICT infrastructure in these countries, it is necessary to prioritize both innovation activities and economic growth. The reverse is also true, particularly with reference to short-run results. For instance, economic growth in these countries will generate more pronounced investment opportunities to enhance both innovation activities and ICT infrastructure.

APPENDIX A: FORMULATION OF COMPOSITE INDICES OF INNOVATION ACTIVITIES AND ICT INFRASTRUCTURE, USING PRINCIPAL COMPONENT ANALYSIS

Our paper designs two indices, namely, composite index of innovation activities (CIIA) and composite index of ICT infrastructure (CIII). These two indices are constructed by deploying principal component analysis (PCA) and by the use of innovation activities and ICT infrastructure indicators (see Table 1). The procedure of designing these indices are available in Pradhan et al. (2016a,b; 2017a,b), and hence, these discussions are not available here. Tables A.1 and A.2 present the PCA results for both CIIA and CIII, respectively.

Table A.1: Summary of PCA-related Information for our CIIA

Part A: Eigen Analysis of Correlation Matrix

PCs	Eigen Value	Proportion Variance	Cumulative Percentage
1	2.771	0.396	0.396
2	2.073	0.296	0.692
3	0.918	0.131	0.823
4	0.634	0.091	0.914
5	0.379	0.054	0.968
6	0.118	0.017	0.985

Part B: Eigen Vectors (component loadings)

Variables	PC1	PC2	PC3	PC4	PC5	PC6
PATE	0.387	-0.390	-0.137	0.408	0.581	-0.082
RDEX	0.321	0.372	-0.001	0.743	-0.451	0.039
RRDA	0.501	-0.321	-0.145	-0.081	0.033	0.036
HTEX	0.394	0.459	0.062	-0.271	0.261	0.688
STJA	0.130	-0.211	0.968	0.039	-0.017	0.003
TRAD	0.435	-0.327	-0.120	-0.363	-0.600	-0.015

Note 1: PCs denotes principal components.

Note 2: PATE is total patents filled by both residents and non-residents, RDEX is research and development expenditure, RRDA is researchers in research and development activities, HTEX is high- technology exports, STJ is scientific and technical articles, TRAD is total trademark applications filled by both residents and non-residents, and CIIA is composite index of innovation activities.

Table A.2: Summary of PCA-related Information for our CIII

Part A: Eigen Analysis of Correlation Matrix

PCs	Eigen Value	Proportion Variance	Cumulative Percentage
1	2.869	0.574	0.574
2	1.140	0.228	0.802
3	0.586	0.117	0.919
4	0.302	0.060	0.979
5	0.104	0.021	1.000

Part B: Eigen Vectors (component loadings)

Variables	PC1	PC2	PC3	PC4	PC5
TEL	0.296	-0.661	0.615	-0.311	0.024
MOB	0.329	0.688	0.290	-0.578	-0.027
INU	0.547	0.131	0.096	0.484	0.663
INS	0.437	-0.269	-0.727	-0.441	0.120
FIB	0.560	0.027	-0.022	0.375	-0.738

Note 1: PCs denotes principal components.

Note 2: TELL is telephone land lines, MOBP is mobile phones, INTU is internet users, INTS is internet servers, FIXB is fixed broadband, and CIII is composite index of information and communication technology infrastructure.

REFERENCES

Agenor, P. and Neanidis, K. C. (2015). Innovation, Public Capital, and Growth. *Journal of Macroeconomics*, 44 (1): 252-275.

Arvanitis, S., Loukis, E. and Diamantopoulou, V. (2013). The Effect of soft ICT Capital on Innovation Performance of Greek Firms. *Journal of Enterprise Information Management*, 26 (6), 679-701.

Chakraborty, C. and Nandi, B. (2009). Telecommunication Adoption and Economic Growth in Developing Countries: Do Levels of Development Matter. *Journal of Academy of Business and Economics*, 9 (2): 51-61.

Chakraborty, C. and Nandi, B. (2011). Mainline Telecommunications Infrastructure, Levels of Development and Economic Growth: Evidence from a Panel of Developing Countries. *Telecommunications Policy*, 35 (1): 441-449.

Cuervo, M. R. V. and Menendez, A. J. L. (2006). A Multivariate Framework for the Analysis of the Digital Divide: Evidence from the European Union-15. *Information and Management*, 43: 756-766.

Dutta, A. (2001). Telecommunications and Economic Activity: An Analysis of Granger Causality. *Journal of Management Information Systems*, 17 (4): 71-95.

Galindo, M. and Mendez, M. T. (2014). Entrepreneurship, Economic Growth, and Innovation: Are Feedback Effects at Work. *Journal of Business Research*, 67 (5): 825- 829.

Guloglu, B. and Tekin, R. B. (2012). A Panel Causality Analysis of the Relationship among Research and Development, Innovation, and Economic Growth in High-Income OECD Countries. *Eurasian Economic Review*, 2 (1): 32-47.

Hasan, I. and Tucci, C. L. (2010). The Innovation-economic Growth Nexus: Global Evidence. *Research Policy*, 39 (10): 1264-1276.

Kirchhoff, B., Catherine, A., Newbert, S. L. and Hasan, I. (2007). The Influence of University R&D Expenditures on New Business Formations and Employment Growth. *Entrepreneurship Theory and Practice*, 31 (4): 543-559.

- Lee, S. H., Levendis, J. and Gutierrez, L. (2012). Telecommunications and Economic Growth: An Empirical Analysis of Sub-Saharan Africa. *Applied Economics*, 44 (4): 461- 469.
- Maradana, R. P., Pradhan, R. P., Dash, S., Gaurav, K., Jayakumar, M., and Chatterjee, D. (2017). Does innovation promote economic growth? Evidence from European countries. *Journal of Innovation and Entrepreneurship*, 6 (1): 1-23.
- Mehmood, B. and Siddiqui, W. (2013). What Causes What? Panel Cointegration Approach on Investment in Telecommunications and Economic Growth: Case of Asian Countries. *Romanian Economic Journal*, 16 (47): 3-16.
- OECD (2005). *Economics Policy Reforms 2005: Going for Growth*. OECD, Paris.
- OECD (2010). *OECD Information Technology Outlook 2010*. Organisation for Economic Co-Operation and Development (OECD), Paris.
- Pradhan, R. P., Arvin, M. B. and Norman, N. R. (2015). The Dynamics of Information and Communications Technologies Infrastructure, Economic Growth, and Financial Development: Evidence from Asian Countries. *Technology in Society*, 42 (1): 135-149.
- Pradhan, R. P., Arvin, M. B., Hall, J. H., and Nair, M. (2016a). Innovation, Financial Development, and Economic Growth in Eurozone Countries. *Applied Economics Letters*, 23 (16): 1141-1144.
- Pradhan, R. P., Arvin, M. B., Mittal, J. and Bahmani, S. (2016b). Relationships between Telecommunications Infrastructure, Capital Formation, and Economic Growth. *International Journal of Technology Management*, 70 (2-3): 157-176.
- Pradhan, R. P., Arvin, M. B., Bahmani, S. and Bennett, S. E. (2017a). The Innovation- growth Link in OECD Countries: Could other Macroeconomic Variables Matter? *Technology in Society*, 51: 113-123.
- Pradhan, R. P., Arvin, M. B., Nair, M., Mittal, J. and Norman, N. R. (2017b). Telecommunications infrastructure and usage and the FDI-growth nexus: evidence from Asian-21 countries. *Information Technology for Development*, 23 (2), 235-260.
- Ramlan, J. and Ahmed, E. M. (2009). Information and Communication Technology (ICT) and Human Capital Management Trend in Malaysia's Economic Development. *Applied Economics Letters*, 16 (18): 1881-1886.
- Sadraoui, T., Ali, T. B., and Deguachi, B. (2014). Economic Growth and International R&D Cooperation: A Panel Granger Causality Analysis. *International Journal of Econometrics and Financial Management*, 2 (1): 7-21.
- Sassi, S. and Goaid, M. (2013). Financial development, ICT diffusion and economic growth: lessons from MENA region. *Telecommunications Policy*, 37: 252-261.
- Shiu, A. and Lam, P. L. (2008). Causal Relationship between Telecommunications and Economic Growth in China and Its Regions. *Regional Studies*, 42 (5): 705-718.
- Vu, K. M. (2013). Information and Communication Technology (ICT) and Singapore's Economic Growth. *Information Economic Policy*, 25 (4): 284-300.
- Yoo, S. H. and Kwak, S. J. (2004). Information Technology and Economic Development in Korea: A Causality Study. *International Journal of Technology Management*, 27 (1):57- 67.
- Zahra, K., Azim, P. and Mahmood, A. (2008). Telecommunications Infrastructure Development and Economic Growth: A Panel Data Approach. *Pakistan Development Review*, 47 (4): 711-726.
- Zhang, F. and Li, D. (2017). Regional ICT Access and Entrepreneurship: Evidence from China. *Information and Management* (forthcoming).

1384 IS THE PRICE OF SPANISH WINE IN HONG KONG THE SAME AS IN WASHINGTON? GEOGRAPHICAL DIFFERENCES ON CONSUMER PREFERENCES AND REPUTATION

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ABSTRACT

This paper, by means of applying hedonic price theory, analyses consumer willingness to pay for the several characteristics attributed to each Spanish wine in the different international markets where the wine is commercialised. The basic methodological idea behind our purpose is that there is asymmetric information between producers and consumers in international markets, and that the degree of asymmetry increases with distance between the country where the wine is produced and the one where it is finally consumed. In order to test the proposed hypothesis we have created a database with more than 30,000 observations corresponding to almost 3,000 Spanish wines sold in 28 different countries. The database has information on the features specific to the appellation of origin, the winery, and the wine, such as the type of wine, vintage, the technical characteristics of the production process... Additionally, we have the prices of the wines in each of these international markets as well as the corresponding markets' structural characteristics. Results show that those objective characteristics and the strongest reputation features, such as main appellation of origin and/or those internationally known, the marks or scores given by international wine advocates, gain relevance when determining the prices for Spanish wines in those farthest markets. In contrast, weakest reputation features such as the characteristics of wineries and smallest appellation of origin with low reputation in international markets, decline with distance.

Key words: Hedonic price theory, Spanish wine, Spatial differences in preferences, reputation and distance.

1 INTRODUCTION

Spain is one of the main world producers of wine. In particular, according to the OIV (2018) it is the first country in vineyard surface area (with near 13% of the world total), the third world producer of wine (almost 15%) and the first exporter of the world in quantity and third in value. Wines with some geographical protection system, such as appellation of origin, hereinafter AO, accounted for more than half of the total value of these exports in 2016 with an increase in the average price over the previous year of more than 2%, while the price of wine without AO it fell almost 8% in that same year (ICEX, 2017). However, wines with AO in 2016 accounted for around 15% of the total volume of wine exported from Spain.

In this market, two phenomena have occurred at the same time: the increase and reinforcement of geographical protection systems for wine, and the increase in the internationally recognized quality of wines produced in Spain.

Geographic protection systems protect both producers and consumers. To the former, because it prevents that other competitors outside the reference zone, or that do not follow certain quality criteria within the area, could use this distinctive denomination in their wines, becoming a barrier to entry. For consumers because it guarantees a certain quality level. Therefore, consumers will be willing to pay an additional amount for the wines included in these protection systems. However, although the effectiveness of appellation of origin as a brand in national markets is tested (Núñez, 2014), it is worth asking to what extent these protection systems act as differentiating elements in international markets.

However, the multitude of appellations of origin, wineries and wines that incorporate differential quality elements generates information asymmetry in this market between consumers and producers. Therefore, mechanisms have been developed to alleviate this problem such as rankings and wine guides with ratings. In this sense, the internationally known Parker list, which evaluates the quality of wines from around the world, included in the 1988-1992 quinquennium around three Spanish wines each year among the top 100 (highest quality), while in the last five years for which this list has been published, 2012-2016, the average number rises to nine, which in some way shows the increase in quality perceived internationally. The importance of these elements of reputation is observed in many articles, showing that these aspects can account for up to 50% of the observed price variations.

However, given that the reputation in this market requires some familiarity and knowledge of the product and that these elements of reputation may disappear with distance, if they are not properly amplified, it is expected that the purchase decision in international markets will be different from the one occurring in the source. In this way, the farther the international market is from the origin, the purchase decision will be based more on objective aspects and on the "stronger" reputation elements that have been promoted in such markets.

The objective of this paper is to investigate the price determinants of the wines produced in Spain in different international markets, using the hedonic approach to price formation. It is possible to assess the changes in preferences in relation to wine, and the role that different reputation elements play in different markets: geographic systems of protection, especially large appellation of origin, as opposed to small ones, as well as the score in the evaluations by experts. Likewise, the role of distance to the market of origin in the changes of these preferences will be verified. For this, the following section summarises the hedonic pricing approach and a brief review of the main papers that have addressed

this issue in the wine market, both nationally and internationally. In the third section we describe the wine database that has been created for this purpose resulting from the fusion of different sources of information. The fourth section presents the results obtained from the estimation of the hedonic function for 28 different markets, as well as the relationship of these coefficients with physical distance. The usual section of conclusions ends the article.

2. LITERATURE REVIEW

One of the most popular procedures used to analyse the prices of different goods is the hedonic pricing approach. This methodology assumes that every product can be broken down into a series of attributes, each of which has a market value. Thus within the product market there is heterogeneity depending on the attributes that are possessed, however, homogeneity is assumed in the attribute markets (that is, all products that have an attribute have it equally). In this way, the price of each product is obtained by accumulation of each one's attributes. An implicit assumption of this model is the competitive equilibrium in the markets of attributes and of the final good. A review on the theoretical and empirical aspects related to this approach can be found in Malpezzi (2002), Chin and Chau (2016) and De la Peña et al. (2016).

There are some contributions that are considered pioneers (Waight, 1929; Court, 1939 and Houthakker, 1952). However, the theoretical support for this theory comes from the work of Lancaster (1966) who developed the New Consumer Theory. This New Consumer Theory analysed consumer behavior in the market of heterogeneous goods, and showed that the utility of the products is derived from their attributes and not the products themselves. Rosen (1974) was the one who finally developed a unified treatment of the underlying market model in the hedonic pricing approach and established the theoretical foundations of hedonic price functions. In his model he considered that there were implicit markets and equilibrium prices for each attribute, so the equilibrium price of the good was the result of the sum of all the prices of present attributes.

In Rosen's (1974) model, a market of a good differentiated by its n characteristics or attributes is considered. In this way, the utility function of the individual depends on the consumption of his basket of the rest of goods and the characteristics provided by the i th unit acquired from the analysed good. Thus, the consumer will maximise his utility subject to the budget constraint and for this he will choose the levels of each attribute that satisfy that the marginal rate of substitution between each of the characteristics of the analysed good and the rest of goods must be equal to the marginal price of such attribute. Therefore, and this is the fundamental result, the implicit marginal price of each characteristic is obtained by taking partial derivatives of the hedonic price function expressed as a function of the characteristics of the good.

The Rosen model has a second stage, usually ignored, in which the supply side is explicit and where the marginal cost of producing an additional unit of each attribute is defined. In equilibrium, the consumer and producer demand and supply functions, respectively, are tangent to the hedonic function in the same point. This point expresses the equality between marginal price and cost, that is to say the equilibrium of the market, so that the quantity of each attribute that will be produced is such that makes the marginal cost of its production equal to the final price that the consumer is willing to pay.

To analyse any market, especially Spanish wine market in different geographical areas, the key assumptions of Rosen's (1974) equilibrium model under perfect competition in the attributes must be validated. These aspects refer to perfect information, the freedom of entry and exit and the non-existence of market power. In this sense, there is a high flow of information available to consumers and producers in the wine market, although information asymmetry is also observed, given that the quality of the product, manifested through some immaterial attributes related to reputation, has a great relevance in the determination of the price. In addition, the transmission of information deteriorates with distance. However, there are corrective mechanisms for this asymmetry. Thus, numerous guides or apps about these specific wine markets are periodically published, accessible to the agents that offer quality evaluations and which allow recovering of some of the lost information. On the other hand, there is a limited freedom of entry and exit in the Spanish wine market with appellation of origin. The entry in the market is limited in the case of geographical protection systems, since vinerias located outside the zones will be automatically excluded and there are entry limitations of the producers within the geographical areas themselves. Nevertheless, the low average size of the firms in the sector seems to point to a low market power of the producers. On the other hand, final consumers are clearly price-acceptors, but channels of distributions (retail distribution and HORECA distribution channel) can operate as a barrier to entry in some markets.

The hedonic pricing approach has made a great contribution to the analysis of the implicit prices of the attributes or characteristics associated to certain goods. There are numerous papers that use this procedure to quantify the willingness to pay for the different attributes manifested by consumers, becoming a tool for analysing revealed preferences. The housing and car markets are where this procedure has been most used.

The paper of Shapiro (1983), for the case of Chilean wines, is considered the first study conducted in the wine market. His aim was to find the effect of the producer's reputation on the price of wine. Ockowski (1993) estimates the function of hedonic prices for Australian premium wine. This author reached the conclusion that quality is a relevant factor in determining the price. He also finds that exclusivity, which he identifies with the vintage and the amount produced of each wine, is also an aspect of great relevance. Another conclusion to be highlighted is the positive influence of innovation. Nerlove (1995) obtains a preference for bottled imported versus bulk wines in the Swedish case. It emphasizes the relevance of the alcoholic content and other identifying quality attributes. Landon and Smith (1998) focus on the impact of wine quality against the reputation of the producer in the case of wines from Bordeaux (France), reaching the conclusion that reputation is more important than quality. Costanigro, McCluskey and Miilhammer (2007) find out, analysing the American market, that the valuations in the attributes are different between white and red wines. They also

encountered hedonic valuation differences when they segmented the sample by category of the wine according to its price. Benfratello (2009), analysing Italian wines, obtains that reputation and more objective characteristics are more influential in the price of wine than sensory characteristics and more subjective attributes, but this author also concludes that the brand is more important than quality.

In the specific case of Spanish wines, the different studies available for small samples and specific regions, show the great importance of reputation aspects and in particular certain appellation of origin, in price determination and especially those of great renown. This result is repeated regardless of the region analysed. Table 1 presents a summary of the papers carried out for the specific case of wines from Spain.

Table 1. Papers that analyse the formation of prices of Spanish wines using the hedonic pricing approach

Authors	Geographical region	Aim	Conclusions
Gil and Sánchez (1997)	Aragón and Navarra	Analysis of consumers preferences and AO in price formation	Important differences in preferences between rural and urban environment. Influence of AO in prices
Angulo et al. (2000)	Spain	Price formation with a large number of attributes	Vintage, quality and AO determine price of wine
Morrilla and Martínez (2002)	Spain	Influence of winery attributes	Quality, vintage and size of winery have an important effect on prices.
Rodríguez and Castillo (2009)	Castilla-La Mancha	Effects of regional AO in Price formation	Very important influence of AO and quality on prices
Núñez (2014)	Spain	Effects of AO in prices. Winery and wine attributes	Very important influence of AO in price formation

3 DATA

The database used in this paper has been developed from merging several sources of information, properly combined to consider the different aspects that can influence the price of wine.

In relation to wines, there is information about the characteristics of the wine: the type of wine (red, white, rosé, sparkling, generous), alcoholic content, aging, sensory characteristics, type of grape used in its production, productive processes used, amount produced and appellation of origin to which it belongs, among other information that correspond to different vintages of each of the different references. This information comes mainly from different editions of the Guide Gourmets of the Wines of Spain. This information is complemented with price data for wines obtained from Wine-Searcher for the 28 markets in which at least 500 different Spanish wines are sold (Spain, Germany, United States, United Kingdom, Belgium, Netherlands, Switzerland, Denmark, Japan, Austria, Australia, Brazil, Canada, Finland, France, Hong Kong, Ireland, Italy, Mexico, Norway, New Zealand, Portugal, Poland, Czech Republic, Russian Federation, Singapore, Sweden and Taiwan). These prices correspond to the average sales' prices (without taxes) in November 2017 in each market. In relation to the appellation of origin, there is a broad set of information on the age, production, climatic characteristics, and indicators of presence in each international market obtained from the two previous sources and the official information from the Ministry of Agriculture.

In relation to wineries, information is also available on characteristics that may influence the price paid for each wine related to its productive capacity and aging, as well as the proportion of sales abroad and the way in which it is present in the different international markets. This information comes mainly from the Guide Gourmets de *Vinos de España*, as well as Wine-Searcher.

There is also firm specific information on features that could influence the final price: their production capacity (size), distribution (belonging to international groups, presence in foreign markets) and promotion (intangible assets, brands and financial capacity). This information has been obtained mainly from the ORBIS database. However, in spite of having this wide database, only some of the variables have finally been used, eliminating others either because they show high collinearity or because they do not affect the price.

Additionally, an indicator on transport costs between Spain and each one of the analysed markets has been calculated using the information provided by the website of UPS transport company. The cost of transport has been constructed by evaluating the cost of transporting a 70 kg package between Madrid and each of the capitals of each market, considering all available transport services. The weighting for each service, among those available for each destination, is the result of ordering the different prices from lowest to highest, giving twice the weight to the cheapest service with respect to the next most expensive one. For the sum to be equal to one, the two most expensive transport services are weighted equally.

The final sample is composed of 32,903 observations, corresponding to 2,910 Spanish wines from 1,048 different wineries, corresponding to 101 appellation of origin and 13 different vintages that are sold in 28 different markets.

4 RESULTS

To estimate the hedonic price function and obtain the coefficients corresponding to the 28 markets, we proceed as follows: First, a single hedonic function is estimated with all data for all countries. Then, we estimate as many hedonic functions as considered attributes, in each of them we choose an attribute which is interacted with a set of representative dummies of each of the markets, eliminating Spain, which is the reference market. In this way we get coefficients for each attribute in each market.

Finally, 81 attributes have been considered. We have included 5 levels of geographical protection (regions with quality wines -*Vinos de calidad*-, regions with local wines -*Vinos de la Tierra*-, appellations of origin, Qualified appellations of origin and Pago wines); 28 specific appellations of origin (only appellations of origin with at least 250 wines in the sample are included). Regarding the wineries, their year of foundation, size, aging capacity, percentage sold abroad and group membership have been considered. In relation to the wines we have included the type (red, white, sparkling and generous), the vintage of the wine, the alcoholic content, the type of official aging (crianza, reserve and great reserve³³⁹), the aging time that takes place specifically in barrels expressed in months, 31 types of grapes (all those found in at least 250 wines), wine production and historical average score of the wine. The transport cost to the market in which the price has been obtained is also included, to control for that direct effect on prices. The results are presented in Table 2.

Table 2. Results of the estimation of the hedonic price function for Spanish wines in 28 domestic and international markets

Attributes	Coefficient	Standard deviation	Price increase in %	Ho: Equality on countries coefficients	Relation of countries coefficients with distance to Spain
Constant	4.355***	1.090	7688.937	-	-
AO	-0.275***	0.087	-24.012	104,63***	2,84***
Qualified AO	-0.097	0.090	-9.239	49,74***	3,21***
Quality wine regions	-0.343***	0.127	-29.054	1,62	0,74
Pago wine	-0.219**	0.099	-19.699	1,38	
Local regional wine	-0.123	0.094	-11.560	8,74***	2,21**
Incorporation year	-1.303***	0.140	-72.831	170,51***	0,61***
Vineyard area	0.005	0.003	0.523	151,16***	0,61***
Aging capacity	0.022***	0.003	2.195	138,43***	0,92***
% of production sold in international markets	0.04***	0.008	4.053	167,88***	0,67***
Group of firms	0.033***	0.007	3.338	66,59***	2,77***
White wine	0.114***	0.037	12.063	24,89***	2,68***
Sparkling wine	-0.065	0.138	-6.282	3,91***	3,64***
Generous wine	0.332***	0.075	39.442	3,01***	5,34***
Red wine	0.154***	0.026	16.616	133,57***	2,96***
Vintage	0.298***	0.006	34.770	154,04***	1,61***
Alcoholic content	-0.368***	0.038	-30.805	170,51***	0,80**
Crianza	-0.315***	0.012	-26.998	19,57***	3,18***
Reserve	-0.086***	0.012	-8.202	21,86***	3,64***
Great reserve	0.093***	0.017	9.746	9,34***	2,68**
Aging in barrels	0.055***	0.002	5.690	27,74***	0,41***
Wine production	-0.17***	0.003	-15.639	169,24***	0,29***
Score	2.354***	0.036	953.213	170,34***	0,73***
Transport cost	0.045***	0.001	4.574	176,94***	0,39***

Table 2. Results of the estimation of the hedonic price function for Spanish wines in 28 domestic and international markets (Results on Appellation of Origin)

Attributes	Coefficient	Standard deviation	Price increase in %	Ho: Equality on countries coefficients	Relation of countries coefficients with distance to Spain
AO Alicante	0.032	0.040	3.265	2,30***	2,16
AO Bierzo	-0.025	0.051	-2.514	6,07***	2,69**
AO Cariñena	-0.157***	0.043	-14.556	4,87***	0,72
AO Castilla	-0.422***	0.043	-34.424	3,51***	1,33
AO Castilla y León	0.045	0.042	4.617	4,60***	0,84
AO Catalunya	-0.287***	0.036	-24.937	1,90***	1,45
AO Cava	0.545***	0.139	72.454	3,99***	3,68
AO Costers del Segre	-0.016	0.033	-1.579	2,35***	4,24
AO Emporda	0.153***	0.034	16.551	2,69***	2,41*
AO Jumilla	0.369***	0.035	44.644	3,09***	1,86*
AO La Mancha	-0.149***	0.048	-13.884	2,46***	1,60
AO Malaga	0.306***	0.055	35.833	1,20	
AO Montsant	0.026	0.032	2.668	2,20***	1,56
AO Navarra	-0.132***	0.025	-12.393	5,82***	3,46***
AO Penedes	-0.064**	0.025	-6.163	5,23***	3,72***

³³⁹ The official type of aging in Spain for red wines is: **Crianza** (wines that have had a minimum aging period of 24 months of which at least 6 will have remained in barrels. In the case of the appellations of origin of La Rioja and Ribera del Duero, this minimum time in barrels is increased to at least 12 months), **Reserve** (wines with a minimum aging period of 36 months, of which they will have remained at least 12 in barrels. In the case of the appellations of origin of La Rioja and Ribera del Duero, this minimum time in barrels is increased to at least 18 months), and **Great reserve wines** (wines with a minimum aging period of 60 months, of which at least 18 years have remained in barrels. In the case of the appellations of origin of La Rioja and Ribera del Duero, this minimum time in barrels is increased to at least 24 months).

AO Priorat	0.39***	0.025	47.679	10,17***	2,98**
AO Ribeiro	-0.13	0.082	-12.176	2,13***	4,32**
AO Ribera del Duero	0.45***	0.021	56.871	41,93***	2,60**
AO Rueda	0.04	0.044	4.039	7,90***	2,92**
AO Rias Baixas	0.297***	0.094	34.548	4,69***	2,55***
AO Somontano	0.193***	0.034	21.304	1,39	
AO Terra Alta	-0.007	0.047	-0.718	1,13	
AO Toro	0.132***	0.025	14.070	10,69***	3,44
AO Valdeorras	0.048	0.061	4.912	0,89	
AO Valencia	-0.1**	0.048	-9.497	1,77**	4,08**
AO Campo de Borja	0.047	0.044	4.810	1,64**	2,72**
AO Mallorca	0.249***	0.073	28.287	2,25***	3,95***

Table 2. Results of the estimation of the hedonic price function for Spanish wines in 28 domestic and international markets (Results on Type of grapes in wine)

Attributes	Coefficient	Standard deviation	Price increase in %	Ho: Equality on countries coefficients	Relation of countries coefficients with distance to Spain
Albarino	-0.004	0.095	-0.420	4,59***	2,56***
Bobal	-0.206***	0.063	-18.607	1,96***	3,17
Cabernet Franc	-0.228***	0.085	-20.417	0,03	
Cabernet Sauvignon	0.131***	0.038	13.985	10,48***	6,13***
Callet	-0.063	0.098	-6.080	1,43	
Chardonnay	-0.195***	0.033	-17.738	4,70***	5,87***
Garnacha Blanca	-0.198***	0.050	-17.923	2,37***	4,27***
GarnachaTinta	-0.216***	0.032	-19.446	15,81***	4,07***
Garnacha Tintorera	-0.355***	0.072	-29.859	1,84**	-10,67
Godello	0.092	0.062	9.633	1,08	
Graciano	-0.244***	0.052	-21.656	9,53***	10,98**
Loureiro	0.919***	0.329	150.704	1,68**	5,07
Macabeo	-0.375***	0.035	-31.283	6,65***	4,83***
Malvasia	-0.142**	0.072	-13.276	2,22***	5,91
Mazuela	-0.494***	0.043	-38.964	11,46***	5,37**
Mencia	-0.149***	0.054	-13.825	6,52***	3,42***
Merlot	-0.228***	0.043	-20.394	8,00***	5,80*
Monastrell	-0.421***	0.042	-34.390	4,15***	5,00*
Moscatel	-0.244***	0.051	-21.619	1,91***	6,27
Parellada	-0.408***	0.088	-33.483	2,45***	10,92**
Pedro Ximenez	0.338***	0.079	40.207	1,78**	5,52**
Petit Verdot	0.08	0.077	8.317	1,49*	9,73**
Pietro Picudo	-0.191***	0.058	-17.348	2,00**	2,54*
Pinot Noir	0.025	0.056	2.552	1,17	
Sauvignon Blanc	-0.026	0.048	-2.566	2,60***	1,37
Syrah	-0.406***	0.037	-33.386	8,60***	4,61**
Tempranillo	-0.137***	0.030	-12.797	99,84***	3,38***
Treixadura	0.113	0.107	11.956	1,71**	4,50
Verdejo	-0.093*	0.048	-8.901	7,00***	3,02***
Viognier	0.092	0.087	9.684	1,23	
Xarello	0.005	0.042	0.505	4,46***	5,90**

The coefficients and standard deviations obtained for each attribute are presented in the first and second columns. In the third column, we present the estimated increase in the price of wine derived from having the different attributes, in the case of the qualitative variables (increase in prices for owning the attribute versus not possessing it), and the elasticity in % in the case of continuous variables (its interpretation would be the percentage increase in prices if doubling the variable in question). It can be verified that of the 81 variables introduced, 58 have been statistically significant. If we exclude the dummies of different appellation of origin and grapes, 19 of the 23 considered attributes have been statistically significant. However, in the other two groups of variables, as expected, the levels of statistical significance are lower either due to a lack of sufficient number of wines in some appellations or types of grapes or because they do not have a direct effect on the price of wine in the international markets.

The most relevant question for the purpose of this paper is to determine if, as expected, there are systematic differences in the values of the coefficients between markets. Then, we proceed to estimate coefficients particularised by country for each of the attributes, as previously indicated. One issue that should be clarified is that, although a statistically non-significant aggregate result is obtained, this does not imply that it is for all markets, given that the aggregate result is a weighting average of those that could be obtained individually. When the hypothesis of equality of the obtained coefficients for the different attributes between markets is tested, only in 12 attributes this equality hypothesis can not be rejected. For 19 of the remaining attributes where the null hypothesis of equality of coefficients between markets is

rejected, there is not a relationship with physical distance, that is, the differences between markets must be caused by other factors different to distance. On the contrary, in 50 attributes, which represent more than 60% of those initially introduced, this relationship with distance is confirmed.

Consequently, it seems that there is evidence of differences across countries in considered attributes at the time of the formation of wine prices and also in favor of a linear relationship with distance.

In relation to geographic protection levels, it should be noted that correct interpretation of results requires that results presented here must be combined with those obtained by other variables. In particular, since we have included variables for some specific appellation of origin, results should be combined with them in order to obtain adequate interpretation. However, one result that is observed is that in general, at least three of the levels of geographical protection show a greater effect with the distance, being these the ones that larger number of wines and geographical indications comprise. That is to say, the appellation of origin serves as a crucial element to determine the price and, especially for large and/or prestigious ones this importance increases with distance. It is interesting the result obtained in the case of PAGO WINES (wines of the best quality and more exclusive characteristics) whose effect does not differ between international markets. This result may be mainly due to the loss of information with distance and that this type of protection, which usually encompasses a single winery, may not be recognised as a brand in remote markets.

Regarding the attributes of the winery, statistically significant effects are obtained, although of small size, except for the one obtained in the case of the incorporation year (the opposite of the age of the winery). These small impacts reflect that the brand associated with the winery does not survive with distance, opposite to the effect found in relation to the appellation of origin. Age, with a positive sign, probably reflects the ability and experience to penetrate in international markets, as well as the wineries having better competitive positions in the markets, which allows them to increase their prices.

Again, in the case of specific attributes of wine, statistically significant effects are obtained that acquire greater relevance with distance, which would indicate that the objective attributes, although to a lesser extent than those that reflect quality or reputation, serve consumers when deciding their propensities to pay. Special attention must be paid in the case of expert's scores, an attribute of reputation, which has greater relevance in terms of distance and a very high elasticity that reflects the importance that critics have in shaping the price. Regarding this elasticity, it should be noted that by construction scores have a small variance (values can be in the interval 75 to 100). A wine that is at 75 points and that would change to 100 points would increase its score by 33%, which would imply multiplying the price by three. This would be the extreme case. However, the importance of this aspect in shaping the international and also national prices of Spanish wines is notorious, in line with the results found in other papers for wines from different countries.

One of the characteristics that has more impact on the price of wine is aging. The results show a greater propensity to pay for older wines. The elasticity of aging in barrels is applied to a continuous variable, while the one related to the official types of aging are decomposed in three dummy variables. In any case, this objective attribute increases its positive effect on price with distance.

In relation to the different geographical appellation included, such as the appellation of origin, we find somewhat miscellaneous effects. The effect in this Table must be interpreted in relation to all omitted appellations. In the first place, there are more statistically non-significant coefficients than in previous characteristics, although making a country-by-country analysis, some of these disaggregated coefficients become statistically significant. Specifically, in four cases there are no statistically significant differences between country and the aggregate. In nine cases these differences are not related to distance. Finally, in the case of larger or more established appellations (Rioja, Ribera...) their impact is increased with distance. Therefore, only these appellations are relevant in international markets and the rest lose their strength and brand character.

5 CONCLUSIONS

As expected, the estimation of the hedonic functions for Spanish wines in 28 different international markets show that there are different propensities to pay for the different attributes of wine in different markets. In addition, there is evidence that these differences depend on physical distance from Spain, at least for a majority of the wine attributes considered.

The objective elements (for example: type of wine and aging) and reputation (such as criticism made by specialists, or belonging to large and reputable appellations of origin), persist with distance and intensify with it, since they are used as elements to determine the propensity to pay for wines and reduce the existing problem of information asymmetry.

REFERENCES

- Angulo, A.M.; Gil, J.M.; Gracia, A. and Sánchez, M. (2000): "Hedonic prices for Spanish red quality wine", *British Food Journal*, 102(7), 481-493.
- Benfratello, L.; Massimiliano, P. and Sacchetto, S. (2009): "Taste or reputation: what drives market prices in the wine industry? Estimation of a hedonic model for Italian premium wines", *Applied Economics*, 41(17), 2197-2209.
- Chin, T.L. and Chau, K.W. (2003): "A critical review of literature on hedonic price model", *International Journal for Housing and its Applications*, 27(2), 145-165.
- Costanigro, M.; McCluskey, J.J. and Mittelhammer, R.C. (2007): "Segmenting the wine market based on price: hedonic regression when different prices mean different products", *Journal of Agricultural Economics*, 58(3), 454-466.
- Court, A.T. (1939): "Hedonic price indexes with automotive examples", en *The Dynamics of Automobile Demand*, General Motors

Corporation, Nueva York, 99-117.

De la Peña, M.R.; Núñez-Serrano, J.A.; Turrión, J. and Velázquez, F.J. (2016): "Are innovations relevant for consumers in the hospitality industry? A hedonic approach for Cuban hotels", *Tourism Management*, 55, 184-196.

Gemma Perza Peiris (2010) "Una primera aplicación de un modelo de precios hedónicos al vino catalán", Documentos de investigación del Programa de Doctorado en Economía Aplicada, Universidad Autónoma de Barcelona.

Gil, J.M., and M. Sanchez. (1997) "Consumer preferences for wine attributes: a conjoint approach", *British Food Journal*, 99(1), 3-11.

Houthakker, H.S. (1952): "Compensated changes in quantities and qualities consumed", *Review of Economic Studies*, 19(3), 155-164.

ICEX (2017): Instituto Español de Comercio Exterior; www.icex.es

Landon, S. and Smith, C.E. (1998): "Quality Expectations, Reputation and Price", *Southern Economic Journal*, 64(3), 628-647.

Lancaster, K. (1966): "A new approach to consumer theory", *Journal of Political Economy*, 74, 132-157. Malpezzi (2002)

Morilla, J. y Martínez, A (2002) "Una función de precios hedónicos para el vino español de calidad en el año 2000", *Estudios Agrosociales y Pesqueros*, 196, 173-193.

Nerlove, M. (1995) "Hedonic price function and the measurement of preferences: the case of Swedish wine consumers", *European Economic Review*, 39(9), 1697-1716.

Núñez, J. (2014): "Creación de valor a través de denominaciones de origen en el caso del vino en España. Una aplicación hedónica", Trabajo Fin de Grado, Universidad de Valladolid.

Oczkowski, E. (1993): "A hedonic price function for Australian premium table wine", *Australian Journal of Agricultural Economics*, 38(1), 93-110.

Rodríguez, M. and Castillo, J.S (2009): "El vino tinto de denominación de origen en castilla-la mancha: un análisis de precios hedónicos", *Revista Española de Estudios Agrosociales y Pesqueros*, 222, 103-123.

Rosen, S. (1974): "Hedonic prices and implicit markets: product differentiation in pure competition", *Journal of Political Economy*, 82(1), 34-55.

Shapiro, C. (1983) "Premiums for high quality products as returns to reputation", *Quarterly Journal of Economics*, 98(4), 659-679.

OIV (2018): Databases and Statistics. International Organisation of vine and wine; www.oiv.int

Waugh, F.V. (1929): *Quality as a determinant of vegetable prices: A statistical study of quality factors influencing vegetable prices in the Boston wholesale market*, Columbia University Press, New York.

Wine-Searcher (2016): www.wine-searcher.com

1388 PRODUCTIVITY, ACCESSIBILITY AND FIRM HETEROGENEITY

ABSTRACT

The aim of this paper is to determine if the effect of accessibility on productivity, usually estimated for large sets of firms or sectors of economic activity, differs with firm characteristics. Some reasons may lead to believe that this should be the case. First, the accessibility measures often incorporate an agglomeration component, and the agglomeration of economic activity is more crucial in those activities with larger knowledge spillovers, requiring access to qualified and specific labour markets as well as specific inputs of productions. Detecting this kind of elasticity sensibility to firm heterogeneity could explain the different values provided by the economic literature for the elasticity of accessibility to productivity. For this purpose, we use four different accessibility indicators from the firms’ perspective, (i) accessibility to labour markets, (ii) accessibility to commodities used as intermediate goods,(iii) accessibility to the markets of other firms that use the firm’s production, and (iv) accessibility to final consumers’ markets. The evaluation of these accessibility indicators comes from a previous paper that uses a wide range of microdata datasets that allow the computation of these indicators to firm level, over a sample of nearly 60,000 Spanish manufacturing firms active in 2009 according to SABI database (which belongs to a set of databases including AMADEUS and ORBIS elaborated by Bureau van Dijk). Using the panel data elaborated from SABI we estimate total factor productivity applying non parametric procedures. Applying geographically weighted regression procedures, we obtain an estimate of the elasticity of each of the four accessibility indicators for each firm included in the sample. Resulting elasticities are regressed against several variables of firms’ characteristics to identify the features that may determine observed changes in elasticities and the extent of their exerted influence. Through a polynomial smooth estimation we define the form of derived relationships, without imposing ex ante restrictions on the nature of these encountered relations. Results show that some firm’s features such as the technological content, the relative labour intensity and the type of intermediate inputs requirements, have statistically significant impacts over elasticity values in the expected direction.

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1005 MEASURING CAPITALIZED PREMIUMS IN HOME VALUES DUE TO VISUAL ACCESSIBILITY OF SCENIC LANDSCAPES USING GWR BASED SPATIAL HEDONIC MODEL

ABSTRACT

This research uses a hedonic modelling approach to assess the implicit willingness to pay for the visual accessibility of voluntarily protected, privately owned, scenic lands based on single family houses. These lands are perpetually protected to preserve natural, historic, and scenic characteristics. The capitalized house premium was captured using a visual accessibility variable, which was a combined weighted measure of 'view' and 'proximity,' referred to here as the Gravity Inspired Visibility Index. Both global (adjusted R²=0.52, AICc=29,828) and geographically weighted regression models (adjusted R²=0.59, AICc=29,729) estimated the price effect but the geographically weighted regression model outperformed the global model. The results from the geographically weighted regression model indicated an average 3.4% price premium on the mean value of homes in the study area to a high of 34% in few sample locations. The paper offers a useful framework for evaluating the effect of land protection for planning and real estate purposes. It also offers useful insights for conservation agencies, local governments, professional planners, and real estate professionals for prioritizing land sites with scenic views.

REFERENCES:

Mittal, Jay and S. Byahut. 2017. 'Scenic Landscapes, Visual Accessibility and Premium Values in a Single Family Housing Market: A Spatial Hedonic Approach,' Environment and Planning B: Urban Analytics and City Science, Sage. DOI: <http://journals.sagepub.com/doi/full/10.1177/2399808317702147>.
 Mittal, Jay and S. Byahut. 2016. 'Value Capitalization Effects of Golf Courses, Waterfronts, Parks, Open Spaces and Green Landscapes: A Cross-Disciplinary Review,' Journal of Sustainable Real Estate, Vol. 8, No. 1, 62-94.
 Mittal, Jay. 2014. 'Value Capitalization Effect of Protected Properties - A comparison of Conservation Easement with Mixed-Bag Open Spaces,' Journal of Sustainable Real Estate, Vol. 6, No. 1 (2014): 23-46.

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SS04.3. Spatial Econometric Interaction Modelling

1555 DEVELOPING A SPATIAL ASSOCIATION MEASURE FOR SYMBOLIC DATA

ABSTRACT

Contemporary spatial data analyses deal with two problems regarding data sets: very detailed or, in contradiction, imprecise description of spatial units. The first one results in data multiplication (e.g. Big Data, interrelated data), while the second one in data generalization (e.g. national average data, average annual data). Both of them are a big challenge for studies of spatial autocorrelation. Symbolic data analysis, introduced by E. Diday in the late eighties, deals with such problems. Its aim is to examine interval, multi-categorical, histogram, and structured data, rather than numerical or categorical data. For such data composition, typical measures of spatial autocorrelation, e.g. Moran's I, join-count statistics, are insufficient. This paper introduces a new spatial autocorrelation index which operates on symbolic multi-categorical data. We apply Allen's set algebra and extend Jaccard index to construct a measure of similarity in space. We examine its properties and limitations, and use real spatial data sets for empirical validation.

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1578 THE DYNAMIC IMPACT OF MACROECONOMIC AGGREGATES ON REGIONAL HOUSING PRICES IN THE US: EVIDENCE BASED ON FACTOR-AUGMENTED VECTOR AUTOREGRESSIONS

ABSTRAC

In this study interest centers on regional differences in the response of housing prices to monetary policy shocks in the US. We address this issue by analyzing monthly housing price data for 417 regions using a factor- augmented vector autoregression (FAVAR) model. Bayesian model estimation is based on Gibbs sampling with normal-gamma priors for the autoregressive coefficients and factor loadings, while monetary policy shocks are identified using high frequency surprises around policy announcements as external instruments. The empirical findings indicate the impact of monetary policy shocks on house prices to be relatively small in comparison to the magnitude of real price fluctuations, but with significant differences between regions located in different states, most prominently between those in the Sun Belt and Midwest states. Key words: Regional housing prices, macroeconomic aggregates, factor-augmented VAR, Bayesian estimation, high frequency identification JEL: C11, C32, E52, R31

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1682 THE EFFECT OF MONETARY AND POLICY SHOCKS ON REGIONAL DISPARITIES

ABSTRACT

The aim of this paper is to assess the impact of fiscal policy (monetary policy) on regional disparities. From a theoretical point of view, policy changes may affect regions differently due to their heterogeneity in their industry- mix and their financial networks. To test for this hypothesis, we use an unbalanced panel of 26 advanced economies countries from 1990 to 2016, estimating the dynamic response of regional inequalities to policy changes, controlling and interacting for country's structural variables and specific variables associated to regional inequalities. The paper follows the method proposed by Jorda (2005) and Teulings and Zubanov (2014), which consists of estimating Impulse Response Functions (IRFs) based on local projections of the effect of downturns on regional inequalities. In detail, in the first part, to establish the impact of fiscal policy (monetary policy) on regional inequalities, for each future period k we estimate an equation where the change in regional inequality through time is regressed against a measure of unanticipated changes in government spending (policy rates), an autoregressive component to capture persistence and a set of country's controls including: (i) the average regional real per capita income; (ii) the initial level of dispersion in the regional real per capita income; (iii) the number of regions in each country. In the second part of the paper, to take into account the role of macroeconomic and regional conditions in shaping the response of regional disparities to economic downturns, we follow the approach of Auerbach and Gorodnichenko (2013) and Abiad et al. (2015), that allow interaction between policy changes and economic conditions. On the one hand, the set of such variables includes, among others, business cycle conditions, the degree of trade openness, the initial level of inequalities. On the other hand, we take into consideration industry-mix variables to analyse the region's output response to these shocks.

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SS05.1. Spatial Analysis: From Neural Computing to Deep Learning

1032 THE MACHINE LEARNING APPROACH TO THE ANALYSIS OF IMAGE-BASED SPATIAL FLOW DATA

ABSTRACT

With the advancement of communication and information technology, we are able to capture real-time or near-real time data on human and vehicle flows in space and time. Such type of data is useful for our understanding of spatial interaction in real time which in turn will shed light on decision analysis and management of pedestrian and vehicle flows. The analysis will also inform and enrich our spatial interaction models which largely target on static data. Real-time modeling of spatial interaction will then be made possible. The analysis of such type of video- based complex data call for new analytical/algorithmic paradigms. Machine learning in general and deep learning in particular appears to be an effective approach to the analysis of people and vehicle flows. This paper introduces novel machine-learning methods for such type of data. The conceptual and theoretical arguments will be substantiated by real-life applications.

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1035 SPATIAL STRATIFIED HETEROGENEITY IN REGIONAL SCIENCE: CHALLENGE AND SOLUTION

ABSTRACT

Spatial stratified heterogeneity (SSH), referring to the phenomena that within strata variance is less than between strata variance, such as countries and urban/rural areas, is ubiquitous in regional science. SSH may exist in parameters, covariates or even mechanisms in a spatial dataset, resulting in confounding when a global model was used to the SSH dataset. Therefore, SSH should be tested at the early stage of data analysis. In another aspect, SSH is a window for human to understand the nature from Aristotle time for simplification, and SSH as a pieces of information may imply the determinants of the observed nonrandom pattern. Geographical detector q statistic is a new tool to measure the degree of SSH and to test the statistical significance of SSH. The q-statistic can also be used to explore the determinants of a phenomena, by testing its SSH which is partitioned by a suspected variable, according to a philosophy that two variables may be causally associated if their spatial patterns tend to be consistent. We illustrate the geographical detector q-statistic by two applications: SSH and its determinants of human population distribution in China and urbanization in the country.

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1266 MODELING SPATIAL ASSOCIATION AND INTERACTION USING DEEP CONVOLUTIONAL NEURAL NETWORKS (CNNS)

ABSTRACT

Convolutional Neural Networks (CNNS), also known as ConvoNets, are multilayered versatile deep learning machines that are good at image classification/segmentation and object recognition. Even as free-download of pre-trained models of CNNS such as AlexNet, GoogLeNet; LeNet, Unet, etc. make CNNS appear commonplace, they are still largely black boxes. However, there is an active and ongoing research effort to uncover what makes CNNS so successful in many formerly formidable AI/machine learning tasks, and to discover fundamental principles and theoretical underpinnings behind them. Continuing in this vein of research, we propose to explore how we may incorporate spatial interaction into CNN type architecture by using local neighborhood functions, which capture spatial association and interaction at regional and sub-regional level. This is intended to be analogous to how local indicators of spatial association - e.g., Local Moran's I statistic, Getis-Ord statistic, etc. are computed. These types of features capture spatial dependence in a way that the filters that are typically used in CNNS to detect edges (e.g., straight lines, vertical lines, etc.) for image processing do not. For exploring the feasibility and utility of our proposed approach, we will use a set of raster-based images relevant to regional science to conduct a set of empirical experiments. Our paper is intended to explore how ideas from deep learning networks might be useful for characterizing and modeling spatial interaction and association, and to help introduce deep learning to the field of regional science.

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SS07.1. Economic Corridors, Development and Regional Cooperation in South Asia and Beyond

1092 THE IMPACT OF TRANS HIMALAYAN TRANSPORT AND INSTITUTIONAL CORRIDORS

ABSTRACT

South Asia forms a quite distinct group of countries in the World, with very low income per capita, strong rural population, high urbanization rates, reduced health care expenditures, high levels of remittances, reduced level of rents from natural resources, young population, reduced amount of trade in services, poor logistics and very reduced level of governmental expenditure. The implementation of Institutional and Transport Corridors across the Himalayas implies potentiates stronger flows of trade, investment and people. Nevertheless the starting point is very low since existing cooperation terms of trade, migration and investment is more connected to countries outside the region than to countries of South Asia. The main research question is to know what are the impediments against a stronger and enriching cooperation between the countries of South Asia that are constraining trade and development in the region? Putting differently will the deployment of transport and communication infrastructure be viable and have impact on trade? To respond to these questions we first formulate a gravity trade model consistent with interantional trade theory and suitable enough to be calibrated with available data on trade flows. Then we collect data on the acessibility patterns of the existing terrestrial and maritime networks and calibrate the trade model. Finally we simulate model for different accessibilities associated to the creation of different links in the Trans Himalayan roads. We conclude that institutional barriers are relevant for trade, maritime networks will continue to play their role and that road networks would have different effects across the regions.

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1370 CONCEPTUALISING ECONOMIC CORRIDORS AND ITS SIGNIFICANCE FOR SOUTH ASIA³⁴⁰**Siegfried O. Wolf**Director of Research, South Asia Democratic Forum (SADF), Brussels, Belgium. Email: Siegfried.Wolf@sadf.eu**ABSTRACT**

Economic corridors (ECs) have become the centre of attention of many planned development initiatives worldwide. Yet no source has been able to provide a clear definition. The definition of economic corridors remains challenged largely due to the multitude of factors determining its genesis and nature, and thus no corridor matches exactly the characteristics of another. Most of the conceptual work analysing economic corridors has been conducted in the context of spatial planning and geography, centred around the urban development and potential spill-over effects into peripheral (rural) areas, predominantly linked with ADB initiated projects in Southeast Asia. Although many studies about Beijing's 'Belt and Road Initiative' (BRI), and especially those with regard to the China-Pakistan Economic Corridor (CPEC), have been published in recent years, it remains to be seen, how far these BRI related analysis will contribute to the conceptualisation and commonly accepted theoretical understanding of ECs. In brief, the presented paper understands ECs not only as a sole infrastructural measure for transport but rather as a comprehensive development approach to foster industrial capabilities, services, trade, and investment. It is therefore expected that the establishment of ECs will be accompanied by crucial social and political impacts. To realise its full potential, economic corridors need to determine its economic-, organisational-, institutional-, behavioural-, political-, and planning characteristics. Without these characteristics, any 'corridor' cannot be considered 'economic'. Furthermore, it is argued that these characteristics do not only describe economic corridors as such but also serve as indicators to measure its feasibility, functionality, effectivity, and efficiency. Based on the existing literature and authors' own observations about ECs in Asia (Focus CPEC), the paper offers a new conceptualisation of ECs based on identified characteristics and indicators for a successful planning and implementation of ECs.

GENESIS OF THE ECONOMIC CORRIDOR CONCEPT

As mentioned above, economic corridors (EC) have become the main focus of development projects in various countries and regions.³⁴¹ Nevertheless, there is no clear definition of EC in the literature yet.³⁴² One of the apparent challenges considering the conceptualisation of EC is, that due to the multitude of factors determining their genesis and nature, no corridor 'matches exactly the characteristics of another'.³⁴³ Due to the increasing prominence among political and economic decision-makers and media, ECs moved to the focus of academic research too. Most of the conceptual work regarding ECs were conducted in the context of spatial planning and geography centred around urban development, predominantly linked with Asian Development Bank (ADB) initiated (and funded) projects in Southeast Asia. Also, numerous research projects regarding the geneses of corridor development were conducted by the World Bank. For instance, in the context of spatial development policy frameworks such as the European Spatial Development Perspective (ESDP), the European Union (EU) substantial work are carried out. In order to boost the growth of alternative dynamics 'global economic integration zones' in 'peripheral areas' notions of 'Euro-Corridors' with multimodal infrastructure, 'transnational cross border development corridors', 'infrastructure networks', or 'Trans-European Networks/TENs' are receiving attention and promotion.³⁴⁴ However, it remains to be seen how far the studies on ECs, which are part of the Chinese 'One Belt, One Road' (OBOR) or 'Belt and Road' (BRI) initiative, will contribute to the conceptualisation and commonly accepted theoretical understanding of ECs.

The following statements can be made to encompass the prevalent notions of ECs. Initially, the idea of 'corridor' was developed to address trade and accessibility problems of landlocked countries.³⁴⁵ It is thus expected that corridors should be created along with physical links between regions (besides linking urban nodes) which were not connected before.³⁴⁶ According to more recent consensus, the purpose and function of 'transport corridors' is not just a matter of building

340 Paper presented at the 12th World Congress of the RSAI 2018, Goa, 29 May – 1 June 2018.

341 H. Safitri, Economic Corridor Policy, Land Concentration and 'Social Exclusion' Java's Economic Corridor Policy Implementation, Indonesia. The Hague: International Institute of Social Studies, 2012, p. 1.
<http://thesis.eur.nl/pub/13083/> (accessed on 15 October 2017).

342 P. De, 'Economic Corridors and Regional Economic Integration'. In P. De, K. Iyengar (Eds.), *Developing Economic Corridors in South Asia*. Manila: Asian Development Bank (ADB), 2014, p. 15.

<https://www.adb.org/sites/default/files/publication/162073/developing-economic-corridors.pdf> (accessed on 15 October 2017).

343 H.-P. Brunner, *What is Economic Corridor Development and What Can It Achieve in Asia's Subregions?*, ADB Working Paper Series on Regional Economic Integration, No. 117, Manila: Asian Development Bank, 2013, p. 1.

<http://www.adb.org/publications/economic-corridor-development-and-what-it-can-achieve-in-asia-subregions> (accessed on 15 October 2017).

344 K. Pain, *Global Cities, Gateways and Corridors: Hierarchies, Roles and Functions*, Paper presented at an International Conference on Gateways and Corridors (Canada's Asia-Pacific Gateway and Corridor Initiative) on May 2-4, 2007, Vancouver, Canada, 2007, p. 8.

http://www.gateway-corridor.com/roundconfpapers/documents/Pain_Kathy_Winnipeg.pdf (accessed on 15 October 2017).

345 J.-F. Arvis et Al., *Connecting Landlocked Developing Countries to Markets: Trade Corridors in the 21st Century*. Washington, DC: World Bank, 2011, p. viii. <https://openknowledge.worldbank.org/handle/10986/2286> (accessed on 15 October 2017).

346 R. Banomyong, 'Comparing Corridor Development in the Greater Mekong Subregion and the Indonesia-Malaysia-Thailand Growth Triangle', In: N. Fau, et. Al. (Eds.), *Transnational Dynamics in Southeast Asia. The Greater Mekong Subregion and Malacca Straits Economic Corridors*. Institute of Southeast Asian Studies, Singapore, 2014, p. 88.

infrastructure, especially not when these corridors should be efficient in reducing trade costs as well as in improving connectivity.³⁴⁷

Furthermore, it is becoming obvious that ‘transport corridors’ are reinforcing the importance of the urban nodes³⁴⁸ but do not create much spill-over effects for the development of peripheries. In other words, ‘transport corridors’ did not aim at the sustainable development and comprehensive modernisation of larger territorial entities. Subsequently, the view on the ‘corridor concept’ just from a transportation perspective must be extended gradually by considering aspects of trade, logistics³⁴⁹, urban development, and supply chains³⁵⁰. As stated by Srivastava³⁵¹, five stages are considered in the evolution of a transport corridor into an EC: Stage 1: transport corridor; Stage 2: transport and trade facilitation corridor; Stage 3: logistic corridor; Stage 4: urban development corridor; Stage 5: economic corridor. Other analysts like De³⁵² having a narrower model of the different phases in the development of an EC and pointing at three stages: (1) transport corridor; (2) logistic corridor; (3) economic corridor. But De is like Srivastava emphasising the significance of trade facilitation, logistics, and services as catalysts in EC development.³⁵³

However, besides the different notion on the development stages of an economic corridor, one can state following: Firstly, an economic corridor can be seen as the most advanced, developed, and complex corridor. Secondly, besides the initial transport corridors, new models appeared like trade, logistics, or supply chain corridors³⁵⁴ which coexist and represent the broad spectrum of different types of development strategies and respective corridors.

The concept of economic corridor was first mentioned and presented as a major goal in the Greater Mekong Subregion (GMS) Development Plan.³⁵⁵ More concretely, the concept of ECs got ‘introduced at the GMS Eighth Ministerial Meeting in 1998 at a time when the GMS-ECP [Economic Cooperation Program] implementation was stalled by the Asian Currency Crisis’³⁵⁶. Against this backdrop, the introduction of ECs in the regional development strategies was supposed to deal with the difficulties and impacts of the financial crisis by stimulating economic endeavours along existing infrastructure for transport.³⁵⁷

It is significant to mention that these innovative types of corridors have exceeded their primary functions by attracting investments and generating economic impulses and actions.³⁵⁸ Through the integration of local economies into international value and supply chains, the newly appeared concept of economic corridors became ‘indispensable in promoting global and regional economic development’.³⁵⁹

CONCEPTUALISATION OF ECONOMIC CORRIDORS

Today, it is widely recognised that EC is a development instrument aiming at the increase of economic growth over a certain period of time and in a specific area.³⁶⁰ Therefore, ECs are linking economic agents along a defined geographical entity and usually provide important connections among major economic nodes centred in urban landscapes.³⁶¹ Consecutively, ECs are seen as ‘driver for inclusive growth’ link production, trade and infrastructure within the identified geographic framework of the centre of economic activities (here described as ‘growth zones’) and extend benefits to their lagging hinterlands (peripheries) as well as more and disadvantaged, remote (rural, mountainous, and arid) areas

347 J.-F. Arvis et Al., *Connecting Landlocked Developing Countries to Markets: Trade Corridors in the 21st Century*, op.cit., p. xv.

348 P. Srivastava, *Regional Corridors Development in Regional Cooperation*, op.cit., p. 2.

349 Ruth Banomyong states: ‘A logistics corridor focuses not only on the physical connection but also on how the flow and storage of freight, people and vehicles is optimised in the corridor with the support of capable service providers and a facilitating institutional environment provided by relevant agencies’. R. Banomyong, *Comparing Corridor Development in the Greater Mekong Subregion and the Indonesia-Malaysia-Thailand Growth Triangle*, op.cit., p. 89.

350 The purpose of such corridors is to reduce costs and time, to reduce the reliability performance, flexibility, and transparency of supply chain networks. As such, supply chain corridors enhance the services associated with the production and movement of goods and other activities that (directly) affect the value of goods.

351 P. Srivastava, *Regional Corridors Development in Regional Cooperation*, op.cit.

352 P. De, *Economic Corridors and Regional Economic Integration*, op.cit., p. 16.

353 P. De, *Economic Corridors and Regional Economic Integration*, op.cit., p. 16; P. Srivastava, *Regional Corridors Development*, op.cit.

354 J.-F. Arvis et Al. *The Cost of Being Landlocked: Logistics Costs and Supply Chain Reliability*. WB Directions in Development. Washington, DC: World Bank, 2010; <https://openknowledge.worldbank.org/handle/10986/7420> (accessed on 15 October 2017); R. Banomyong, Ruth, ‘The Greater Mekong Sub-region of Southeast Asia: Improving Logistics Connectivity’, in: J. H. Bookbinder (Ed.). *Handbook of Global Logistics: Transportation in International Supply Chains*. International Series in Operations Research & Management Science. New York: Springer, 2013, pp. 69–96.

355 ADB, *Central Asia Regional Economic Cooperation Corridor Performance and Measurement and Monitoring: A Forward-Looking Retrospective*. Asian Development Bank (ADB), Manila, Philippines, 2014, p. 2;

<https://www.adb.org/publications/carec-corridor-performance-measurement-and-monitoring-forward-looking-retrospective> (accessed on 15 October 2017); C. Wiemer, *Economic Corridors for the Greater Mekong Subregion*. EAI Background Brief No. 479. Singapore: East Asian Institute, National University of Singapore, 2009, pp. 2-3.

<http://www.eai.nus.edu.sg/publications/files/BB479.pdf> (accessed on 15 October 2017).

356 M. Ishida, *Special Economic Zones and Economic Corridors*. ERIA Discussion Paper Series. Economic Research Institute for ASEAN and East Asia, Jakarta, Indonesia, 2009, p. 4.

<https://core.ac.uk/download/pdf/9306181.pdf> (accessed on 15 October 2017).

357 *Ibidem*, p. 4.

358 R. Banomyong, *The Greater Mekong Sub-region of Southeast Asia: Improving Logistics Connectivity*, op.cit. p. 2.

359 ADB, *Central Asia Regional Economic Cooperation Corridor Performance and Measurement and Monitoring: A Forward-Looking Retrospective*, op.cit., p. 1.

360 H. Safriti, *Economic Corridor Policy, Land Concentration and ‘Social Exclusion’ Java’s Economic Corridor Policy Implementation*, Indonesia, op.cit. p. 1; AGIL. (2000). *Zona Paz Economic Corridor Strategy*. Concept Paper for USAID/Guatemala. Guatemala-CAP Income Generation Activities Project (AGIL). Bethesda, MD: Abt Association Inc., p. 2. http://pdf.usaid.gov/pdf_docs/Pnacy158.pdf (accessed on 15 October 2017).

³⁶¹ H.P.-Brunner, *What is Economic Corridor Development and What Can It Achieve in Asia’s Subregions?*, op.cit.

through transport development and expansion of production activities.³⁶² As such, an EC is designed to create global, regional and domestic value and supply chains through the creation and/or connection of economic centres and produces (ideally) positive multi-sectoral spill-over effects.

In brief, this study understands the concept of EC not only as a sole infrastructural measure for transport of commodities, but rather as a comprehensive development approach to foster industrial and other manufacturing capabilities, services, trade and investment. It is expected that the establishment of ECs will be accompanied by crucial economic as well as social and political impacts within and beyond the chosen areas. Keeping this in mind, an EC requires economic, organisational, institutional, behavioural, political, and planning aspects (interpreted here as characteristics) in order for its full potential to be realised. Without these key characteristics, a 'corridor' cannot be understood as 'economic'. Additionally, it is argued that these characteristics do not only describe an EC but they also serve as indicators measuring the feasibility, functionality, effectivity, and efficiency of an EC. Based on the existing literature as well as on the authors own observations, the following indicators can be identified:

I. Conceptualised geographic framework

As a spatial entity, an EC development is featured by the identification and definition of a geographical framework. According to its conceptualisation, the geographical framework can span different scales³⁶³: from a broad scale which is mostly regional or national to a narrower scale aiming at tackling specific, geographically limited local bottlenecks. As such, a geographical framework for the development of interconnection can take place between entire regions, within a region, across sub-regions (on a national or transnational scale) between states, within a state or subordinated territorial entities of a state (like a province of a state), as well as across regions and sub-regions.³⁶⁴ The chosen space for a corridor can be natural (given) defined area or a specifically planned one.³⁶⁵ In both cases, however, it must possess a minimum of 'geographic cohesiveness' which is not undermined by (extraordinary) unthrifty, unfavourable environmental conditions like vast deserts, restive mountainous areas, or other areas with misanthropic conditions.

Based on Srivastava's³⁶⁶ notion of a development process based on 'sequencing zones' of national corridors and their subsequent transformation into regional corridors, one can state that the geographic framework of EC has been 'fluent' since its establishment. This 'fluency' depends on the extent of regionality and area of influence of an EC. Here, Srivastava identified four zones which are demarcated with inter-zone sequencing: Zone 1: narrow national corridor, with focus on the initial and/or upgrading of existing road infrastructure; Zone 2: broad national corridor, including area development and railroads; Zone 3: narrow regional corridor, including trade facilitation and logistics; and Zone 4: broad regional corridor, including cross-border economic zones (here understood as 'transnational growth zone').³⁶⁷

II. Identified growth zones

The identification of growth zones within the geographical framework is a crucial part of each EC planning process. The growth zones³⁶⁸ are centres of economic activities, which are also described as economic and industrial nodes^{369,370}. These nodes function as a major provider of most of the essential material and human resources³⁷¹ but also as a logistic and communication hubs or gateways within and the outer space of the defined geographical framework of the EC.³⁷² In other words, the growth zones or nodes constitute the backbone of each geographical framework of EC. Basically, there are different types of nodes (growth zones): commercial nodes (linking important places of economic activities in each participating country of an EC), border nodes (containing foremost border hubs like checkpoints and dry ports), gateway nodes (creating access to external markets), or interchange nodes (determining intersects between different routes of a corridor or between different corridors).³⁷³

362 M. Ishida, I. Isono, 'Old, New and Potential Economic Corridor in the Mekong Region', In M. Ishida (Ed.). *Emerging Corridors in the Mekong Region*, BRC Research Report No. 8. Bangkok: Bangkok Research Center (BRC), 2012, pp. 1-42; <http://www.ide.go.jp/English/Publish/Download/Brc/08.html> (accessed on 15 October 2017); C. Wiemer, *Economic Corridors for the Greater Mekong Subregion*, op.cit., pp. 2-3.

363 Arvis et Al., *Connecting Landlocked Developing Countries to Markets: Trade Corridors in the 21st Century*, op.cit., p. 161.

364 K. Yhome, R.R. Chaturvedy, 'Emerging Trans-Regional Corridors: Perspectives from South and Southeast Asia', In K. Yhome & R. R. Chaturvedy. (Eds.). *Emerging Trans-Regional Corridors: South and South East Asia*. New Delhi: Observer Research Foundation (ORF), 2017, p. 1. <http://cf.orfonline.org/wp-content/uploads/2017/01/GP-ORF-Transregional-Corridors.pdf> (accessed on 15 October 2017).

365 B. Marrian, *Towards a General Theory of Corridor Development in South Africa*, 2011.

<http://repository.up.ac.za/bitstream/handle/2263/8193/5b6.pdf?sequence=1> (accessed on 15 October 2017).

366 P. Srivastava, *Regional Corridors Development in Regional Cooperation*, op.cit., pp. 10-12.

367 Ibidem, pp. 10-12.

368 The 'growth zones' are also described as 'growth poles'. Patricia Uberoi states that the notion of 'growth zones' or 'are often allied with various other more or less interchangeable terms, such as 'cooperation zone', growth poles' or 'growth polygon'. P. Uberoi, *The BCIM Economic Corridor: A Leap into the Unknown?*, Working Paper, Institute of Chinese Studies (ICS), New Delhi, India, 2014, p. 4.

<http://www.icsin.org/uploads/2015/05/15/89cb0691df2fa541b6972080968fd6ce.pdf> (accessed on 15 October 2017).

369 The nodes are also described as hubs or clusters.

370 P. Srivastava, *Regional Corridors Development in Regional Cooperation*, op.cit., p. 2; C. Wiemer, *Economic Corridors for the Greater Mekong Subregion*, op.cit., p. 2.

371 H.-P. Brunner, *What is Economic Corridor Development and What Can It Achieve in Asia's Subregions?*, op.cit., p. 1.

372 M. Castells, *The Information Age: Economy, Society and Culture*. Volume 1: *The Rise of Network Society*. Second Edition. Oxford: Blackwell Publishers, 1996; M. Franck, 'Twin Cities and Urban Pairs, A New Level in Urban Hierarchies Structuring Transnational Corridors? A Case Study of the Pekanbaru-Dumai Urban Pair', In: N. Fau et Al. (Eds.). *Transnational Dynamics in Southeast Asia. The Greater Mekong Subregion and Malacca Straits Economic Corridors*. Institute of Southeast Asian Studies, Singapore, 2014, p. 271.

373 E.-X Lainé, 'Mukdahan and Savannakhet, Internationalization Process of Twin Mekong Border Cities on the East West Economic Corridor', In: N. Fau et Al., (Eds.), *Transnational Dynamics in Southeast Asia. The Greater Mekong Subregion and Malacca Straits Economic Corridors*. Institute of Southeast Asian Studies, Singapore, 2014, pp. 338-360.

III. Established special economic zones (SEZ)

In theory and in practice, the establishment of special economic zones (SEZs) is a crucial instrument to develop growth zones. As for economic corridors, there is a multiplicity of names and forms of SEZs with differing functions.³⁷⁴ For example, many SEZs have characteristics of bonded zones (BZs), freeports, export processing zones (EPZs) or free trade zones (FTZs), industrial, science and technology parks, petrochemical zones, and provide special incentives, including tax exemption or reduction to investors, purpose-built production facilities, duty-free imports and simplified customs procedures, and other services.³⁷⁵

There are, however, essential structural features to describe SEZs. Firstly, SEZs can be defined as a geographically demarcated area within a state. Secondly, this formally delimited part of a national territory operates with different — typically more liberal and administrative efficient, regulatory and fiscal regimes (set of laws and/or measures) than to the rest of the state.³⁷⁶ Thirdly, SEZs are usually entrusted with a dedicated governance structure to run the regulatory regime of a SEZ.³⁷⁷ Fourthly, SEZs are usually provided with a physical infrastructure supporting the activities of the firms and other economic agents operating within them.³⁷⁸ In order for SEZ to be fully-fledged, sufficient multimodal infrastructure (road, railway, waterway) connecting the zone to markets, sources of inputs, and major transportation hubs (gateways) such as ports and airports must be provided.³⁷⁹ In addition, there must be an adequate public transportation, real estate for business and housing (e.g. industrial or mixed-up parks), education and health facilities, water supply, and telecommunications networks.³⁸⁰ Plus, SEZs also demand overall security, including energy and food security as well as protection against crime and terrorism.

SEZs commonly serve to numerous objectives: (1) attract foreign direct investment (FDI); (2) create jobs, especially to eradicate local unemployment; (3) improve trade facilitation and promote and diversify exports and imports; (4) modernise economy in general and upgrade industry and manufacturing in particular through technology, knowledge and skill transfers; (5) induce economic reforms and development strategies; and (6) test innovative economic policies while maintaining the status quo for the rest of the country.³⁸¹ SEZs are considered successful if they were able to bring about significant structural change in the economy and long-term dynamic and sustainable economic benefits by achieving above mentioned overall goals.³⁸²

To sum up, SEZs are a development programmes in their own right which determine independent strategies for economic development. However, in the combination with ECs, both the zones and corridors can provide a mutual deepness. In other words, the success of SEZs largely depends on the degree of their integration in domestic economy. The establishment of necessary linkages³⁸³ between SEZs and national economy can be promoted by EC that benefits from the agglomeration effects as well as from other benefits of SEZ. One should mention that EC can help in reducing potential negative side-effects of SEZs, like its tendency to create economic enclaves.³⁸⁴ This is problematic when the enclaves are used by multinational companies and larger domestic investors from export-orientated industries. This could create market distortions and undermine free and fair economic competition since the local entrepreneurship, especially small

374 C. Baissac, 'Brief history of SEZs and overview of policy debates', In T. Farole, (Ed.), *Special Economic Zones in Africa: Comparing performance and learning from global experience*. World Bank, Washington, DC, US, 2011, p. 27, <https://openknowledge.worldbank.org/handle/10986/2268> (accessed on 15 October 2017).

T. Farole, *Special Economic Zones in Africa: Comparing performance and learning from global experience*. World Bank, Washington, DC, US, 2011, p. 24, <https://openknowledge.worldbank.org/handle/10986/2268> (accessed on 15 October 2017).

375 M. Ishida, *Special Economic Zones and Economic Corridors*, op.cit.; FIAS, *Special Economic Zones: Performance, lessons learned, and implications for zone development*, Foreign Investment Advisory Service (FIAS), World Bank, Washington, DC, USA, 2008, p. 2, <http://documents.worldbank.org/curated/en/343901468330977533/pdf/458690WP0Box331s0April200801PUBLIC1.pdf> (accessed on 15 October 2017); S. Woolfrey, *Special economic zones and regional integration in Africa*, tralac Working Paper, No. S13WP10/2013, Trade Law Center (tralac), Stellenbosch, 2013, p. 2.

<http://www.tralac.org/files/2013/07/S13WP102013-Woolfrey-Special-economic-zones-regional-integration-in-Africa-20130710-fin.pdf> (accessed on 15 October 2017).

376 A. Dobronogov, T. Farole, *An economic integration zone for the East African Community: Exploiting regional potential and addressing commitment challenges*. World Bank Policy Research Working Paper 5967, Washington, DC, USA, 2012, p. 5; <http://documents.worldbank.org/curated/en/120641468023381622/An-economic-integration-zone-for-the-East-African-Community-exploiting-regional-potential-and-addressing-commitment-challenges> (accessed on 15 October 2017); S. Woolfrey, *Special economic zones and regional integration in Africa*, op.cit., p. 2.

377 T. Farole, *Special Economic Zones in Africa: Comparing performance and learning from global experience*, op.cit., p. 24.

378 C. Baissac, *Brief history of SEZs and overview of policy debates*, op.cit. pp. 24-25; T. Farole, *Special Economic Zones in Africa: Comparing performance and learning from global experience*, op.cit., p. 24.

379 C. Baissac, *Brief history of SEZs and overview of policy debates*, op.cit., pp. 24-25.

380 T. Farole, *Special Economic Zones in Africa: Comparing performance and learning from global experience*, op.cit., p. 24.

381 C. Baissac, *Brief history of SEZs and overview of policy debates*, pp. 4-26; T. Farole, *Special Economic Zones in Africa: Comparing performance and learning from global experience*, op.cit., pp. 91-94; FIAS, *Special Economic Zones: Performance, lessons learned, and implications for zone development*, op.cit., pp. 12, 32; UNIDO, *Industrial Development Report 2009: Breaking in and moving up – new industrial challenges for the bottom billion and the middle income countries*. United Nations Industrial Development Organisation (UNIDO), Vienna, Austria, 2009, pp. 8, 79. https://www.unido.org/fileadmin/user_media/Publications/IDR_2009_print.PDF (accessed on 15 October 2017).

382 R. Auty, 'Early Reform Zones: Catalysts for Dynamic Market Economies in Africa', in: T. Farole, G. Akinci, (Eds.), *Special Economic Zones: Progress, Emerging Challenges, and Future Directions*. World Bank, Washington, DC, USA, 2011, pp. 207-226; <http://documents.worldbank.org/curated/en/752011468203980987/Special-economic-zones-progress-emerging-challenges-and-future-directions> (accessed on 15 October 2017); T. Farole, *Special Economic Zones in Africa: Comparing performance and learning from global experience*, op.cit.; T. Farole, G. Akinci, (Eds.), *Special Economic Zones: Progress, Emerging Challenges, and Future Directions*. World Bank, Washington, DC, USA, 2011; <http://documents.worldbank.org/curated/en/752011468203980987/Special-economic-zones-progress-emerging-challenges-and-future-directions> (accessed on 15 October 2017).

383 The mutual entrenchment will be implemented through so called backward and forward linkages.

384 T. Farole, G. Akinci, (Eds.), *Special Economic Zones: Progress, Emerging Challenges, and Future Directions*, op.cit., pp. 4-5.

and medium enterprises (SMEs), would be hampered in their development by the emergence of SZEs, exclusively towards SMEs. SEZs have been criticised for hosting import-dependent activities that do not add significant value; perpetuating low-skill assembly operations; attracting FDI in low-skill, low technology and footloose industries; suppressing labour rights; allowing poor workplace health and safety conditions; and having weak environmental controls.³⁸⁵ However, 'well-managed' zones can 'play a long-term dynamic role in their country's development process',³⁸⁶ particularly when they embed in an EC development.

IV. Connectivity within the geographical framework (internal connectivity)

Internal connectivity within the geographical framework is a sine qua non condition for EC development. In other words, the growth zones (or nodes) of an EC must be linked through various connectivity projects. Furthermore, the nodes must be integrated into production chains³⁸⁷, trade and logistic networks³⁸⁸ within the given geographical framework. The connectivity between the nodes is essential because without strong functional links, no significant economic movement and interaction can take place along the EC.³⁸⁹ Ideally, there should be a high level of connectivity within a growth zone. For instance, this can be achieved through the existence of an efficient feeder system to improve the overall connectivity and mobility within a zone, such as an integrated train, tram, metro, taxi lines, and bus system that would facilitate pedestrian movement.³⁹⁰ At the same time, the local transport system shall also include effective mechanism for goods traffic. It is essential that the connectivity between the nodes as well as within the growth zones are multimodal, meaning that the various transportation systems, for both the passengers and goods, are complementary, inter-connected and harmonised. The multimodality of infrastructure and transport systems would also help to bridge existing diversity of terrains which is a feature of many chosen area for the EC. Tariq Karim³⁹¹ recommends the adoption an organic to 'configure the corridors and linkages in a manner that best appear to be in consonance with geomorphology of different terrain'. This would contribute to sustainability of implemented infrastructure connectivity. However, in order for the infrastructure to sync with the variety of territorial and environmental conditions, the EC planning should support 'multimodality of transport rather than uniformity'³⁹².

Moreover, the connectivity based on multimodality is crucial to achieve the necessary spill-over effects from grow zones into the remote and/or underdeveloped areas, specifically in order for the peripheral regions to be able to benefit from the growth zones.³⁹³ According to Srivastava³⁹⁴, this 'process is uneven, with the core (the metropolitan/urban areas) benefiting first and the periphery (hinterland/rural areas) becoming integrated only later'.

V. Connectivity beyond the own geographical framework (external connectivity)

To achieve a high level of efficiency of ECs, it is important that measures are conducted to extend the connectivity beyond the borders of the initially defined geographical framework. This is gaining particular significance when the EC connectivity projects involve transnational dimensions. Referring to the above mentioned Srivastava's³⁹⁵ model of sequencing zones of the EC development, this would mean the extension of Zone IV and the creation of a cross-border dimension of economic corridors.

However, the 'external connectivity' of an EC could include initiatives to link different ECs or the linking of growth zones of one EC with nodes outside the own initial geographical framework. In this context, ECs are supposed to serve as promoters of regional cooperation and integration within as well as amongst different regional entities, such as South Asia, South East Asia, Central Asia, Middle East, or South-East Europe. Therefore, ECs must have an inclusive and comprehensive character to function as drivers of economic growth as well as processes of regionalisation. It is not enough that ECs are integral to the economic fabric and the economic actors surrounding it. If this were to be the case, ECs would generate limited economic benefits as they remain isolated—a narrow, exclusive area of operation. For example, they would remain at a narrow national or provincial stage. But in order to achieve the maximum benefit, ECs must pervade into larger economic networks, such as regional and global value chains, production and transport

385 FIAS, Special Economic Zones: Performance, lessons learned, and implications for zone development, op.cit., p. 33.

386 D. Madani, A Review of the Role and Impact of Export Processing Zones, Policy World Bank Research Working Paper, Washington DC, USA, 1999, pp. 7-8.

http://siteresources.worldbank.org/EXT/EXPCOMNET/Resources/2463593-1213887855468/11_A_Review_of_the_Role_and_Impact_of_EPZs.pdf (accessed on 15 October 2017).

387 H.-P. Brunner, What is Economic Corridor Development and What Can It Achieve in Asia's Subregions?, op.cit., p. 7, 8; B. Marrian, Towards a General Theory of Corridor Development in South Africa, op.cit., 2001.

388 P. Srivastava, Regional Corridors Development in Regional Cooperation, op.cit.

389 W. G. Roeseler, D.v. Dosky, 'Joint development in urban transportation: a practical approach to modern growth management', In: Landscape and Urban Planning, Volume 20, Issue 4, 1991, p. 338; B. Marrian, Towards a General Theory of Corridor Development in South Africa, op.cit., 2001.

390 W. G. Roeseler, D.v. Dosky, Joint development in urban transportation: a practical approach to modern growth management, op.cit., p. 338; B. Marrian, Towards a General Theory of Corridor Development in South Africa, op.cit., 2001.

391 T.A. Karim, 'Connecting South Asia with Southeast Asia: A Reality Check'. In K. Yhome, R.R. Chaturvedy (Eds.), Emerging Trans-Regional Corridors: South and South East Asia. New Delhi: Observer Research Foundation (ORF), p. 12. <http://cf.orfonline.org/wp-content/uploads/2017/01/GP-ORF-Transregional-Corridors.pdf> (accessed on 15 October 2017).

392 Ibidem, p. 13.

393 ADB, Strategy and Action Plan for the Greater Mekong Subregion East-West Economic Corridor, Asian Development Bank (ADB), Manila, Philippines, 2010; <https://www.adb.org/sites/default/files/publication/27496/gms-action-plan-east-west.pdf> (accessed on 15 October 2017).

E.X. Lainé, Mukdahan and Savannakhet, Internationalization Process of Twin Mekong Border Cities on the East West Economic Corridor, op.cit., pp. 341-342.

394 P. Srivastava, Regional Corridors Development in Regional Cooperation, op.cit., p. 2.

395 P. Srivastava, Regional Corridors Development in Regional Cooperation, op.cit., pp. 11.

networks.³⁹⁶ The success of an EC depends not only on a smooth functioning of the inter-coordinated and synchronised multimodal infrastructure, but also on the development or at least on the access to an established gateway node. Ideally, such a gateway node is a port with oversea, blue-water trans-shipment capabilities. The linkage of an EC with one or more airport(s) is, nonetheless, of great importance too.

VI. Articulated common culture and history

Recent and current EC development projects are increasingly featured by an awareness of common culture and history. The complex role of culture and history play a crucial role in the development of an EC initiative.³⁹⁷ The experience of a common cultural and historical ground can contribute to the enforcement of 'people-to-people' contacts but also to the improvement of necessary processes of diplomatic endeavours, negotiations, and communication. Furthermore, the sense of a shared history and cultural belonging can create political and economic loyalties within the geographic framework featured by unequal and competing actors.³⁹⁸ To instrumentals this 'soft power', the awareness, or at least the explicit emphasis, of common culture and history is prevalent in most of the implemented and envisaged EC initiatives, especially in Chinese funded ones.³⁹⁹ But one must be also aware that the extensive use of soft-power instruments can create feelings of cultural deprivation and repression. This is gaining significance when the geographic framework of an EC includes subordinated territorial entities which are already feeling economically exploited and socially, politically side-lined by central authorities. The situation is getting even more complex when these 'restive regions' are inhabited by indigenous population that is feeling increasingly marginalised by the development of ECs. In such a context, there is the imminent challenge that an EC initiative is getting identified as an instrument of exploitation instead of development, and the use of soft-power instruments as cultural suppression instead of building a common ground.

VII. Processes of modernisation and industrialisation

An EC must be endowed with an 'enabling industry, one that is able to meet goals inherent to transport, trade, logistic as well as other pressing national and social objectives'⁴⁰⁰. The development of ECs is not only featured by the stimulation of merely economic growth but also by efforts to push processes of modernisation of economies in general and upgrading of industries in particular. Moreover, a well-planned EC development has the potential not only to create desired industrial agglomeration in urban areas but also industrialisation of the hinterland. It is expected that, especially areas of the hinterland in which economic viability exist, remain under-utilised.⁴⁰¹

Generally speaking, the upgrade of industries is focusing not only on the improvement of existing industrial estates and manufacturing capacities, but also on the creation of new industries and industrial clusters. It is thus hoped that the participating countries and/or regions of a successful EC initiative would achieve a higher position in the global value chain (GVC) production. More concretely, it is expected that the upgrade of industries will help to produce more qualified, technological advanced products. Subsequently, the strengthening of the industrial base due to EC development should not result in an increase in low cost and low technology products. Instead, the EC should promote the improvement of manufacturing innovation and adaption of integrating technology and industry, should foster processes of advanced restructuring of the manufacturing (e.g., by strengthening more service-orientated sectors, introduction of intelligent manufacturing) and internationalisation of industries by fostering own (domestic) brands. Subsequently, the modernisation and upgrade of industry will be most likely accompanied by the build-up of knowledge hubs and respective creation of employment and subsequent reduction of poverty which could lead to positive impacts a social development too.⁴⁰²

VIII. Social and societal development

It is expected that a functional and effective EC is featured by an economic growth which creates a remarkable uplift in the standards of living of people, especially those working and living in functioning and successful growth zones. When these growth zones create sufficient spill-over effects, the whole population of the geographic framework might have the chance to benefit from the EC initiative and its respective projects. For example, the availability and improved access to employment opportunities will not only work towards the betterment of the overall living conditions of the people but increase social integration too.⁴⁰³ More trade and other economic activities between the different areas of an EC and with

396 H.-P. Brunner, What is Economic Corridor Development and What Can It Achieve in Asia's Subregions?, op.cit, p. 1.

397 T. Winter, 'One Belt, One Road, One Heritage: Cultural Diplomacy and the Silk Road', The Diplomat, 29 March 2016.

<http://thediplomat.com/2016/03/one-belt-one-road-one-heritage-cultural-diplomacy-and-the-silk-road/> (accessed on 15 October 2017).

398 T. Winter, 'Heritage diplomacy along the One Belt One Road', IIAS Newsletter, No. 74 (Summer), International Institute for Asian Studies, Leiden, Netherlands, 2016.

<http://iias.asia/the-newsletter/article/heritage-diplomacy-along-one-belt-one-road> (accessed on 15 October 2017).

399 D. Shambaugh, 'China's Soft-Power Push. The Search for Respect', Foreign Affairs, 16 June 2015.

<https://www.foreignaffairs.com/articles/china/2015-06-16/china-s-soft-power-push> (accessed on 15 October 2017).

400 NdoT, Moving South Africa: The Action Agenda. Pretoria: National Department of Transport (NdoT), 1999, pp. 6, 17, 18; B. Marrian, Towards a General Theory of Corridor Development in South Africa, op.cit., 2001.

401 K. Yhome, R.R. Chaturvedy, Emerging Trans-Regional Corridors: Perspectives from South and Southeast Asia, op.cit., p. 1; S. Dutta, S. Gupta (2017), 'Economic Corridors and Pro-Poor Private Sector Development in South Asia: A Case Study of Bangladesh and India', In P. De, K. Iyengar (Eds.), Developing Economic Corridors in South Asia. Manila: Asian Development Bank (ADB), 2017, p. 219.

<https://www.adb.org/sites/default/files/publication/162073/developing-economic-corridors.pdf> (accessed on 15 October 2017).

402 P. De, Economic Corridors and Regional Economic Integration, op.cit, p. 15.

403 NdoT, Moving South Africa: The Action Agenda, op.cit., pp. 6, 17, 18; B. Marrian, Towards a General Theory of Corridor Development in South Africa, op.cit.

neighbouring countries will strengthen people-to-people contacts. The latter one in combination with the rising socio-economic conditions of the people will help to bridge cultural, ethnic and other differences between diverse communities within the geographic framework of an EC and surrounding areas. Furthermore, in numerous cases the overall EC vision is harbouring the hope that the uplift of the people's living standards contains or even reverse unfortunate developments ('social evils') within the societies of the geographical framework (and beyond): like reduction of religious extremism, jihadism, political violence and militancy, terrorism, separatism, ethnic and social cleavages among others. However, one must be also aware that the establishment of an EC, especially when it is not well-planned by centralised decision makers by side-lining local population, numerous societal downsides needs to be factored in, like outbidding of local (especially) disadvantaged communities, social displacements, social conflicts.⁴⁰⁴

IX. Effective and fair regional distribution mechanism

It is in the nature of ECs to create agglomeration effects, which of course are a desired phenomenon in the initial phase, but it could also unfold negative effects on disadvantage areas with low capabilities.⁴⁰⁵ To enhance spill-over effects and to bridge asymmetries, it is significant to establish effective and fair mechanism of financial regulations between the different actors and territorial entities, foremost in centre-region but also in inter- and intraregional relations. This mainly includes distributions between political centres (places of decision-making) and peripheral areas. The establishment of distribution mechanism is gaining significance since in many cases of EC developments, the centres of main political decision making are not identical with the centres of main economic activities and/or revenue creation. In consequence, the establishment of fair allocation mechanisms is necessary due to the fact that territorial sub-entities are often featured by variations in economic conditions and capacities creating 'differentiated abilities' to exploit the benefit on an EC.⁴⁰⁶

Respective mechanism of EC related financial regulations should be established in three priority areas in a transparent and balanced manner:

- (1) Allocation of investments in quantitative (number of envisaged projects) and qualitative ('economic relevance') terms;
- (2) Income and revenue distribution;
- (3) Dispersal of financial costs (e.g., interest rates, maintenance of EC projects, security).

X. Pre-Existence of economic viability

The planning of EC, especially the conceptualisation and definition of the geographic framework in general and the identification of the nodes in particular, usually considers the pre-existence of economic viability.⁴⁰⁷ The area in which a given economic corridor is to be developed has the necessary economic viability when following criteria are addressed⁴⁰⁸:

- (1) The area possesses an 'enabling economic mass' which means that the identified locations ideally encompass a 'large amount of economic resources and actors';
- (2) The area shows a pre-existent strong economic growth;
- (3) The area exhibits a natural propensity and strong effective demand for further mixed-use development;
- (4) The area is free of crucial inhibitors (veto-actors).

To summarise, the criteria ensure that the development of a corridor in a region must make sense in economic terms. A corridor from 'nowhere to nowhere through nowhere' would be futile.⁴⁰⁹ It is also not very meaningful to combine substantive economic hubs when there is 'no potential for growth in between (because of adverse geography such as extremely rugged terrain or desert)'. In other words, if a corridor is not economically feasible and does not offer investors a 'satisfactory cash return' on their investment they will not become a reality, at least not in sustainable, effective and efficient ways.⁴¹⁰

XI. Integrated and comprehensive EC planning

The EC development must be based on an integrated and comprehensive planning. In other words, there needs to be a cooperative and overarching direction to oversee and execute the corridor vision, the respective plan, the planning process, and the implementation of the plan. In order to devise and administer such a centralised approach, all relevant

404 K. Yhome, R.R. Chaturvedy, *Emerging Trans-Regional Corridors: Perspectives from South and Southeast Asia*, op.cit., p. 1.

405 H.-P. Brunner, *What is Economic Corridor Development and What Can It Achieve in Asia's Subregions?*, op.cit., p. 3.

406 A. Palit, 'The MSR Economic Corridor: Character and Implications', In K. Yhome, R. R. Chaturvedy (Eds.). *Emerging Trans-Regional Corridors: South and South East Asi*, New Delhi: Observer Research Foundation (ORF), 2017, p. 61

<http://cf.orfonline.org/wp-content/uploads/2017/01/GP-ORF-Transregional-Corridors.pdf> (accessed on 15 October 2017).

407 B. Marrian, *Towards a General Theory of Corridor Development in South Africa*, op.cit.

408 B. Marrian, *Towards a General Theory of Corridor Development in South Africa*, op.cit, 1; W. G. Roeseler, D.v. Dosky, *Joint development in urban transportation: a practical approach to modern growth management*, op.cit.; GPMC, *Mabopane-Centurion Development Corridor: Integrated Growth and Development Implementation Strategy*, 1997, Greater Pretoria Metropolitan Council (GPMC), Pretoria, 1997, p. 6; B. Marrian, *Towards a General Theory of Corridor Development in South Africa*, op.cit.

409 P. Srivastava, *Regional Corridors Development in Regional Cooperation*, op.cit, pp. 3-4.

410 W. G. Roeseler, D.v. Dosky, *Joint development in urban transportation: a practical approach to modern growth management*, op.cit., p. 336, 342; B. Marrian, *Towards a General Theory of Corridor Development in South Africa*, op.cit.

socioeconomic and socio-political realities have to be taken into account.⁴¹¹ Additionally, governmental actions done by, for instance, sectoral departments responsible for land use policy and management, transportation planning, infrastructure investment and maintenance, and security sector agents, as well as actions by non-governmental actors, are imperative to ensure the realisation of the 'corridor-vision'.⁴¹² Any actions that run counter to the vision will need to be adequately addressed. In practice, the integrated and comprehensive planning of economic corridors require the two below listed elements:

(1) The formulation of an overall EC vision

The overall vision shall manifest the fundamental principles and guidelines for the establishment and functioning of the EC, and a general code of conduct for interaction and cooperation of actors within the chosen geographic framework as well as external relations.

(2) A concrete action plan

The corridor proposal shall also include a concrete action plan with a complementary time-frame. The action plan should outline exactly when key investments (like energy and infrastructure) in the corridor will be made to ensure private sector trust and involvement.⁴¹³

XII. Political will

To implement a mega development project like an EC, all crucial decision-makers need to possess the necessary political will which is constituted by four main criteria: The commitment and constructive mind-set of all major actors, the existence of an encompassing consensus, the accommodation of local concerns and interests, and the existence of driving forces

(1) Commitment and constructive mind-set of all major actors

All actors involved must possess the political will to implement the necessary measures. Decision-makers at all levels of government and sector representatives need to be fully committed to the corridor-project. This requires a cooperative and constructive mind-set among all major actors, because without it, a successful and comprehensive implementation of EC remains unlikely.⁴¹⁴ Most importantly, the constructive mind-set is based on a long-term commitment, making the political will sustainable and not appear as a short-term episode.

(2) Existence of an encompassing consensus

The decision-makers must not only have the political will, but also the know-how and capacities to produce and maintain a consensus on the EC development. The consensus should include the majority of people living within the entire geographical framework of the respective EC. It is not unusual that individual projects or aspects of the concrete action plan faces criticism. Plus, it is not a secret that individual communities and persons are opposing the entire EC initiative. However, on the whole, the core of an overall EC vision should be not challenged fundamentally. A severe questioning of the general benefits of an EC must be interpreted as an indication for maldevelopment in the planning and/or implementation phases. Additionally, it is a pointer that challenges exist towards an unproblematic functioning of the development initiative in the long run.

(3) Accommodation of local concerns and interests

The political will also include the volition and ability to consider the interests and concerns of the local people. Former experiences show that a successful EC demands local ownership of the people. The latter one is calling for the sufficient inclusion of the local people in the decision-making processes of the EC development. This is gaining significance in the context of individual project development in the homelands of the respective local communities, especially in cases leading to compulsory land acquisition and displacements. If the local concerns and interests will not be taken into account adequately, the appearance of veto actors will more likely increase the costs and delay of the EC development.

(4) Existence of driving forces

One of the most significant but also critical factors for building the sufficient political will is the existence of driving forces. These driving forces are usually on the national level governments and/or semi-governmental agencies, business representatives; and on the transnational level, international regimes or organisations. They function especially in the earlier periods of the EC planning and implementation as engine. From a critical perspective, the existence of driving forces fosters the notion that the EC is an exclusive, elite driven project. However, driving forces also ensure the resilience of the necessary political will.

XIII. Enabling institutional structure and mechanism ('hard infrastructure')

411 B. Marrian, Towards a General Theory of Corridor Development in South Africa, op.cit.

412 W. G. Roeseler, D.v. Dosky, Joint development in urban transportation: a practical approach to modern growth management, op.cit., p. 329.

413 W. G. Roeseler, D.v. Dosky, Joint development in urban transportation: a practical approach to modern growth management, op.cit., p. 329; B. Marrian, Towards a General Theory of Corridor Development in South Africa, op.cit.

414 W. G. Roeseler, D.v. Dosky, Joint development in urban transportation: a practical approach to modern growth management, op.cit.; NDoT, Moving South Africa: The Action Agenda, op.cit., p. 30; B. Marrian, Towards a General Theory of Corridor Development in South Africa, op.cit.

It is rather fruitless to prepare corridor plans without enforcing or implementing them, or hamper the realisation of the plans because of unnecessary red tape and lack of functional institutional and skilled human resources.⁴¹⁵ Therefore, to ensure a successful implementation of the EC planning, the following further factors must be addressed:

(1) Institutional capacities

Whereas the integrated and comprehensive planning determine essential preconditions for a successful conceptual and preparatory phases of EC, the consecutive period of the implementation of the overall EC vision, the subsequent action plan and its operationalisation needs to be supported by an institutional structure and mechanism. Hall and Marrian emphasise the significance of the existence of institutions which are able to manage and ensure comprehensive implementation and regulation of the EC.⁴¹⁶ It is crucial that the EC related institutional structure is able to operate independently and is free from the influence of partisan interests of certain driving forces of the EC development.

(2) Abilities to reform

Most likely, the necessary institutional, independent structure for the EC development needs to be newly formed and/or will require an institutional transformation.⁴¹⁷ This requires usually a complex reform measure involving all levels of government and respective administration. In addition to the establishment of effective planning bodies, the EC would also greatly benefit from the reduction of excessive regulations, rigid conformity to formal rules and regulations and, other bureaucratic hindrances imposing on the decision-making- and implementation processes. Moreover, anybody responsible for the planning and the implementation of the corridor and respective projects needs the necessary capacity and mandate to fulfil their tasks.⁴¹⁸

(3) Human resources and management capacities

The pre-existence of skilled human resources in decision-making and administration entrusted with sufficient technical and managerial know-how for the implementation of major development programmes in general and ECs in particular are a prerequisite for any planning and implementation phase of EC.

XIV. Enabling policy framework and mechanisms ('soft infrastructure')

The establishment of ECs requires soft infrastructure, and the relevant rules, regulations, and standards need to be in place.⁴¹⁹ This soft infrastructure is important because there are not only poor transportation related facilities and networks but also non-physical hindrances hampering a smooth functioning of EC. Such hurdles are for example high levels of regulations and trade barriers, red tape, corruption, inadequate enforcement of contracts, poor definition and enforcement of rules of engagement, asymmetry in standards, delays in customs, delays at ports and border crossings, pilferage in transit, corruption, and highly restrictive protocols on movement of cargo, confusing and complex customs clearance procedures (e.g. regarding the numbers of required documents), among other institutional and policy constraints.⁴²⁰ To overcome these challenges, the participating countries in a cross-border EC development need to agree on a harmonised set of rules, regulations, and standards. This calls for the formulation and implementation of well-planned national as well as regional policy frameworks and most likely numerous reform programmes. It would also include steps towards the strengthening of existing or the creation of new regional forums and frameworks like RTAs (regional trade agreement) and FTAs (free trade agreements), and other regional regimes as well as measures against corruption and improvement of transparency. It would be important the respective decision-makers are not only aiming at setting regulatory benchmark for the regional context, meaning the geographical framework of the EC, but attempt to meet international (global) standards. Apparently, such processes require the set-up and strengthening of transnational, effective coordination among the stakeholders and agencies concerned. Without an effective coordination (including respective institutions, 'hard infrastructure'), it is unlikely that an optimal cross-border EC will come into existence. Furthermore, effective coordination will help to maintain and reinforce the political will of the involved actors to participate in the EC development and 'it could also resolve conflicting interests between governments and stakeholders'⁴²¹.

Besides these mainly trade and transport related causalities for the establishment of an enabling policy framework and mechanism, the set-up of financing schemes is of utmost importance for any planning and implementing of an EC vision. The development of an EC demands large investments. This capital needs to be raised, mobilised, and allocated for the individual EC projects. Besides attracting financial resources from multilateral development banks like Asian Development Bank (ADB), World Bank, Asian Infrastructure Investment Bank (AIIB), larger economies such as Japan, China or India could fill financing gaps.⁴²² Concrete financial mechanism could be foreign direct investments (FDI), loans, aid. Furthermore, money could be provided not only from the public but also from the private sector. In this context, the

415 NDoT, Moving South Africa: The Action Agenda, op.cit., p. 22; B. Marrian, Towards a General Theory of Corridor Development in South Africa, op.cit.

416 P. Hall, 'Land-use change and Transport policy', In Habitat International, Vol 7 (3/4), 1983, p. 73; B. Marrian, Towards a General Theory of Corridor Development in South Africa, op.cit.

417 Ibidem, p. 73.

418 B. Marrian, Towards a General Theory of Corridor Development in South Africa, op.cit.

419 P. De, Economic Corridors and Regional Economic Integration, op.cit, p. 16; P. De, I. Kavita, 'Making the Case for Economic Corridors in South Asia', In P. De, K. Iyengar (Eds.), Developing Economic Corridors in South Asia, Manila: Asian Development Bank (ADB), op.cit, p. 5.

420 U. Subramanian, J. Arnold, Forging Subregional Links in Transportation and Logistics in South Asia, World Bank: Washington, DC, USA, 2001, pp. 75-79.

<http://documents.worldbank.org/curated/en/529151468769277296/pdf/multi0page.pdf> (accessed on 15 October 2017).

421 P. De, Economic Corridors and Regional Economic Integration, op.cit, p. 40.

422 P. De, I. Kavita, Making the Case for Economic Corridors in South Asia, op.cit., pp. 5-6.

so called public-private partnership model could serve as a model.⁴²³ Nonetheless, it must be emphasised too, that these financing mechanisms to attract capital must be flanked by national financial, especially regarding taxation, reform measures. The latter ones include the establishment of transparency and accountability programmes and institutions to end the impunity for economic a financial crime and misbehaviour (e.g., lack in payment moral). This is important not only to address sufficiently current and upcoming EC related financial burdens like interest rates or costs of maintaining individual projects.

XV. Enabling and favourable (safe) environment

The success of development projects depends significantly on the geographic stability and zoning security. Stability and security are crucial factors in building a positive image which can be seen as a third precondition for an enabling and favourable environment. Without guarantees to the security and stability—which enhances planning reliability—in the medium to longer term, potential investors will be hesitant to make investments.⁴²⁴ As such, the security concerns must be addressed adequately before countries starting to develop an EC. This includes multidimensional aspects of secure trade like measures to promote transport security, and improvement in customs regimes, port facilities, and logistics management⁴²⁵ as well as new, specific security threats like international terrorism, jihadism, or militant subnational movements. Subsequently, the participating states and regions must develop a collective and coherent concept to ensure the security of the EC development as well as its smooth functioning. This comprises also the delivering of overall good governance by the political decision-makers to create the necessary stability within the chosen geographic framework of the EC. Furthermore, especially potential regional (domestic) and bilateral conflicts have to be taken into account. These conflicts are gaining significance when the chosen geographical framework includes disputed territories and contested claims over local resources leading to an increase of traditional and non-traditional security threats.

One should also note that the success of an EC depends greatly on a positive image and perception among the broader public, the media and potential investors within and beyond the area of an EC.⁴²⁶ A lack of security and stability would harm significantly a positive image and subsequently hamper the creation of a conducive and favourable environment for a flourishing EC.

XVI. Effective diplomacy

ECs are complex development instruments which are not only involving a multitude of different actors (governments, international organisations and regimes, NGOs, individuals among others) but also affecting all spheres of state and society. To avoid conflicts, costs and other hindrances during the EC development, comprehensive people-to-people connectivity and transparent, inclusive policy formulation, decision-making, as well as respective communication are all crucial. Subsequently, for an unobstructed EC implementation, the establishment of effective mechanisms of public diplomacy and negotiations are needed. More concretely, the creation of a set of different negotiation mechanism should include bilateral as well as multilateral formats. Furthermore, mechanism should also incorporate as much as possible different actors involved and/or affected by the EC development. In other words, it is crucial to use not only ‘Track One’ (diplomacy & decision-making is done exclusively on the official governmental level) but also ‘Track Two’ mechanism of negotiations, where civil society and other non-state actors have the opportunity to feedback their insights, opinions, and interests into the EC decision-making processes. Here, it would be of utmost important that local population and civil society representatives are involved in the debates over the distribution over the costs and benefits of the EC initiative.

Besides the achievement of the support of local communities, good public diplomacy and effective negotiation mechanism would help to communicate successfully the overall EC vision on the international level and subsequently to win over more partners. This is gaining significance since there is generally much suspicion towards large-scale development projects regarding concrete incentives, especially when it comes to security and geopolitical orientated consideration.

XII. Sustainability, ecological and environmental awareness

Deteriorating general economics of nature, environmental mismanagement and degradation, environment related social and political conflicts and inefficient use of scarce natural resources have negative impacts on the overall environment within the EC’s geographic framework in general and on certain economic sectors like agricultural production and tourism in particular. Subsequently, a lack of ecological and environmental awareness and protection hampers severely sustainable development which hits not only agrarian communities but also urban areas, especially the growth zones. To achieve sustainable growth, the EC development has to take into account the fact that environmental issues are interwoven with economic and social systems. In other words, the vision of EC needs to consider a so-called triple-bottom line approach,⁴²⁷ focusing on combining environmental, social and economic considerations. But the integrative role of

423 Ibidem, pp. 5-6.

424 W. G. Roeseler, D.v. Dosky, Joint development in urban transportation: a practical approach to modern growth management, op.cit.; B. Marrian, Towards a General Theory of Corridor Development in South Africa, 2001.

425 P. De, Economic Corridors and Regional Economic Integration, op.cit, p. 40.

426 B. Marrian, Towards a General Theory of Corridor Development in South Africa, op.cit.

427 Economist, ‘Triple Bottom Line’, 17 November 2009.

<http://www.economist.com/node/14301663> (accessed on 15 October 2017).

this approach needs to be extended by including built environment, governance and (political, administrative) institutional issues too, which are also essential components of sustainable development.⁴²⁸

The search for sustainability as well as for ecological and environmental awareness emphasise the following determinants: Firstly, any EC development needs to understand the complexity of interactions and relationships which impact the wider environment, economy and social and institutional systems. Secondly, there is a need to move the regions, including local, subordinated territorial entities, in the centre of the EC planning. Here, the incorporation of local based solutions and enhancement of local ownership (e.g., through community participation) are essential elements. Thirdly, to avoid negative impacts of large-scale development projects, the environmental assessment of the participating regions is necessary, since it can support processes of formulating and integrating sustainability objectives into plans and programmes for environmental protection. Subsequently, monitoring and minimising of ecological risks imposed by EC developments in order to achieve sustainable growth, will require new and innovative ways. As such, it is expected that ECs are linked with the promotion of greener technologies and a more efficient use of regional resources, enforcing green manufacturing, as well as consider issues like social justice, needs of disadvantaged local communities, resource sharing among other things.⁴²⁹

FINAL THOUGHTS: THE NEED TO BRIDGE THE CONNECTIVITY GAP IN SOUTH ASIA AND THE POTENTIAL ROLE OF ECONOMIC CORRIDORS

South Asia has reached a pivotal point in time. Comprising the states of Afghanistan, Bangladesh, Bhutan, India, Nepal, Pakistan, Sri Lanka, and the Maldives, and being a home of around one-fourth of the world's population, South Asia has witnessed remarkable up and downs in all spheres of both the state and society. Even a passing view of its current developments shows that the entire subcontinent is in transition and has reached a crossroads. Despite a more or less shared colonial experience of the British Raj (colonial rule), the South Asian states have progressed along widely diverse paths of statehood, nation-building, and different strategies of development. This finds its expression not only in the tremendous variety of regime types ranging from democracies to authoritarian regimes (including monarchical systems and military dictatorships), but also in the subcontinent's emergence as a hub for international terrorism, religious fundamentalism, large sociopolitical movements with separatist and anti-systemic or pro-democratic dispositions. On top of this, several states faced the challenge of boosting their economies to address the worrying manifold socioeconomic difficulties. Having this in mind, it does not come as a surprise that South Asia is a home to persistent encounters between Eastern and Western concepts and notions of institution- and nation-buildings as well as normative foundation of nations to address the manifold tasks. The fact that the region is struggling not only with multi-layered social-economic uncertainties, but also with deeply entrenched national disharmonies and bilateral crisis, makes it a site of some of the world's most intractable intra- as well as inter-state conflicts. This has led critical analysts to identify the region as a part of the global 'Arc of Crisis'.⁴³⁰ In this context, South Asia was unable to fully recover from the traumatic partition that followed the end of the European presence. The latter phenomenon turned into a major source for intraregional diplomatic conflicts and fully fledged wars became rampant and prevailed over the logic of effective and cohesive regional cooperation.

Subsequently, South Asia has not stood out as one of the great success stories when it comes to regional integration and cooperation. This finds its expression in the limited achievements of the South Asian Association of Regional Cooperation (SAARC). Instead of functioning as a vehicle for multilateral collaboration, since its official establishment in 1985, it is hampered by inadequate political will or insufficient capacities to promote sustainable integration and cooperation process.⁴³¹ Fundamental state-building tasks and bilateral issues caught the main attention of the South Asian political leaderships after gaining independence. Regionalism and inter-regional cooperation was therefore a distant concern for these newly founded states.⁴³²

However, one has to understand that regional integration and cooperation is not a linear process; rather, it is an evolutionary path marked by various heights and lows. The appearance of persistent challenges within the EU, which is often portrayed as the world's pioneer of regionalization, can be seen as a proof. Despite having experienced several deep crises, the EU continues to function without undermining its basic normative principles and stresses the resilience of the integration process in Europe. In other words, the traumatic legacies of the past—foremost the experience of two world wars, the destruction of Europe, and the experience of radical ideologies leading to the death of so many millions of

428 R. D. Gardener, *Sustainable Regional Development: Developing a Sustainability Assessment Framework for District and Metropolitan Integrated Development Plans*. Thesis presented in partial fulfilment of the requirements for the degree of Master of Philosophy in Sustainable Development Planning and Management in the Faculty of Economic and Management Sciences at Stellenbosch University, 2014, p. 40. <http://scholar.sun.ac.za/handle/10019.1/86408> (accessed on 15 October 2017).

429 P. De, *Economic Corridors and Regional Economic Integration*, op.cit, p. 20.

430 'Arc of Crisis' is a term which got introduced into the debate by Zbigniew Brzezinski in 1978. According to Brzezinski, the "arc of crisis," stretches "along the shores of the Indian Ocean, with fragile and social and political structures in a region of vital importance to us threatened with fragmentation. The resulting political chaos could well be filled by elements hostile to our values and sympathetic to our adversaries." Source: I. Rehman, 'Arc of Crisis 2.0?', *National Interest*, 7 March 2013, <http://nationalinterest.org/commentary/arc-crisis-20-8194> (accessed on 14 March 2018). See also: G. Lenczowski, 'The Arc of Crisis: Its Central Sector', *Foreign Affairs*, Spring Issue, 1979, <https://www.foreignaffairs.com/articles/russian-federation/1979-03-01/arc-crisis-its-central-sector> (accessed on 14 March 2018).

431 A. Rahman, SAARC: Not yet a community. In J. Rolfe (ed.). *The Asia Pacific: A Region in transition*. Honolulu: Asia-Pacific Center for Security Studies, 2004, pp. 133-148.

432 S. Datta, Sreeradha (2017) 'India: The Bridge Linking South and Southeast'. In Yhome, K. and Rajeev Ranjan Chaturvedy. (Eds.), *Emerging Trans-Regional Corridors: South and South East Asia*, New Delhi: Observer Research Foundation (ORF), 2017, pp. 16-25. <http://cf.orfonline.org/wp-content/uploads/2017/01/GP-ORF-Transregional-Corridors.pdf>. (accessed on 15 March 2018)

people—and the collective memory of it led to the political determination to change the unfortunate trajectories, creating a path towards European integration which can take multiple ways but does not change its direction.

Today, it seems that South Asia finally reached a turning point which could lead the region towards greater regionalization. Therefore, one should take the current developments in the respective countries into account since it seems that several trends occurred which have the potential dynamic to break with entrenched, unfortunate patterns of the past. Here, besides the steady rise of religious extremism, Jihadism, and cross-border terrorism (including the state-sponsored terrorism) turning bilateral ties sour, there is an awareness among South Asian political decision-makers that the steady process of regional disintegration needs to be reversed. Additionally, suffering from a multitude of socioeconomic inequalities, but at the same time having the opportunity to evaluate one's own situation in a comparative national as well as international perspective, South Asia's growing civil societies are starting to question the harmful logic of fragmented national interests and conflicts. Consequently, the argument that colonialism is the cause of most of the current problems, such as underdevelopment and political instability, is losing credibility. This of course will not force the individual national governments to increase trust and transparency of state behaviour immediately, but it might help to overcome the endemic unwillingness to initiate any cohesive, purposeful action in the direction of ending the traditional political and economic disunity in the region.

Presently, there is a greater perception of the necessity for interstate rapprochement and cooperation to unleash new dynamics in the direction of a more integrated South Asia. This process is undoubtedly enforced through voices from within the region which are increasingly advocating a break with unfortunate historical paths to achieve security, economic development and public welfare, and the complex identity crises of the South Asian states. Along with all the major stakeholders in the region, India is of crucial importance for the success of any kind of regional project. Not only because of the tremendous asymmetries in size and population, which make India the natural centre piece of South Asia, but also because of newly and partly rediscovered interests in the energy resources and trade potential that new routes, allegiances and transport agreements may yield. This is gaining momentum since all South Asian states share a border with India, but practically none of them share a common border, except for the troubled Durand Line between Afghanistan and Pakistan. Furthermore, it is important to note that the smaller states of South Asia too are not spared by the global dynamics and subsequent regional processes of transition. Each of them has discovered their geopolitical leverage within the emerging regional dynamics. Yet they are still constrained by complex internal politics. Needless to say, whichever the outcome of this process may be, it will define the international perception of South Asia as an area of persistent crisis or as a region which still has the potential to develop fruitful cooperation.

But what could the driving forces and appropriate instruments for improved regional cooperation be? It becomes clear that besides some individual success stories (like the growing middle class), South Asian states have to contend with endemic poverty, tremendous inequalities, mega-urbanisation, and extra-ordinary challenges when it comes to infrastructure, environmental issues, food and energy security. Most of these issues can be linked with the lack of connectivity within South Asia and its interconnections with other regions, for example South East Asia or Central Asia. Against this backdrop, the establishment of a South Asia wide EC network would significantly improve trade and transport facilities and ease regional trade. Additionally, it would improve the infrastructure which is still 'abysmally inadequate and of poor quality' compared to the one in other regions.⁴³³ If this challenge is sufficiently addressed, ECs can create more opportunities for the successful establishment of cross-regional linkages. It would also help to link South Asia with global transport and logistic networks and production chains. In this context, ECs are not only able to play a key role in integrating economies⁴³⁴ across a region and functioning as essential building blocks of regional economic integration⁴³⁵, but they can also serve as a confidence building tools in a political non-congenial environment.

However, in order to be able to benefit from these potential positive impacts, the EC planners need to move beyond the economic prism and consider the larger political and social context; because without this the development of an EC can lead to further entrenchment of existing conflicts and cleavages, turning a peaceful regional cooperation, especially in South Asia, into an even more distant dream.

Taken into account the persistent tensions between India and Pakistan as well as New Delhi's unease with Beijing's major development vision—the 'Belt and Road' initiative/BRI (currently the strongest driving force of economic corridor constructions world-wide) and its extensions into South Asia, foremost the China-Pakistan Economic Corridor (CPEC)—it seems unlikely that the political differences can be sufficiently bridged in the near future. The ongoing distrust and subsequent lack of political consensus will continue to severely hamper cross-border connectivity within the region. Therefore, it is imperative to understand the challenges which major, cross-border infrastructure projects in South Asia are facing.

To sum up, by monitoring several economic corridor projects, such as the ongoing implementation of the CPEC and the associated challenges, it becomes obvious that a comprehensive approach to the concept of ECs is needed, not only to guide the formulation and implementation of such a mega development initiative, but also to measure its effectivity, efficiency, and sustainability. An assessment of the performance of EC just on the basis of economic cost-benefit calculations, including the increase in trade volumes, build-up of physical infrastructure, logistics, services, or industrial

433 T.A. Karim, *Connecting South Asia with Southeast Asia: A Reality Check*, op.cit, p. 15

434 R. Vickerman, 'Restructuring of Transportation Networks'. In G. Atalik and M. M. Fischer (ed). *Regional Development Reconsidered*. Berlin: Springer, 2002, pp. 148-58.

435 H. Kuroda, M. Kawai, R. Nangia, 'Infrastructure and Regional Cooperation'. In F. Bourguignon, B. Pleskovic (ed.). *Rethinking Infrastructure for Development*. Washington, DC: World Bank, 2007, pp. 235-260.

and manufacturing areas among other quantitative indicators, is crucial but far too narrow. Assessing the social and political dimensions of the EC implementation should be of utmost importance, especially in the case of South Asian countries faced with a multitude of domestic and bilateral challenges. The case of South Asia clearly underlines the challenges for a smooth implementation and further functioning of EC when overt or clandestine, simmering social, political and economic flashpoints are not taken account sufficiently. The unwillingness and/or inability to create a regional political consensus as well as to bridge the gap in local ownership of the people in remote areas due partisan economic interests of the national decision-makers, the lack in communication and transparency are increasingly provoking additional resistance towards EC initiatives. In tackling this puzzle, the concept of EC shows that numerous aspects have to be factored in to ensure not only a successful implementation but also a smooth functioning offering maximum benefits for the actors involved.

1636 REGIONAL TRADING BLOCS AND GLOBAL WELFARE. THE NEED OF FOCUSING ON HARMONIZATION OF “STANDARDS” WITH REFERENCE TO RTBS

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ABSTRACT

Over the last few decades, a large number of trading blocks (RTBS) has been created or proposed in nearly every region of the world. So the study of the welfare implications of trading blocs has become very relevant in the present global trade scenario. While RTBs are believed to increase welfare to countries involved, as it is a movement towards free trade,⁴³⁶ some economists believe that RTBSs can have a negative welfare effect on trade volume and world welfare as the blocks control entry decisions, pricing, marketing etc. which may distort the free flow of trade and the resulting distortion may reduce the welfare. Viner (1950)⁴³⁷ had pointed out Free Trade Agreements can actually worsen the welfare of member countries, and the world wise efficiency by creating trade diversion. Later other economists⁴³⁸ also had come to the judgment that regional liberalization of trade did not necessarily increase the welfare of even the members of the grouping. But all of these studies have discussed the welfare effect from the view pint of “tariff liberalization” and very few studies have focused on the role of RTBs with respect to NON –Tariff barriers to trade and its welfare implications.

With tariff barriers becoming increasingly less important, the regulatory regimes like labour standards and environmental norms as well as product standards and technical regulations are becoming more important determinants of trade. This paper has singled out export standards (termed as Technical Barriers to Trade or TBTs and Sanitary and Phytosanitary measure SPS in the WTO context) as one particular domestic regulatory regime and will analyze its effects on global trade with reference to regional trading blocks. The empirical evidence shows difference in export “standards” i.e. the product standards and conformity assessment procedures across countries can greatly influence trade volumes and patterns. As the governments have the ability to set standards based on domestic firms' product characteristics or technology capacity, it can raise foreign exporters' costs to adjust according to these requirements. Moreover, there often exists a great difference in standards across markets each of which requires an individual compliance cost such as the redesign cost for exporters. Hence, the difference in standards across markets can severely affect a firm’s export capacity and the overall volume of trade. **RTBs** present opportunities for controlling technical barriers to trade (TBTs) by “harmonization” of standards by its in–built advantage as the countries of the same region share similar “geo-climatic and cultural practices” – the preconditions of standard harmonization. Unfortunately export standards are most often not an important issue in some RTAs. The present paper shows harmonization and mutual recognition of standard can be beneficial and can have a significant positive impact on trade within the region and with third countries as well. Harmonization of standards in RTAs can work as a **stimulator for the intra as well as interregional trade.**

1 INTRODUCTION:-

Over the last few decades, the world has witnessed the creation of a large number of Regional trading blocks (RTBs) in almost every region of the world. The North American Free Trade Agreement (NAFTA), the European Union (EU), the Association of south East Asian Nation (ASEAN), the South Asian Association of Regional Cooperation (SARRC) are just a few examples of this trend. Therefore, the study of the welfare implications of trading blocs has become very relevant in the present global trade scenario. In Article 24, the architects of the GATT allowed for free trade areas and custom unions, both being preferential trade agreements (PTAS). The GATT has also overtime permitted developing countries a greater latitude to undertake PTAs that fall short of free trade areas and customs unions: the latter two require a commitment to getting internal tariff barriers down to zero, whereas the former permit permanent discriminations at levels other than zero. (Bhagwati 2002). While RTBs are believed to increase welfare to countries involved, as it is a movement towards free trade,⁴³⁹ some economists believe that RTBSs can have a negative welfare effect on trade volume and world welfare as the blocks control entry decisions, pricing, marketing etc. which may distort the free flow of trade and the resulting distortion may reduce the welfare. But all of these studies have discussed the welfare effect from the view pint of “tariff liberalization” and very few studies have focused on the role of RTBs with respect to NON –Tariff barriers to trade and its welfare implications.

With tariff barriers becoming increasingly less important, the regulatory regimes like labour standards and environmental norms as well as product standards and technical regulations are becoming more important determinants of trade. This paper has singled out export standards (termed as Technical Barriers to Trade or TBTs and Sanitary and Phytosanitary measure SPS in the WTO context) as one particular domestic regulatory regime and will analyze its effects on global trade with reference to regional trading blocks. The empirical evidence shows difference in export “standards” i.e. the product standards and conformity assessment procedures across countries can greatly influence trade volumes and patterns. As the governments have the ability to set standards based on domestic firms' product characteristics or technology capacity, it can raise foreign exporters' costs to adjust according to these requirements. Moreover, there often exists a great difference in standards across markets each of which requires an individual compliance cost such as the

436Lipsey (1957), Wonnacott(1996). Wei and Frankel (1998), Nitsch (1996)

437Viner, Jacob. (1950). The Customs Union Issue. New York, NY: Carnegie Endowment for National Peace.

438Johnston (1965), Cooper and Messell (1965), and Berglas (1979).

439Lipsey (1957), Wonnacott(1996). Wei and Frankel (1998), Nitsch (1996)

redesign cost for exporters. Hence, the difference in standards across markets can severely affect a firm's export capacity and the overall volume of trade. **RTBs** resent opportunities for controlling technical barriers to trade (TBTs) by "harmonization" of standards by its in-built advantage as the countries of the same region share similar "geo-climatic and cultural practices"– the preconditions of standard harmonization. Unfortunately, export standards are most often not an important issue in some RTAs. The present paper shows harmonization and mutual recognition of standard can be beneficial and can have a significant positive impact on trade within the region and with third countries as well. Harmonization of standards in RTAs can work as a **stimulator for the intra as well as interregional trade. The second part of the paper has taken into account harmonization and mutual recognition of selected products under ASEAN (as it has done fairly well under standard harmonization for some selected product) and tried to find out how far standard harmonization has affected the volume of trade.**

2 EXISTING LITERATURE:

Though Regional trade blocs were first thought to be formed due to beneficial economic welfare for the countries involved but as early as 1950, this suggestion was questioned. Jacob Viner (1950) pioneered the analysis of the immediate effects (static) of preferential trade agreements (PTAs). He argued that trading blocks may reduce world welfare of member nations if inefficient trade patterns emerge. His argument is that PTAs could act as trade creating or trade diverting entities. While the more obvious trade diversion can impose a cost on the non-member countries, the less obvious welfare costs are endured by consumers of member countries due to low-cost import substitutes coming in from member countries. The first phase of research on RTBs had focussed on the effect of custom unions on production (Viner 1950), trade flows, and consumption (Meade 1955; Lipsey 1957). With the second phase from the 1960s and beyond, economists began to find out the true aims of members of a regional economic integration grouping. By that they came to the opinion regional liberalization of trade did not necessarily increase the welfare of even the members of the grouping. Notable contributions in this phase include those by Johnston (1965), Cooper and Messell (1965), and Berglas (1979).

On the other hand Lipsey (1957) argues that in certain instances trade-diversion in customs unions could be welfare improving for its members. Kemp and Wan (1996) later show that a welfare-improving customs union could be developed leaving the welfare of non-members in their initial state. Bhagwati and Panagariya (1996a, p. 83) have analyzed "... whether the (dynamic time-path) effect of the PTA is to accelerate or decelerate the continued reduction of trade barriers toward the goal of reducing them worldwide." They dismiss Kemp-Wan's (1976) and Krugman's (1991b) static arguments as not meaningful to the context of dynamic path analysis. Bhagwati and Panagariya (1996a, 1996b) also made the point that "free trade areas" and "free trade" is not the same. In contrast to Bhagwati and Panagariya (1996a), Krugman (1991a), and Frankel, Stein, and Wei's (1995) arguments that RTBs may have a negative welfare effect, for members as well as non-members Wonnacott (1996) argues that free trade agreements (FTA) may be better than previously thought. He argues that, even under trade diversion, welfare may increase for both the diverting country and the world due to economies of scale. In a simulation that extends the work of Frankel, Stein, and Wei (1995), Wei and Frankel (1998) examine the effects of forming continental trade blocs on trade volume and overall world welfare. But all of these researches have focussed only on tariff liberalisation but not on trade restrictive impact of technical barriers to trade. Chen and Matoo (2004) had shown theoretically and empirically that regional agreement on standards increases the trade with the participating countries but not necessarily with the rest of the world. Baller (2007) looks at trade effects from TBT liberalization for members of the liberalizing region as well as two separate groups of excluded countries, industrialized and developing respectively. The study finds compelling evidence that Mutual Recognition Agreements for testing procedures have a strong impact on both export probabilities and bilateral trade volumes.

3 THE MODEL:-

3.1 Description of the model:-

Let us suppose there is a Regional Trading Block named R which consists of three countries A, B and C, where country A is exporting to country B and C. The importing country imposes varied standards⁴⁴⁰ and technical requirements on the good that is marketed in its market. The standard is quality related and not negative externality linked. ⁴⁴¹Firstly we assume complying with standards has no effect on consumers' demand for the regulated product. Firm 1 is domiciled in country A, in which it sells Q_{1A} units of output, while it exports Q_{1B} and Q_{1C} respectively to country B and country C. Suppose D_{ij} shows the variable compliance cost for the i th firm to export to j th country market. Initially we assume the production technology shows constant returns to scale. The exporting country has to bear a fixed set up cost F_j to enter into any export market j and the variable cost D_{ij} and we assume F_j and D_{ij} varies across markets. Firm 1 is situated in country A, 2 in country B and 3 in country C. Let us take the total cost of compliance with foreign standard as:- $E_{ij} = D_{ij} + F_j$3.1.1

E_{ij} varies across markets. Initially we assume the production technology shows constant returns to scale.

The Profit of firm 1, (Exporting Firm)

$$\pi_1 = (a - bq_{1A})q_{1A} + \{a - b(q_{1B} + q_{2B})\}q_{1B} + \{a - b(q_{1C} + q_{3C})\}q_{1C} - E_{1B}q_{1B} - E_{1C}q_{1C} \quad (3.1.2)$$

440 By "standard" here we mandatory "standard" which is a part of TBT of WTO

441 or it can be linked with some "imposed" negative externality which has no actual implication for welfare.

The profit of importing country firm:

$$\pi_B = \{a - b(Q_{1B} + Q_{2B})\}Q_{2B} \quad (3.1.3)$$

$$\pi_C = \{a - b(Q_{1C} + Q_{3C})\}Q_{3C} \quad (31.4)$$

The equilibrium exports are:

$$Q_{1B} = \frac{(a - 2E_{1B})}{3b} \quad (3.1.5)$$

$$Q_{1C} = \frac{(a - 2E_{1C})}{3b} \quad (3.1.6)$$

$$\text{Total export:- } Q_{1B} + Q_{1C} = \{2a - (2E_{1B} + 2E_{1C})\}/3b \quad (3.1.7)$$

However assuming production technology shows Increasing Returns to Scale and the cost function showing the cost of exporting to country B & C be: $E_{1B}.q_{1B}^{0.5}$ and $E_{1C}.q_{1C}^{0.5}$ respectively. The equilibrium outputs are:

$$Q_{1B} = \left(a + \sqrt{a^2 - (12b * E_{1B})} \right) / 6b \quad (3.1.8)$$

$$Q_{1C} = \left(a + \sqrt{a^2 - (12b * E_{1C})} \right) / 6b \quad (3.1.9)$$

$$\text{Total export:- } Q_{1B} + Q_{1C} = \left\{ 2a + \sqrt{a^2 - 12b * E_{1B}} + \sqrt{a^2 - 12b * E_{1C}} \right\} / 6b. \quad (3.1.10)$$

3.2 Effect of Harmonization of Standard:

In this section, we examine the impact on both intra-regional trade and trade with excluded countries of regional initiative like harmonization. Instead of straightforward assuming upward or downward harmonization ⁴⁴² we can assume harmonization at the average rate of standard that leads to the compliance cost common to both the markets:

$$E = (E_{1B} + E_{1C})/2 \quad (3.2.11)$$

Assuming initial standard in one of the countries (say country B) is more stringent than another (country C) it is upward harmonization for the later and downward harmonization for the former.

The equilibrium exports under C.R.S,

$$Q_{1B} + Q_{1C} = \{2a - (2E_{1B} + 2E_{1C})\}/3b \quad (3.2.12)$$

The equilibrium exports under IRS,

$$Q_{1B} + Q_{1C} = \left\{ 2a + \sqrt{a^2 - 6b * E} + \sqrt{a^2 - 6b * E} \right\} / 6b \quad (3.2.13)$$

3.2.1 Effect on intra-regional Trade:-

Harmonization of standard will work as a trade booster when the production technology shows I.R.S as the firms can reap the benefits of economies of scale.

Lemma 3.1:-Harmonization to average standard will lead to increase in the import and so as the volume of trade in the region when the production technology shows IRS whereas it will not affect the volume or trade if the production technology shows CRS.

Proof:-Follows from (4.1.7)&(4.2.12);(4.1.10)&(4.2.13) ■

Lemma 3.2:-Import in the harmonizing region increases unambiguously for the country with most stringent initial standard (Country B) as the exporting country can reap the benefits of both the integrated market as well as reduction in compliance cost, whereas for country C the effect on import is ambiguous as the exporting country can get the benefit of only the former.

Nevertheless the import in Country C will increase iff,⁴⁴³

$$E_{1B} < 3E_{1C} \quad (3.2.14)$$

The above result predicts that if the difference between the initial standards is not sufficiently high then the import in the country can increase after harmonization even if it follows upward harmonization.

3.2.2:- Effect on Inter-regional trade:

The interregional trade of the harmonizing region should also increase as the exporting country even if it is not located within the region can target the entire region as the export market and can reap the benefits of scale economies.

Lemma 3.3:- Intraregional trade volume will also increase if the region follows standard harmonization.

3.2.3 Effect on welfare:-

The welfare effect of standard harmonization on exporting country depends on the effect on producer's surplus as the consumer surplus of the exporting country remains unchanged with or without harmonization. The revenue from export

442 Chen and Mattoo(2004)

443 Comparing values of q_{1c} before and after harmonization.

market which has undergone downward adjustment will surely increase unless the demand is highly inelastic⁴⁴⁴.the revenue from the market with upward adjustment will also increase if condition 3. 2.14 is fulfilled and demand is not very inelastic. Though the producer surplus in the importing country will fall due to reduction in domestic production, the consumer surplus will increase due to fall in price surely for country B and for country C as well if condition 3.2.14 is fulfilled. Therefore the welfare of importing countries can also increase due to harmonisation.

4 HARMONIZATION AND MUTUAL RECOGNITION OF STANDARD:-

The exporting country may target more than one export market in a region R. ⁴⁴⁵In that case the standard in different export markets may be different which may lead to difference in both the fixed and variable part of the compliance cost. If production technology shows constant returns to scale then difference in standard **will** lead to the same result as the harmonized standards as long as only harmonization is there.(not Mutual Recognition Agreement). If the production technology shows increasing returns to scale then there will be remarkable difference in the consequences of trade under differentiated standard and harmonized standard both in terms of volume and welfare.

4.1 Effect of Mutual Recognition Agreements (MRAs):-

One of the most powerful measures to boost trade is the mutual recognition of existing Standards, whereby a country grants unrestricted access of its market to products that meet any participating country’s standards. This was the approach taken in principle by the European Union, with the spur of the Cassis de Dijon judgment of the European Court of Justice. Mutual recognition agreements (MRAs) are, however, not likely to be an option if there is a significant divergence in the initial standards of the countries, as became evident in the context of the European Union. In such cases, a certain degree of harmonization is a precondition for countries to allow products of other countries to access their markets.

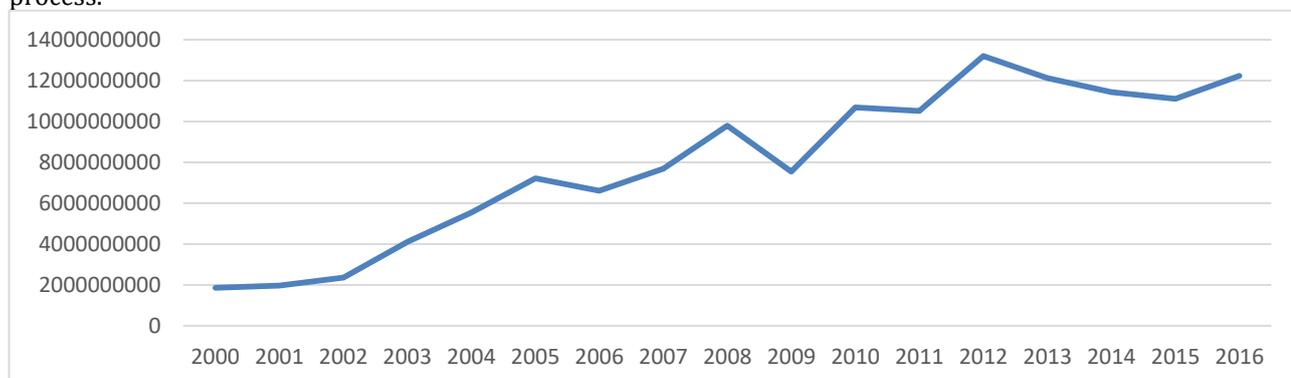
Mutual recognition can be equivalent to downward harmonization⁴⁴⁶,i.e products that comply with a standard set by any participating country can be freely sold in the entire region which will lead to choice of least strict standard. In the present model mutual recognition can be adoption of average standard with the cost of compliance consisting $\min(F_A, F_B)$ instead of $(F_A + F_B)$.

The effect is very obvious. It will lead to a further increase in the volume of trade as it leads to further decrease in the cost of compliance and the exporting firm will reap the benefit of integrated market as well as reduction in cost .

5 EMPIRICAL EVIDENCE: -

Harmonization of Standards is a big issue in negotiating regional trade agreements. In this context we have considered ASEAN which has agreed to align national standards for 11 priority product groups with relevant international standards. These products include some important widely traded product in the region. Working on harmonization Moreover, trade facilitation measures have been undertaken by ASEAN countries to complement efforts in tariff reduction and elimination under African Free Trade agreement. (AFTA). These include the elimination of unnecessary technical barriers to trade, harmonization of standards and conformance measures and simplification of harmonization and customs. The adoption of international standards is equally critical for ASEAN’s external trade as it is for intra-ASEAN trade so that the products could compete at an international level. As international standards define the characteristics that products and services have to meet in export markets, these help developing countries take part fairly and competitively in international trade. The ASEAN framework agreement on mutual recognition which was signed in 1998, provides for a mutual recognition of standards and conformity assessment among ASEAN countries. This arrangement allows products that are certified in one ASEAN country to be sold in other member countries without having to go through the same standards and conformity assessment.

Based on the data on intra ASEAN volume of trade it can be observed that trade volume have improved over time for some selected products like Automotive, foodstuffs, pharmaceuticals which have gone through the harmonization process.



444 As there will be fall in price in the importing country due to increase quantity from exporting country

445 The reason as the same region shares same climatic and socio economic conditions it is comparatively easier for the countries to go for Harmonization of standards.

446 Chen and Mattoo(2004)

Fig 1:-Growth of trade volume of (intra Asian) Automotive products

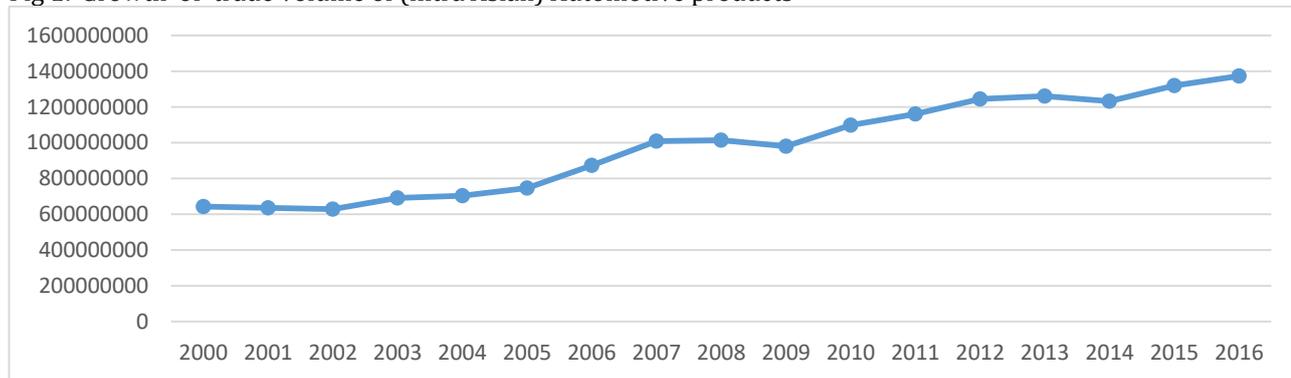


Fig 2:-Growth of trade volume of (intra Asian) pharmaceutical products

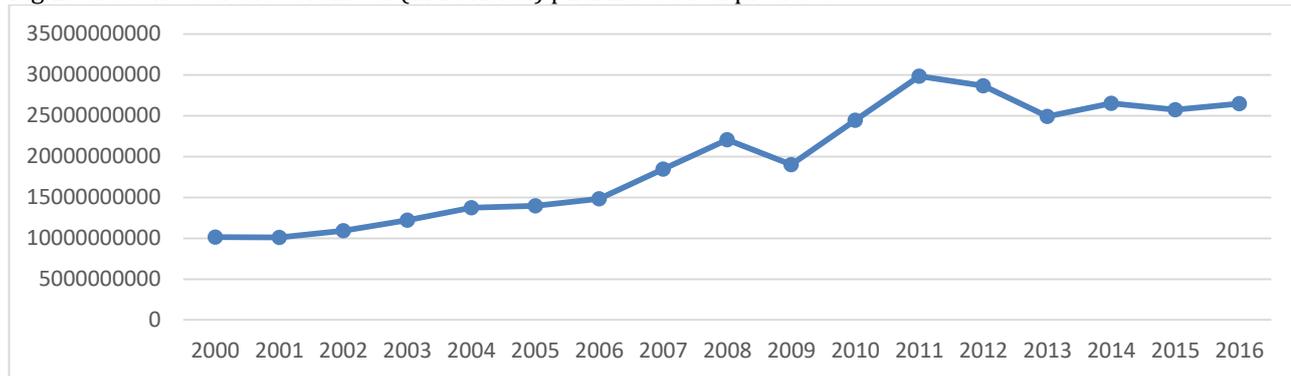


Fig 3:-Growth of trade volume of (intra Asian) food products

The trade volume (at constant prices) has shown an increasing trend for which the possible explanation can be the standard harmonization.

6 CONCLUDING REMARKS:-

Regional trading blocks and regional trading agreements creates opportunity for standard harmonization and mutual recognition as the same region shares various common features and national standards are not sometimes not significantly different. In the present day world trade scenario barriers related to product standards are the main concern of developing country’s export today. Exporters from developing countries are increasingly feeling the pressure to conform to international standards if they are to enter successfully developed country markets. Much has been achieved in various developing countries to construct the requisite quality infrastructure, to enable exporters both to understand the nature and detail of the quality standards to be met and to take the steps to comply with them. The potential to use product standards as hidden trade barriers is immense. Even if a small part of this potential is allowed to be exploited, the implementation of the free trade regime could become dominated by protectionists and those who would welcome trade retaliation and counter retaliation. However, transparency and harmonization of standards could become trade facilitators in addition to providing technical quality and safety parameters. Exporting country has to incur significant cost harmonization of standard meet up the standard specified by their trading partner as the trading partner (importing country) has the advantage to set the “standard” nearer to the domestic standard if its intention is to protect the local producers. As mentioned earlier, this paper specifically deals with the possible welfare effects of regional standard harmonization and shows standard harmonization within the regional trading block can be welfare improving and states the condition under which intra-regional and inter regional volume of trade along with welfare improve after standard harmonization and mutual recognition. It points out if the initial standards are not too different and importing countries are also not too apart (technological improvement etc), which is likely to happen among the members of a regional trading block welfare after harmonization can improve for all the members who has followed harmonization .moreover welfare of non-member exporting country will also improve which is not possible under tariff liberalization within regional trading block.

Agreements on standards raise issues that are both politically and analytically challenging. Unlike tariffs, standards cannot be simply negotiated away because the original reason for their existence is not trade protection but the enhancement of welfare by remedying sale of “low quality products”. If standard harmonization and mutual recognition agreement is feasible, then it will increase the total volume of trade. As mentioned in the introduction many Regional Trading Agreements do not have enough provision for liberalizing TBT by harmonization and Mutual Recognition Agreements though there is enough scope of that.

REFERENCES:-

Baller, S. (2007) “Trade effects of regional standards liberalization: a heterogeneous firms Approach”, World Bank Policy Research Working Paper 4124, February 2007.
 Berglas, E. (1979). "Preferential trading theory: the n commodity case." Journal of Political Economy 87: 315-331.

Bhagwati, Jagdish and Arvind Panagariya. (1996a). "The theory of preferential trade agreements: historical evolution and current trends." *The American Economic Review* 86 (May): 8287.

Cooper, C. and B. Messell. (1965). "A new look at customs unions theory." *The Economic Journal* 75: 742-747.

Chen, Maggie X. and A. Mattoo (2004), "Regionalism in Standards: Good or Bad for Trade?", World Bank Policy Research Working Paper, November 2004

Frankel, Jeffrey, Ernesto Stein, and Shang-jin Wei. (1995). "Trading blocs and the americas: the natural, the unnatural, and the super-natural." *Journal of Development Economics* 47 (June): 6195.

Pettman,S.(2013) "standard harmonization in ASEAN :progress,challenges and moving beyond 2015."ERIA Discussion Paper series

Krugman, Paul. (1991a). "Is bilateralism bad?" in Elhanan Helpman and Assaf Razin, eds. *International Trade and Trade Policy*. Cambridge, MA: MIT Press.

Lipsey, R. (1957). "The theory of customs unions: trade diversion and welfare." *Economica* 24: 40-46.

Meade, James E. (1955). *The Theory of Customs Unions*. Amsterdam, North Hol,

Reardon ,J,R,Kling,N,D, MCCorkle ,D,E, Miller ,C (2002) .*American Business Review* .Vol-20 No1 pg 91-99

Viner, Jacob. (1950). *The Customs Union Issue*. New York, NY: Carnegie Endowment for National Peace.land

Wei, Shang-Jin and Jeffrey A. Frankel. (1998). "Open regionalism in a world of continental trade blocs." *International Monetary Fund Staff Papers* 45: 440.

Wonnacott, Ronald J. (1996). "Free trade agreements: for better or worse?" *The American Economic Review* 86 (May): 62-66.
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APPENDIX 1

$$\frac{\partial \pi_1}{\partial Q_{1A}} = a - 2bQ_{1A} = 0$$

$$\frac{\partial \pi_2}{\partial Q_{2A}} = a - bQ_{1A} - 2bQ_{2A} - F_A - D_{2A} = 0$$

$$\frac{\partial \pi_2}{\partial Q_{2B}} = a - 2bQ_{2B} = 0$$

From above equations:-

$$2bQ_{1A} + bQ_{2A} = a$$

$$bQ_{1A} + 2bQ_{2A} = a - F_A - D_{2A}$$

$$2bQ_{2B} = a$$

Solving by Cramer’s rule one can get the quantities.

APPENDIX 2

Country A, Consumer surplus under free trade is: $- 4a^2 / 18b$

The consumer surplus after it imposes standard on imports is: $-(2a - F_A - D_{2A})^2 / 18b$

Producer Surplus for firm 1 i.e firm in Country A under free trade is $a^2 / 9b$ Producer surplus after the country imposes the standard on imports is: $(a + F_A + D_{2A})^2 / 9b$...2.2.15

Country B, Producer Surplus under free trade is $13a^2 / 36b$ Producer surplus after complying with international standard:- $a^2 / 4b + (a - 2 F_A - 2D_{2A})^2 / 9b$ 2.2.1

APPENDIX 3

Firm i situated in importing country j,

Before Harmonization,

$$Q_{ij} = \left(5a - \sqrt{a^2 - (12b * E_{ij})} \right) / 12b$$

$$P_j = \left(5a - \sqrt{a^2 - (12b * E_{ij})} \right) / 12$$

After Harmonization,

$$Q_{ij} = \left(5a - \sqrt{a^2 - (6b * E_{ij})} \right) / 12b$$

$$P_j = \left(5a - \sqrt{a^2 - (6b * E)} \right) / 12$$

**SS08.1. Metropolitan
Governance in a conflict,
competition and cooperation
contexts**

1024 LONG CYCLE PLANNING AS A TOOL FOR THE RESILIENCE OF THE TERRITORIES: THE CASE OF EDUCATION SECTOR IN CASCAIS, PORTUGAL

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1 INTRODUCTION

It is notorious the persistence of understanding the role of education as a central factor for increasing the quality and intensity of development at different scales - national, regional and local (Saviotti et al., 2016). At the same time, the discussion on how to achieve this importance is practically the same, with a very strong presence of the ideological component, generating instability and fragility to the policies adopted. Knowing that one of the few certainties that are accepted in this area is the requirement of a consistent and steady course of action beyond the ephemeral political cycles, the tension, uncertainty and permanent conflict felt in the educational system ends up inhibiting its role in development.

One of these tensions lies in the management of the education system and, above all, in its ability to connect to the business world (Moberg, 2014.) The greater or less centralization in the bodies of central administration has been discussed at length and even segmented in parts, as the human resources - teachers and non-teachers - facilities, curricula, among other aspects.

This chapter is then born from the municipal ambition to assume extended competences in the educational field motivated by the proximity and adequacy that it may bring to local needs, namely in economic dynamics and social cohesion. This pull factor corresponds to a push factor that is linked to the interest of the ministerial agencies, in a context of structural public debt, to alleviate financial responsibilities.

However, whether by conviction or convenience, this decentralization of powers provided by the Central Administration and in Portugal seems to be generalized (see news), requires clarification of the advantages of the process as well as the forms and costs of its implementation. These are essential challenges to transform the local educational system into a factor of socioeconomic distinction and qualification and create renewed instrument of local development.

The objectives that structure this work and support the validation of the thesis seek to explore the relevance of participation in the redefinition of the local education system; Modalities to foster the relationship between the school and local actors; The importance of strategy as defining a possible future, consensual and desired; Possibilities to design contents that make flexible management of the curriculum possible; Improve school performance.

The methodology is based on the presentation of the case of the municipality of Cascais in the Lisbon Metropolitan Area and its work to create a new educational and training ecosystem, within the scope of the new competences contracted with the State, through the Municipal Educational Strategic Plan, where it is possible to find priorities that sustain a structural change in personal shaping, in the reinforcement of the collective identity and in the articulation with the productive fabric.

Due to the great work of involvement, auscultation and information, due to the concern to guarantee a future of the education system marked by cooperation and co-responsibility, the definition of goals, objectives and actions and also of programs of actions duly scheduled and monitored, it is considered that this is an experience that deserves to be shared and reflected.

2. LITERATURE REVIEW

2.1. Educational policy as a development policy

Education, like health and social protection, is one of the strong pillars of social state, seeking to guarantee equal opportunities for all members of a community and to face trends of inequality and social injustice. With few exceptions, the greater development of these strong pillars corresponds to higher levels of social and economic development. This correspondence can be accessed in many ways, with territorial expression. One of the most popular rankings is the Human Development Index (HDI) (United Nations Development Program, 2017), where education is one of the central aspects contributing to rank the nations of the globe by levels of development. Their acceptance even led to the methodology being applied at regional and local scale, for example in Brazil (Rezende et al., 2005).

But how to transition from education in development and structural change, understood as the pondered reconsideration of basic social principles (McMillan and Rodrik, 2011). It can be discussed in an operational way and in a temporal way. Firstly, it must be recognized that the educational system does not only provide scientific and technical knowledge, directly useful for economic growth and social development, but also provides knowledge that becomes an awareness for the exercise of a more informed, more active, more conscious citizenship.

The shaping of a person has three components: technical, scientific and informative. Sustainable development involves shaping a system of education that promotes structural change by ensuring increasing levels of performance in those three components as well as affirming (Psacharopoulos and Woodhall, 1993), "investment in education is a key element of the development process". Its importance is reflected in the growing recognition, since the early 1960s, that investing in both formal and informal education and training provides and enhances the skills, knowledge, attitudes, and motivation necessary for economic and social development" (p. v).

It is clear that this is a demanding bet on the costs and time it takes to impose. The opportunity costs of investing in the education system make this the best option for the use of financial resources that are thus being diverted from other applications. In other words, “the opportunity cost must be considered in the evaluation of investment projects because, as noted earlier, every investment decision involves a sacrifice of alternative opportunities” (Psacharopoulos and Woodhall, 1993:23). On the other hand, it is a long term bet because the results are not immediate, they are expected to be long-lasting and self-reproducible (Wals, 2012).

2.2. Educational Ecosystem, Local Development and Decentralization

Education as a centralized policy defines contents, objectives and similar goals for all territories regardless of local particularities and interests. It is evident that the autonomy of schools can lighten this “dictatorship”, but their means and energy sometimes fail to promote a curricular offer or educational project as related to the territory as it would be desirable (Veiga, 2003). And so, local identity, resources and dynamics are almost always outside the hard core of educational policies (Brown, 2015; Stromquist and Monkman, 2014). In other words, there is an undeniable qualification of local human resources, which often are fixated in the region itself, but there are also limitations derived from the incipient inclusion of content linked to local and regional specificities.

The opportunity for change arises with the openness to decentralization manifested by central governments that seems to occur both out of conviction and convenience, but which in itself is not a guarantee of quality, as, moreover, underline Winkler (1989), Fiske (1996) and Skeland and Filmer (2007) when they mention the risks associated with the possibility of elite capture, the risks of inequality in access to education and the lack of capacity of local governments and schools to deliver quality education.

The literature also emphasizes “that inconsistent curricular and quality standards, resistance from teachers’ unions, and the reluctance and inability of parents to make technical decisions on education matters may in fact reduce, not increase, the effectiveness of education service delivery” (Qi, 2014).

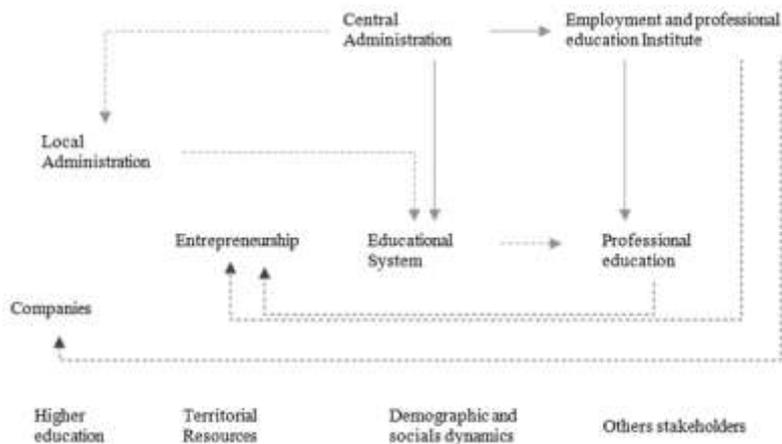
This is why “education decentralization is a multifaceted concept with political and economic aspects. It takes many forms in different countries depending upon how political and fiscal responsibilities are allocated to lower levels of government. Decentralized governance is practiced for different reasons in different places using different instruments” (Jeong et al., 2017).

By controlling these risks, the benefits of decentralization can be enhanced by highlighting local resources (locative, human, territorial, initiative), greater flexibility in curricula and greater participation of local actors in the education system. Parry (1997) stresses that “The benefits of decentralization in broad terms include greater responsiveness to citizens, improved decision making based on more accurate information and better knowledge of local conditions, and improved efficiency in service delivery” (p. 211).

Decentralization can take many forms as Rondinelli and Nellis (1986) e Rondinelli et al. (1989). These authors suggest the possibility of different approaches to understand decentralization: Deconcentration shifts workloads from a ministry’s centrally located offices to staff or offices outside the national capital. Employees are still employees of the central government, however, and generally have little discretion in implementing policies. Delegation is the transfer of authority from the central government bureaucracy to some other public sector authority such as public corporations, regional development agencies, or special function agencies. Devolution is the “true” form of decentralization in which subnational levels of government are given complete authority for specific public services which were previously provided by the central government. Finally, the last approach is privatization which gives responsibility to private organizations such as non-profit or voluntary organizations, trade associations, professional groups, religious organizations, cooperatives, or business firms to carry out functions which were previously performed by the public sector (Parry, 1997:211-212).

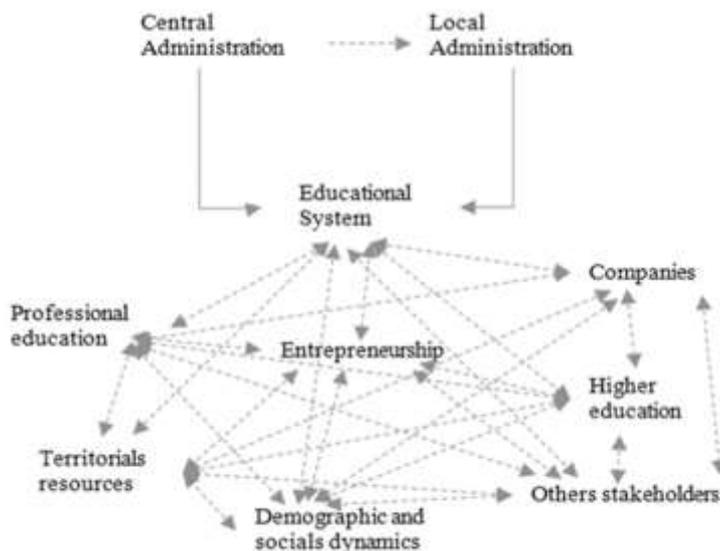
The deepening of this model and its continuity can help to build an educational ecosystem that corresponds to a complex interaction between direct and indirect actors of the educational system and that results in the creation of synergies from its intervention (Figure 1 and 2). As claim by Toutain and Mueller (2015) “Ecosystems are situated in complex contexts. Actors interact in a particular geographical area and their behaviours, responses and actions are influenced by a set of social, political, cultural and economic conditions. This process progressively builds the ecosystem of an organisation or specific domain as educational sector” (p. 8).

Figure 1. Educational Ecosystem (Centralized version).



Source: Author's elaboration.

Figure 2. Educational Ecosystem (Decentralized version)



Source: Author's elaboration.

3 EDUCATIONAL COMMUNITIES AND TERRITORIES: THE POTENTIAL OF STRATEGIC PLAN FOR LOCAL EDUCATION SYSTEM

Education in Portugal was one of the sectors that most evolved since the second half of the last century and, especially, after the revolution that restored democracy in the country. From an obligatory 4-year schooling that was not respected, "strongly marked by the doctrinal promotion of a citizenship restricted to the logic of the nation-state" (Afonso, 2008:61) and supported in a wide network of local educational equipment, education was understood as a fundamental right inscribed in the Constitution of the Portuguese Republic where Article 73 imposes that "Everyone has the right to education and culture" and schooling has been extended gradually Up to 12 years or until the student is 18 years old.

The concern for a long time was that of quantity, that is, to provide more students and families an opportunity for education and teaching. We therefore agree with Santos et al. (2016) When they stress that "this radical transformation is the result of a profound evolution observed in educational policy and, more specifically, in the planning of educational resources" (p. 19).

Is under way in many European countries a process of decentralization from the central state to local governments of skills in public policy management with the public purpose of more actively involving communities in the fundamental issues of their daily lives. But also as states Cuéllar-Marchelli (2003) "Decentralized services, (...) are expected to improve decision-making, allocate resources more efficiently, and hence report higher quality levels" (p. 146). This is why "one of the most urgent problems is to find ways to involve local society in the development of general education in municipalities" (Laudams, 2014:570).

A less transparent goal may also be to seek to achieve the minimum state by transferring financial responsibilities to local authorities, hoping for greater efficiency and effectiveness. One of the topics that stands out in this general process is education.

In Portugal, this approximation of education systems to local territories formally required the elaboration of a Municipal Educational Strategic Plan with which it would be possible to design a medium / long-term educational system moulded to and by local actors, their needs and their identities. In the case that is intended to illustrate, the future of the Cascais

educational system was actually constructed by the local community through a large participatory process allowing define strategic objectives and concrete lines of action. And the result was the building of a future desired by the community through the educational system.

4. CASCAIS MUNICIPAL STRATEGIC EDUCATIONAL PLAN⁴⁴⁷(CMSEP): AN INSTRUMENT FOR STRUCTURAL CHANGE

The objective of this chapter is to provide a testimonial about the methodological and technical aspects related with each phase and step of elaboration of the educational strategic plan for the municipality of Cascais which is expected to lead over the next five years to important steps in the process of building change in the educational system but in social and economic development, providing the desired structural change.

4.1. Brief notes on the territorial and economic framework of Cascais

In order to understand the territorial context where this educational system is placed it is important to analyse some facts and figures about Cascais municipality. This municipality only has 3,2% of the total area of the Lisbon Metropolitan Area (LMA) and only 7% of all population, counting with an area of 97km² and 206 000 residents in 2011. Though, Cascais has the biggest grow of population, 21%, between 2001 and 2011, one of the best figures in LMA during this period.

Located in the western end of the metropolitan area, shares its borders with Sintra and Oeiras municipalities and has a strong relationship with the country’s capital, Lisbon. The geographical location of Cascais gives it an almost unique specificity at a national level. From the Atlantic coast, to the estuary of the Tagus, to the protected landscapes of Serra de Sintra (Natural Parque of Sintra-Cascais), the municipality has environmental and landscape characteristics with high economic potential for tourism and leisure (Figure 3 and 4).

Figure 3 – Location of Cascais and Lisbon Metropolitan Area at the national level



Source: Author’s elaboration.

Figure 4 – Cascais urban areas and main transportation connections

⁴⁴⁷ Plano Estratégico Educativo Municipal de Cascais



Source: Author's elaboration.

The axis formed between Cascais, Oeiras and Lisbon is densely urbanized but it is still one of the most important areas at a regional level, especially on the potential for tourism and economic development. Therefore, exists here a relationship bigger than simple geography, transportation is in part the base of this strong urban occupation and territorial connection.

In relation to employment and economy, the third sector dominates the local economy with 86% of the employed population working in this sector, the secondary sector only has 13% of employment. These numbers show that local economy is mainly dominated by services, commerce and tourism. Another indicator of the economic condition of this municipality is the percentage of residents working within the municipality, 53%, with one of the best percentages of all LMA. Although business volume still is very low, only 3% of the total for the metropolitan area, nonetheless power of purchase, although being dropping in the last few years is still equal to the metropolitan values but higher compared with the national figures. Unemployment rate has experienced some grow between 2001 and 2011, from 6,5% to 7,4%, but still very similar to the neighbour municipalities and LMA.

On the figures about education, Cascais present levels of schooling superior to those seen in LMA and also at national level. For instance, 21% of Cascais residents have higher education and only 2% are illiterate. In terms of early school leaving, the rate sits on 1,7%, equal to the metropolitan and national rate.

4.2. The motivation for the elaboration of CMSEP

The municipality of Cascais have a long history and experience with the local management of the education, and this experience allowed all the stakeholders to develop good relationships between them. In fact, Cascais was one of the 15 municipalities (from 308 Portuguese municipalities) to sign the Inter-Administrative Agreement of Delegated Competencies. The Portuguese education system has dealt with many changes over the years going from centralization to decentralization, which is the phase we are in nowadays. The decentralization from the Ministry of Education to the local level of power – municipalities – is the result of the application of the principle of subsidiarity to the management of the educational sector. It is also important to retain that in the education sector the municipality of Cascais presents a really particular case in the Portuguese educational scenario, since half of the school population attend to private schools, what brings more challenges and more stakeholders to a already complex and very exceptional territory.

This pilot project has a pedagogic and administrative character and it aims to promote the efficiency in the use of educational resources and built up knowledge and experience in decision making at municipal level in the topic of education.

The evolution from a centralized educational system to a decentralized local and municipal system is materialized and has force of a law with the Inter-administrative agreement. The agreement signed between Cascais municipality and the Ministry of Education⁴⁴⁸, in 2015, transfers the responsibility for a great part of the education sector to the municipality. This is means that the municipality is from now on responsible for all the levels of teaching, from pre-schooling to the secondary level, including the professional education courses and other aspects of the education system. These responsibilities include non-teaching staff (teachers are still under the responsibility of MNE), school social support (such as meals, transport and materials), maintenance and equipping of school facilities (although some school like Secondary Schools are still under the responsibility of MNE), transportation and after school activities.

⁴⁴⁸ Ministério da Educação - MNE

The Municipal Strategic Educational Plan is a completely new instrument of planning in the education and also municipal context, but it is developed along another instrument with more deeper roots in the local context, the “Educational Plan”⁴⁴⁹, a more normative and typical document in the planning environment that can be compared to a master plan for local education.

Planning strategically in education allow us to leave the scale of immediate, the scale of everyday and makes us look the future, using local resources, making use of opportunities and solving the problems of the system, fostering new possibilities for structural change. At the same time, schools have difficulties to link their actions and projects to a strategy design for the local/municipal level, this means education strategic planning design to the municipal level is, until today, hardly incorporated in the school’s action plans and projects.

The introduction of this new strategic document is the result of a new way of managing and arranging the educational system, with the municipalities in the lead of their own system, as part of the new framework of decentralized powers. This gain of more and diverse responsibilities carries the need for more instruments, such as strategic plans and requires the involvement of more and different stakeholders. Stakeholders in this context can take many shapes and forms such as teachers, schools, school districts, technical and elected bodies from the municipality with direct relationship with education, local organizations and groups, among others.

4.3. Path to the Strategy

The strategic educational plan can be divided in three major phases: Diagnosis; Participation and Plan Development. The diagnosis and plan development phases are, as can be further seen, “the most important and also the most time-consuming” (Unesco, 2010 :7).

The Diagnosis phase “is the first step of the strategic planning process. It consists of the critical analysis of the status, functioning and results of the education system, with the view to identifying strengths and weaknesses” (Unesco, 2010 :9). The analysis was not limited to the educational system it was also important to cover the environment in which the systems is operating as so it is important not to limit the analysis to the current situation, past trends are also determinant to understand the current situation (Unesco, 2010). Since this diagnosis took a holistic approach, it can be divided in three different components:

- **the territorial characterization**, with the analysis of local urban dynamics, population, employment, transportation and other indicators;
- **the diagnosis that supports the works of the “Educational Letter/Map”**, with all the indicators related to school population, grades and results, students social support among other subjects;
- **the strategic plan diagnosis** where the legal framework, municipal plans, programs and projects with impact on local education were analysed, as well as recommendations from international and national authorities on the subject of education. Besides this, was made a survey of all stakeholders and resources of this educational system.

The Participation phase was by far the biggest task on this plan, since the goal was to make the plan with and for the educational community (students, families, teacher, schools, city council, etc). Participation is a process very imbued in this community and the municipality has a great experience in this kind of processes. Participation and also consulting took many forms and shapes in this process, from workshops with stakeholders and students, to meetings with elected bodies of the city council and the regular meetings with the team from the municipal education department. Were also sent questionnaires to all entities that could have a saying in the local educational system, and was also organized two rounds of interviews/talks with the directors of school districts.

Workshops were by far the more intense activities of this process and the biggest source of information to the plan. The participation in the workshops was made by invitation to representatives of organizations, which were divided by typology of stakeholders, such as workers from the city council (as test session), representatives from public schools, representatives from private schools, civil society members and the elected deputies of the municipal assembly and other councilman.

Workshop 1 had five sessions that count with 25 to 30 participants each, divided in tables of 5/6 people, accompanied with a Facilitator, usually someone from the technical team, that ensured the development of the workshop exercises smoothly and without incoherencies. As Figure 5 shows each participant had several *post-it’s* where could be written five problems, five opportunities and three resources of Cascais’ educational system. In rounds problems where presented to the table and facilitator would see if there where redundancies or overlapping ideas in the *post-it’s*, finally the table would have a final list of problems that could be voted to find the most important ones. The same procedure was used both for opportunities and resources. By the end of the workshop sessions the top results from each table were presented to the rest of the tables. This methodology was also used in the round of workshops for students from private and public schools, from all ages, with the due adaptations for this group.

Figure 5 Methodology of Workshop 1

⁴⁴⁹ Carta Educativa – CE



Source: Author's elaboration.

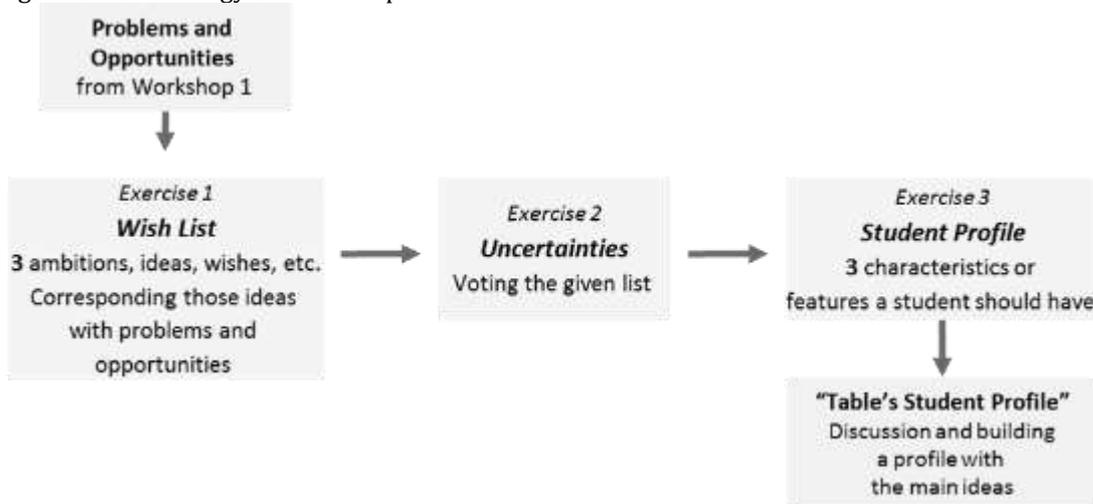
On round 2 of workshops the same organization method was adopted for the sessions, what differs from the first round are the exercises asked to the participants. These sessions had three different exercises: The Wish List, the Critical Uncertainties Framework and the definition of a Student Profile (Figure 6)

On the Wish List exercise the idea was to make the participants suggest three ambitions, ideas, aspirations and wishes to the local education system. With all the *post-its* grouped by themes, the participants were asked to associate these wishes/ambitions/ideas to a list of problems and opportunities (that came from the top problems and opportunities found on the first round of workshops).

On the second exercise the goal was to find out what participants believe to be the biggest challenges in the education sector, and how it's planning is affected by external factors, here named Uncertainties. From a list participants could vote which factors they believe affect more the system, such as policy change, demographics or economic conditions, but could be also added more factors.

The last, and third exercise, was about the Student Profile, or profiles. Here participants could present a few ideas, characteristics or features they believe that students by the end of their academic career should have, or in other words, the product of Cascais' educational system.

Figure 6 Methodology of Workshop 2



Source: Author's elaboration.

At the end of the Participation phase and with the Diagnosis completed the technical team had already much information and data to prepare a final analysis of Cascais' educational system. The SWOT tool was the technique chosen for "identifying internal Strengths and Weaknesses and external Opportunities and Threats" (Unesco, 2010 :15). Since there is no specific tool for moving from diagnosis phase to the identification of objectives and priority programs the procedure was to create strategic objectives that answered the main issues reported about the educational system

Ended the second phase was time to move from Diagnosis and Participation phase to the actual strategy design.

4.4. Designing the Strategy

The participatory process and the diagnosis phase produced, among other results, a set of main principles and values that should be inherent to the strategy to be design. These principles are: capacitation, sharing, opening to the community, co-responsability, participation and social cohesion.

Based on these principles the Strategic Ambition was defined as "Quality education in Cascais is the based on a solid and inclusive individual and collective development capable of capturing, establishing and expanding values, skills, creativity and innovation, promoting an educative territory that fosters participation and sharing of responsibilities."

This Strategic Ambition was divided in three main Strategic Objectives (SO):

- Strategic Goal 1: An Education for Success

Build a successful educational system that guarantees the integral development of each citizen, their knowledge and skills based on equal opportunities that allows the construction of individualized academic or professional paths.

- Strategic Goal 2: An Education for All Life

Ensure an education system that encourages lifelong learning and responds to the training needs of all citizens.

- Strategic Goal 3: Education with and for the Community

The resources of the educational system will provide a wide range of new spaces, values and dynamics that enhance the relationship between the school, the community and the territory.

Each one of this Strategic Objectives has different Action Plans (AP) and inside each AP a set of Actions that have a designated chart (Figure 7). It is worth mentioning only the APs that value the topics of professional education and articulation with economic dynamics. In Strategic Goal 1, AP6 - Valuing Professional Education, where it is considered that the opportunities offered by the system in these areas should be visible, exploited and seductive in order to respond to the needs of those who want to attend and who already attends this type of teaching. In this AP6 we can find the 6 Actions that compose this action plan:

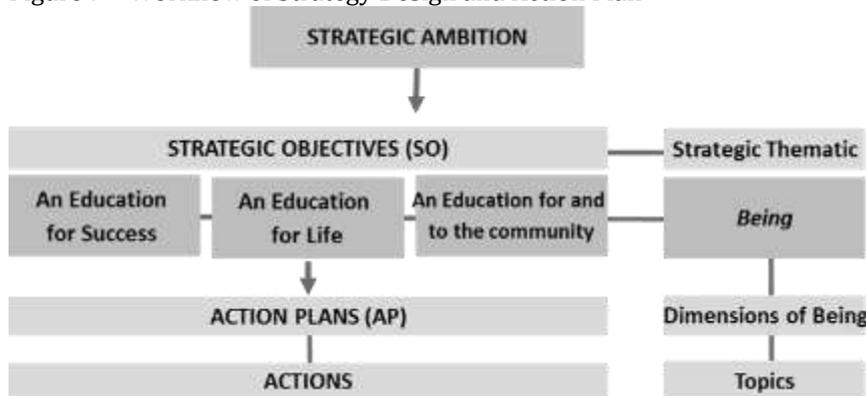
- Observatory of Professions
- Open Day of Professional Education
- Access to Vocational Education Kit
- Demand-offering platform for Professional Internships
- Pivots of Professional Education
- Professional Training Showcase

In Strategic Goal 2, emphasis should be placed on AP9 - Enhancing adult education and training, where it is considered that the school also serves to provide new skills or to deepen knowledge already acquired. Education and training find many ways of achieving this, and one of the most obvious is to consider the professional and personal experience of citizens. The actions that materialize it are:

- Study of the needs of the local labour market
- Exhibition of Professions and Higher Education
- Project "Millennials (Gen Y) and Centennials (Gen Z)"

Every Action chart is composed by the description of the main objective behind the action and how it should be implemented, besides this the chart has identified partners and resources needed, as well as, indicators of performance.

Figure 7 – Workflow of Strategy Design and Action Plan



Source: Author's elaboration.

Side by side with the Strategic Objectives was created a Strategic Thematic (ST), named as "Being". The goal behind this parallel thematic was to create a response for one of the Interadministrative Agreement demands, the flexible curriculum. This means that the 4 subjects included in this strategic thematic can be used as part of a more practical and experimental way of teaching, less formal and more based on exploration and creation outside of the classroom.

Each "Dimension of Being" has a set of "Topics for Implementation" that work as ideas or suggestions for teachers and students to discover and use local resources.

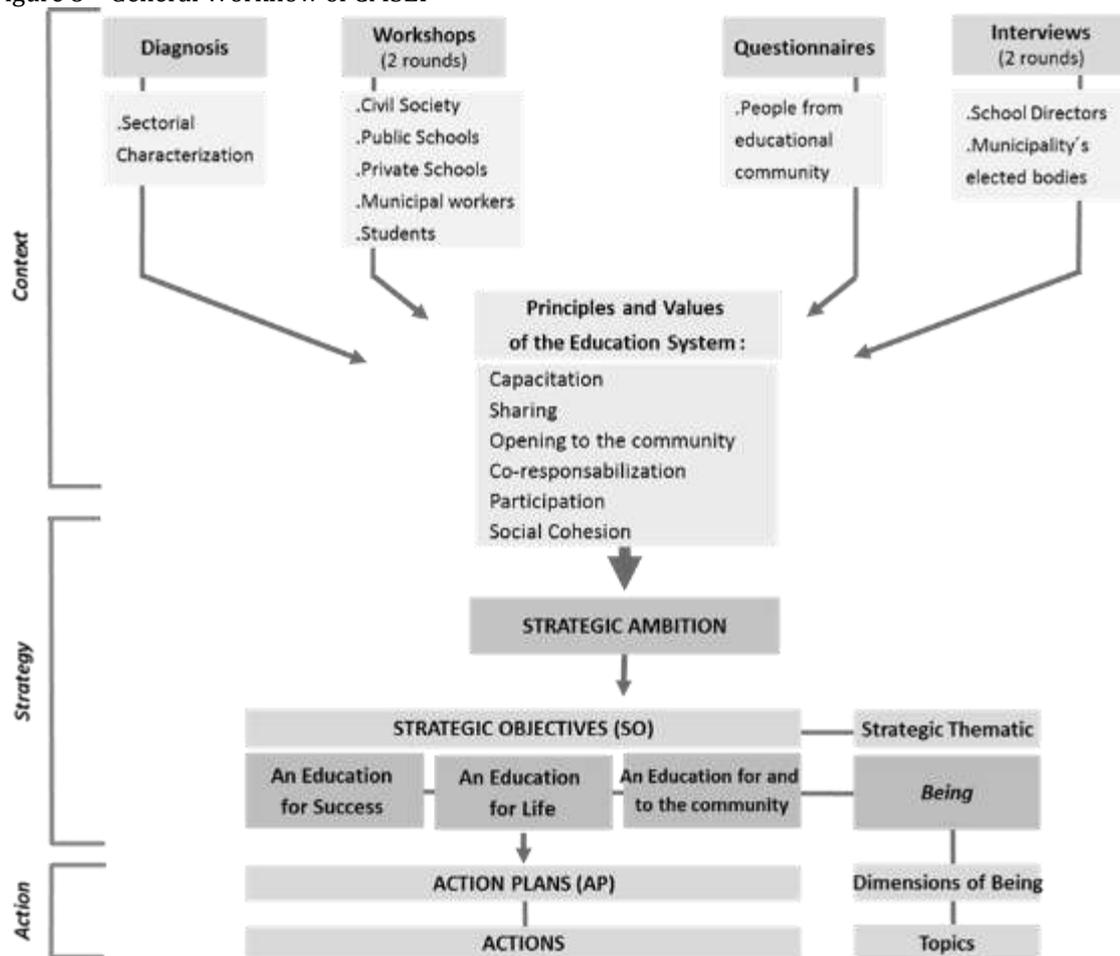
One of the subjects - "Be an entrepreneur" - have as topics the follows

- Entrepreneurship Competition
- Business start-up program for young people
- Creative Cascais / Ideas Contest
- Youth Employment Forums

Since it is non-mandatory schools can choose to explore all the themes or some of them, or just adapt the topics for implementation to their current projects. The freedom allowed in the implementation of this topic explains one of the concerns of this whole project, schools are free to make their own decisions, so the plan should never interfere inside of school decisions and options. The plan was made to provide help to the local municipality at the management of the educational systems and to give support to schools.

The vision of the whole process can be consulted in figure 8, where it is possible to highlight the three fundamental moments: the identification of the measured and perceived reality; the definition of the strategy; and the definition of the action plan.

Figure 8 – General Workflow of CMSEP



Source: Author's elaboration.

Part of the support this Strategic Plan should provide to schools is on the matter of applying strategic thinking to school plans. Each School District has (more or less) a 4-year plan that among other subjects should have the strategy for these group of schools and well as a set of projects that should be implemented in the schools. One of the things noted during the diagnosis phase was that the majority of the plans lacks in strategy because it strategic thinking is something that was never before explored in school management. It also fails on the diagnosis of its own problems, and without proper understanding of their school population and surrounding community it is hard to define a strategy and an ambition. The Interadministrative Agreement also demands that school plans are adapted when the Strategic Plan is approved by the Municipal Education Assembly, so this responsibility was always on the base of the designing of the plan.

Although setting a strategy was the main goal of this plan it was also important to established a Governance framework and a Calendar of implementation. These two tools allow that the plan can be more easily implemented and stakeholders understand better their responsibilities. Setting a Calendar for such a big task is never easy and it is impossible to take on every Action Plan and Action at the same time, so, here the purpose was to define priority groups. In the three priority groups created were distributed the APs, according with the ability of each AP to respond to the main problems identified on the diagnosis. The second and third group of priorities include those AP that are less transversal and with less coverage of the issues previously identified. Since this plan only has 5 years to be implemented the priority programs were distributed in semesters within this time period, has can be seen on the following figure (Figure 9).

Figure 9 – Action Programs Priority Groups Calendar

		Calendar (semesters)										Actions
		1	2	3	4	5	6	7	8	9	10	
Priority 1	AP 1											35
	AP 4											
	AP 6											
	AP 10											
	AP 12											
Priority 2	AP2											24
	AP5											
	AP7											
	AP8											
	AP9											
	AP11											
Priority3	AP 3											12
	AP 13											

Source: Author's elaboration.

5. CONCLUSIONS

In Portugal, there is a popular expression that says "there are evils that come for good". And in fact, the recent financial crisis since 2008 that has affected some countries has accelerated the process of "slimming" the state with the goal of reducing costs. This logic of this "Minimum State" had repercussions in several areas, but education was one of the most affected with what is called decentralization of competences at the local level associated with the respective financial transfers.

In this process, "hunger has joined the will to eat" because the municipalities also aspire to a greater role in all areas that can provide an increase in economic and social development, as long as they also see their municipal budget strengthened.

One of the key implications expected from all the changes made in the education system is what we can expect in the field of entrepreneurship and the training of both young people and adults, since local government, in articulation with the interested actors, can more accurately identify trends and needs in regular education and vocational training.

Lastly, the decentralization of education systems has generated the need to find solutions to balance between sensitivity of local diversities and the need to achievement national goals (Burns and Köster, 2016).

The relationship between what was desired by central and local governments identified in the inter-administrative contract and the reality must therefore be mediated by the Municipal Educational Strategic Plan. Where, through a participatory model, the main challenges and ambitions manifested by the Local community were taken into account. Furthermore, a significant part of the plan focused on the articulation of the educational system and the business world, not only in the logic of optimizing the relationship between demand and supply in the local and even metropolitan market of employment, but also accelerating and optimizing the processes of social inclusion by the integration of people in the labour market.

In Portugal, for example, some 175,900 people under the age of 30 have been identified who do not study, work or attend vocational training, and it is therefore urgent to find a strategy for solving the problem, in order to contain social exclusion and others problems derived from it. This grand design has had repercussions on the ambition and strategic objectives, action programs and actions of the **CMSEP**.

The CMSEP, facing the education system as a complex system, relied heavily on fundamental principles for effective governance (Burns and Cerna, 2016):

- Concentration in processes
- Adaptability and flexibility
- Involvement and co-responsibility
- Holistic system approach
- Use evidence and results for policy and technical decision making

Due to its relevance and influence in large domains of local society, and being supported by a more or less formalized diversified governance, its expected the plan will be able to contribute strongly to structural change at the local level.

REFERENCES

- Afonso, A. Políticas Educativas Contemporâneas: dilemas e desafios. In Cunha, N. F. (Org.). *Pedagogia e Educação em Portugal, Séculos XX e XXI*. Vila Nova de Famalicão: CMVNF, 2008. p. 61- 80.
- Alves, N., Centeno, M., & Novo, A. (2010). O investimento em educação em Portugal: retornos e heterogeneidade. *Boletim Económico do Banco de Portugal*, 16(1), 9-39.
- Brown, C. A. (2015). The Need to Give Voice to Local Scholars in Educational Policy. In *Globalization, International Education Policy and Local Policy Formation* (pp. 1-6). Springer Netherlands.
- Brush, C. G. (2014). Exploring the concept of an entrepreneurship education ecosystem. In *Innovative Pathways for University Entrepreneurship in the 21st Century* (pp. 25-39). Emerald Group Publishing Limited.
- Burns, T., and Cerna, L. (2016). Enhancing effective education governance. *Educational Research and Innovation*, 221-233.
- Burns, T., and Köster, F. (2016). Modern governance challenges in education. *Educational Research and Innovation*, 17-39.
- Cuéllar-Marchelli, H. (2003). Decentralization and privatization of education in El Salvador: Assessing the experience. *International Journal of Educational Development*, 23(2), 145-166.
- Fiske, E. 1996. *Decentralization of education: Politics and consensus*. Washington DC: World Bank
- IIEP-UNESCO. 2010. *Strategic planning: Techniques and methods*. Education sector planning, Working paper 3. Paris: IIEP-UNESCO.
- Instituto de Emprego e Formação Profissional, <https://www.iefp.pt/noticias?item=7325997> (accessed 29.6.2017)
- Jeong, D. W., Lee, H. J., & Cho, S. K. (2017). Education decentralization, school resources, and student outcomes in Korea. *International Journal of Educational Development*, 53, 12-27.
- Łaudams, V. (2014). How Actors of Local Society (Community) Influence the Development of Decentralized General Education, and their Attitude to it. *Procedia-Social and Behavioral Sciences*, 140, 570-575.
- McGinn, N., & Welsh, T. (1999). *Decentralization of education: why, when, what and how?* Unesco.
- McMillan, M. S., & Rodrik, D. (2011). Globalization, structural change and productivity growth (No. w17143). National Bureau of Economic Research.
- Moberg, K. (2014). Two approaches to entrepreneurship education: The different effects of education for and through entrepreneurship at the lower secondary level. *The International Journal of Management Education*, 12(3), 512-528.
- Parry, T. R. (1997). Achieving balance in decentralization: A case study of education decentralization in Chile. *World Development*, 25(2), 211-225.
- Psacharopoulos, G., & Woodhall, M. (1993). *Education for development*. Oxford University Press.
- Qi, Tingting, (2011), Moving Toward Decentralization? Changing Education Governance in China After 1985, in Tiedan Huang, Alexander W. Wiseman (ed.) *The Impact and Transformation of Education Policy in China (International Perspectives on Education and Society, Volume 15)* Emerald Group Publishing Limited, pp.19 - 41
- Rezende, A. J., Slomski, V., & Corrar, L. J. (2005). A gestão pública municipal e a eficiência dos gastos públicos: uma investigação empírica entre as políticas públicas e o índice de desenvolvimento humano (IDH) dos municípios do Estado de São Paulo. *Revista Universo Contábil*, 1(1), 24-40.
- Rondinelli, Dennis and Nellis, John (1986), "Assessing decentralization policies in developing countries: The case for cautious optimism," *Development Policy Review*, Vol. 4, No. 1:3-23.
- Rondinelli, Dennis, McCullough, J. S. and Johnson, R. W. (1989), "Analysing decentralization policies in developing countries: A political-economy framework," *Development and Change*, Vol. 20:57-87.
- Santos, L., Cordeiro, A. M. R., & Alcoforado, L. (2016). Planeamento de recursos educativos em Portugal ao longo dos últimos 80 anos. *Revista Educação e Emancipação*, 9(2), 13-35.
- Saviotti, P. P., Pyka, A. and Junca, B. (2016), Education, structural change and economic development. *Structural Change and Economic Dynamics* 38:55-68
- Skeland, G and D. Filmer (2007). "Autonomy, Participation and Learning: Findings from Argentine Schools, and Implications for Decentralization". *Education Economics* Vol. 15, No. 1, March pp. 103-127
- Stromquist, N. P., & Monkman, K. (2014). Defining globalization and assessing its implications for knowledge and education, revisited. *Globalization and education: Integration and contestation across cultures*, 1.
- Toutain, O. and Mueller, S. (2015). *The Outward Looking School and its Ecosystem*. Entrepreneurship 360, OECD
- United Nations Development Programme (2017), *Human Development Report 2016 Human Development for Everyone*. New York: UNDP.
- Veiga, I. P. A. (2003). Inovações e projeto político-pedagógico: uma relação regulatória ou emancipatória? *Cadernos Cedes*.
- Wals, A. E. (2012). *Shaping the education of tomorrow: 2012 full-length report on the UN decade of education for sustainable development*. Unesco.
- Winkler, D. 1989. *Decentralization in Education*. Washington, DC: World Bank.

1371 DEVELOPMENT OF DECISION SUPPORT FOR SPATIAL ENVIRONMENTAL PLANNING OF URBAN COASTAL AREAS**Ravinder Dhiman¹, Pradip Kalbar^{1, 2}, Arun B. Inamdar³**¹Centre for Urban Science and Engineering, Indian Institute of Technology Bombay, Powai, Mumbai, 400076 – India²Interdisciplinary Program in Climate Studies, Indian Institute of Technology Bombay, Powai, Mumbai, 400076 – India³Centre of Studies in Resources Engineering, Indian Institute of Technology Bombay, Powai, Mumbai, 400076 – India**ABSTRACT**

Environmental planning of urban coastal areas is critical for sustainable development of cities. The process of environmental planning involves classification of areas into different categories. Coastal area classification in India is a challenge for decision makers due to uncertainty of current coastal regulations and lack of scientific rational about existing classification methods. In addition to the above challenge, implications of urbanization, pollution and regional vulnerability of coastline highlight the need for developing the methods to protect coastal resources from anthropogenic activities and natural hazards which is possible through suitable planning and policy improvement at national and international scale. This research work aims towards facilitation of synergy between environmental protection and anthropogenic development in coastal cities. In present work, we developed a scientific method by integrating the Multiple Criteria Decision Making methods with spatial science for coastal area classification. A Geographic information system (GIS) based Multi-criteria Decision Making (MCDM) approach is developed in this work to provide scientific rational for classifying coastal areas. Utility functions based on the environmental sensitivity of physical coastal features are used to quantify membership values for coastal features. Furthermore, these quantitative membership values for coastal features are applied in different weighting schemes to derive Coastal Area Index (CAI) which classifies the coastal areas in four distinct categories viz. 1) Extremely Sensitive Zone, 2) Highly Sensitive Zone, 3) Moderately Sensitive Zone and 4) Low Sensitive Zone based on the environmental sensitivity of urban coastal areas. We targeted Mumbai, a coastal megacity in India, as our study area for the purpose of demonstration and validation of developed methodology. Results of CAI showed the distinct classification of coastal areas which can be used a decision support by developmental and planning authorities to prioritize coastal areas for developmental and conservational activities. Most effective coastal management options can be proposed for different classes of coastal areas based on CAI. This decision support will enhance the quality of decision making for coastal planners, managers and researchers during spatial environment planning of urban coastal areas.

Keywords: Coastal Cities; Coastal Resource Management; Urbanization; Spatial Planning, Environmental Sensitivity**1 INTRODUCTION**

Indian coastline is populated with numerous developmental activities and marine resources which supports nationwide economy. Coastal areas along the Indian coastline are under the influence of natural hazards because of vulnerability associated with Arabian Sea and Bay of Bengal in terms of extreme events such as cyclones, extreme rainfall and tsunami etc. (Alcántara-Ayala, 2002; Ramesh et al., 2015). Coastal areas overlapped with huge population such as cities along the coast are having greater exposure to natural and anthropogenic stress. Developmental activities in Indian coastal cities are prominent driver of country's economy which leads to the degradation of marine environment and depletion of coastal resources. In similar way, Indian coastal cities are also subjected to the water and soil pollution due to anthropogenic activities (Datta et al., 2010; Newton et al., 2012; Shirodkar et al., 2009). According to Vaz (2014), urbanization has led the transformation of mangrove area into developed area significantly for different anthropogenic activities in Mumbai city. There is always a need to develop balance between anthropogenic development and conservation of environmental resources to support sustainable development. In similar way, Indian government has made efforts for sustainable utilization and conservation of coastal resources with the help of coastal regulations such as Coastal Regulation Zone (CRZ) notifications (1991, 2011) under Environment (Protection) Act, 1986 (Krishnamurthy et al., 2014). Current CRZ notification is subjective in nature because of unclear definitions and some of other regional challenges at administration level are fragile institutional framework, land encroachment, destruction of coastal biodiversity, ignorance of coastal communities, and violation of regulations in various coastal cities of India (Chouhan et al., 2016; Parthasarathy, 2011). These challenges can be addressed by developing suitable quantitative decision support methods for spatial environmental planning of coastal areas in cities.

This is the high time to develop a scientific quantitative method for suitable planning of coastal areas to synergies the environmental protection and anthropogenic development. In this paper, we developed a quantitative method for decision support using Geographic Information System (GIS) and multicriteria decision making (MCDM) techniques for spatial environmental planning to characterize coastal areas into different classes based on the environmental sensitivity towards anthropogenic development for coastal areas in cities.

Recently, MCDM and GIS techniques are acknowledged as suitable tool for decision making for various applications such as land suitability analysis based on specific criteria (Baud et al., 2015), categorization of animal and plant habitats (Schmoldt et al., 2001), urban planning (Bryan, 1988), agriculture resource management (Ananda & Herath, 2003), natural resource management (Mendoza & Martins, 2006) and storm-water management (Gogate et al., 2017). Some of recent applications of MCDM and GIS in coastal resource management are coastal areas conservation (Pourebrahim et al., 2014), coastal vulnerability assessment (Sudha Rani et al., 2015), coastal reclamation (Feng et al., 2014) and disaster

resilient index (Orencio & Fujii, 2013). Therefore, we found that MCDM and GIS techniques are suitable for development of a quantitative method for spatial environmental planning for coastal areas in Indian cities.

In present study, we developed a classification method for coastal areas for spatial environmental planning which is objective in nature using MCDM and GIS technique. Furthermore, this method can be used as a decision support for integrated coastal zone management by stakeholders in the allied areas.

2 METHODS

This work is based on application of MCDM techniques integrated with GIS tool for unique classification of coastal areas to support spatial environmental planning. A novel quantitative method is developed and applicability of particular method is verified by a case study in coastal area of Mumbai city in India. Results of case study are validated and sensitivity of the same has been tested rigorously. Detailed methodological framework is depicted in figure 1.

Study Area

Coastal areas of Mumbai city in India is selected as a case study for validation of developed method for spatial environmental planning. Study area is surrounded by Arabian Sea on the west and Thane creek on the east. Mumbai city, being the most populous city in India, began with seven islands gradually merged due to land reclamation into one big island city. Some of the major challenges which are being faced by coastal planners in this city are water shortage, coastal soil and water pollution, seasonal coastal flooding, untreated pollution discharge and solid waste dumping in mangroves and adjacent creeks (Pacione, 2006). Severe pollution in coastal areas of Mumbai city is main driver of depletion of coastal ecosystem which required immediate attention for environment management (Murthy et al., 2001).

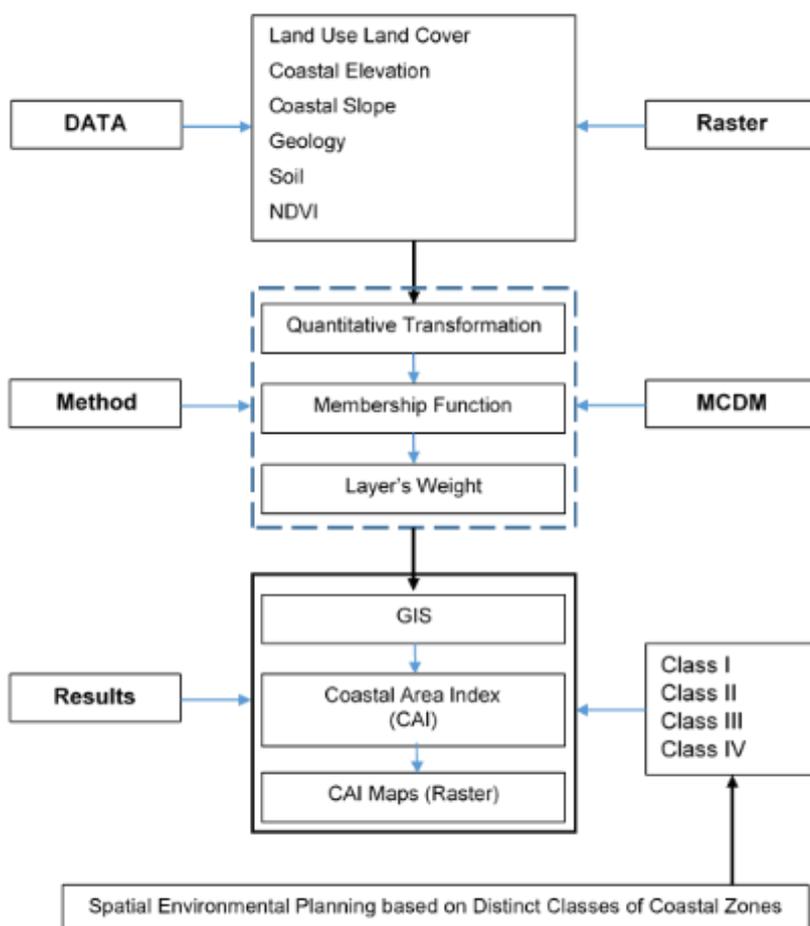


Figure 1 Methodological framework for spatial environmental planning of coastal areas

Data Requirements and Processing

Primary data for this study is used from remote sensing dataset of LANDSAT 8 satellite for different physical coastal features of Mumbai coast and secondary data is used from central agencies of Government of India as referred in table 1. Total 6 variables (LULC, Geology, Soil, NDVI, Slope and DEM) termed as layer for different coastal features, are converted into raster format at pixel level.

Table 1 Detailed description of dataset used for the case study

Coastal Features	Source	Resolution
Marine Geomorphology	Landsat 8	30 m
LULC	Landsat 8	30 m

Coastal elevation and Slope	SRTM	30 m
NDVI	Landsat 8	30 m
Geology and Soil types	Survey of India	Vector dataset

Calculation of Coastal Area Index (CAI)

A novel approach for calculation of CAI in urban coastal areas is developed which can be used for spatial environmental planning of coastal cities. In this approach, we transformed the subclasses of physical coastal features into quantifiable membership functions on a linear scale of 0 to 1 for entire dataset based on the utility of particular coastal feature for coastal ecosystem as described in table 2.

Table 2 Layer weights for coastal features and utility based membership function for subclasses of coastal features

Coastal Features	Layer Weight	Subclasses (Membership Function)
LULC	30	Rocks (0.1), Built-up land (0.2), Fellow land (0.3), Saltpans (0.4), Sandy area (0.5), Vegetation (0.6), Cropland (0.6), Forest (0.8), Marshes (0.8), Mudflats (0.8), Aquatic Veg (0.9), Mangroves (0.9), Water bodies (1)
NDVI	15	Water (0.2), Barren (0.4), Sparse Veg (0.6), Dense Veg (0.8)
Geology	10	Rhyolite (0.1), Trachyte (0.2), Unclassified Flows (0.3), Intertrappean (0.4), Compound Flows (0.5), Alluvium (0.6), AA Flows (0.8), Agglomerates Tuff (0.9), Mud (1)
Soil	10	Backfilled (0.1), Fine (0.4), Clay (0.8), Mud (0.8)
Slope (%)	15	75 - 100 (0.2), 50 - 75 (0.4), 25 - 50 (0.8), < 25 (1)
DEM (m)	20	> 10 (0.2), 5 - 10 (0.6), 1 - 5 (0.8), < 1 (1)

Membership functions are used to assign preferences in numerical format to different variables based on the importance of one variable over other. First of all, membership functions of all subclasses at pixel level are quantified based on the experts' knowledge and author's understanding about study area. After assigning membership function to all pixels of all layers, weights are assigned to different layers according to the preferred importance of the particular layer in context of spatial environmental planning and these weights are assigned by the author based on the regional understanding of the study area. Furthermore, linear weighted summation method is used to calculate the final CAI, where, normalized pixel values are multiplied with respective layer weights and aggregated to generate the CAI.

CAI for the i^{th} pixel can be computed using following equation:

$$CAI_i = \sum_{j=1}^n w_j \cdot x_{ij} \text{ for } i = 1, 2, 3 \dots, m \quad (\text{Eq. 1})$$

Where, i is pixel number in the layer (there are m number of pixel in the one layer)

j is layer number (there are n number of layers)

x_{ij} is the pixel value of the i^{th} pixel in the j^{th} layer

w_j is the weight of the j^{th} layer

The CAI obtained using Eq. 1 is further normalized to express on a scale of 0 to 10. Final CAI map is obtained in GIS and further classified into four distinct categories on a scale of 0 - 10 where each category of CAI represents the environmental sensitivity of natural coastal ecosystem towards developmental activities. In CAI, category 1 is extremely sensitive, category 2 is highly sensitive, category 3 is moderately sensitive and category 4 is low sensitive against the anthropogenic development.

3 RESULTS AND DISCUSSION

In this study, major physical coastal features such as LULC, NDVI, Soil, Geology, Slope and DEM are characterized and further classified in sub-classes at a pixel level of 30m resolution in GIS. This characterization of physical coastal features at pixel level provides the quantitative understanding of spatial distribution of various features along the coastal stretch of Mumbai city.

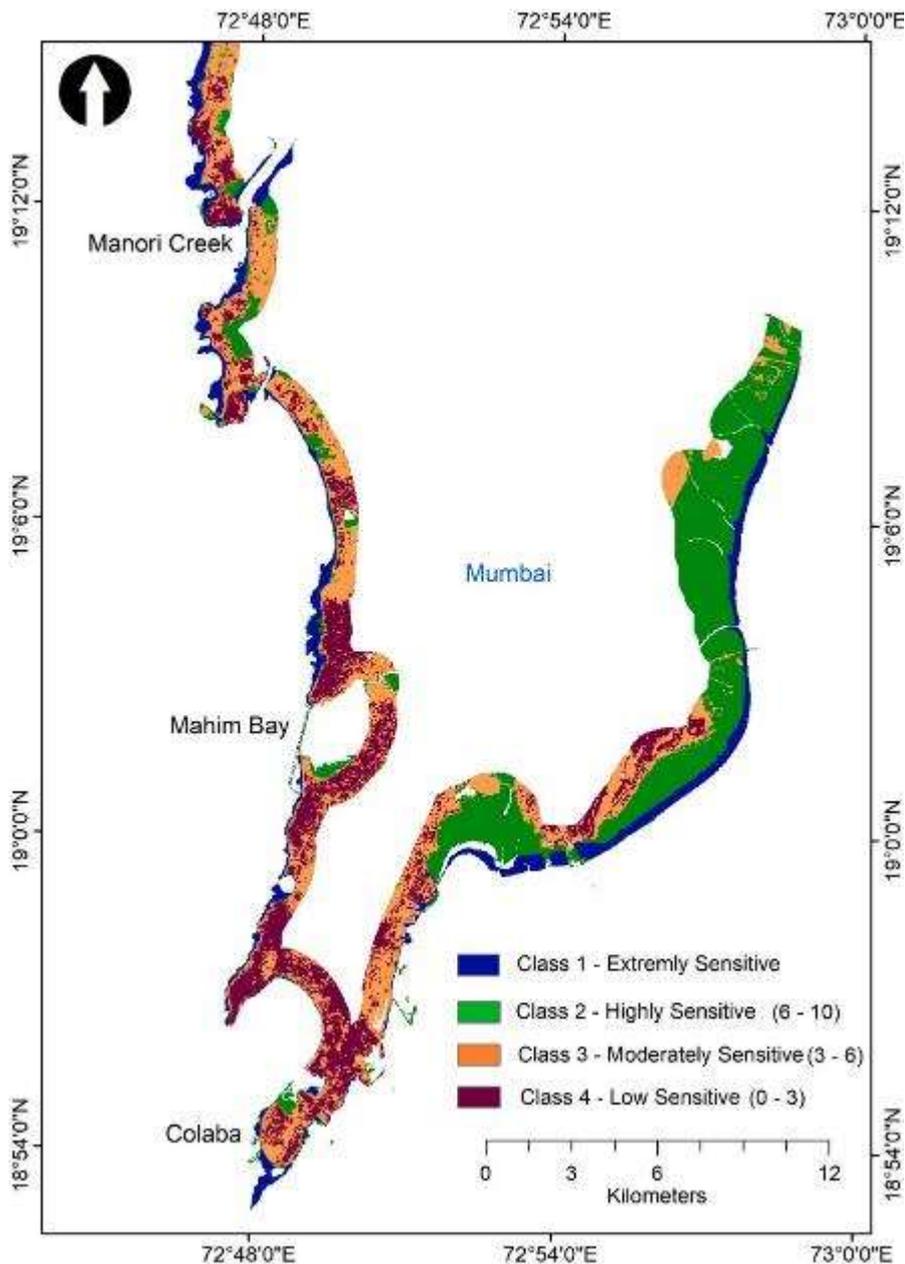


Figure 2 Coastal Areas Index for coastal stretch of Mumbai representing the classification of coastal areas into distinct categories based on the environmental sensitivity.

The CAI as shown in figure 2, is computed based on the GIS coupled MCDM approach for coastal city of Mumbai classifies the coastal area into four major classes within the normalized range of 0 – 10. Coastal stretch of Mumbai is demarcated for prioritization of different categories based on the environmental sensitivity of particular category. Class 1 (Figure 2) is depicted as the intertidal zone of Mumbai city, which is highly dynamic in nature and much important for demarcation of land from sea. Intertidal zones contain high nutrients which supports the productivity of marine life and hence this is considered as no development zone for developmental activities except special cases. Class 2 (Figure 2) is categorized as highly sensitive and CAI index range for this class is 5 – 8 at a scale of 0 – 10, which can be observed majorly distributed along the Thane Creek in Mumbai considering the biodiversity including mangroves, mudflats and other important indicators of primary productivity in the area. Urban coastal area categorized under class 3 (Figure 2) of CAI with in a range of 3 - 5 is showing moderate sensitivity because this area is majorly influenced by open spaces and barren land which can be considered for both conservational and developmental activities according to the desired requirements by coastal planners. Low sensitive area of CAI is categorized as class 4 with an index range of 0 – 3, describing most of the urbanized area in coastal area of Mumbai. Furthermore, these all these classes as shown in CAI, are validated through available latest satellite images combined with field visits. The proposed method for CAI clearly demarcated the boundary lines among these 4 classified areas which is useful for planning process by associated stakeholders such as planning authorities and Urban Local Bodies (ULBs).

Classification of coastal areas for developmental and conservational activities usually carried out by decision makers based on the existing notification of coastal regulations, which is susceptible to subjectivity and bias from different stakeholders. Scientific rationale for coastal area classification in Indian coastal cities with the help of advances in decision science will improve the prevailing decision making process of coastal planning. Outcomes of this work will lead to a scientific tool for coastal planners and decision makers including the benefits for policy makers, coastal managers,

research institutes, coastal communities and other associated stakeholders. The CAI developed in this study is found suitable as a decision support for spatial environmental planning of urban coastal areas and method developed for CAI can be used and applied to other locations with similar settings easily. This study attempt to verify the practicality of developed CAI for better planning of coastal areas satisfying the present research gap in literature. Our CAI method generate the categories of coastal areas where we can propose most effective urban coastal management options. For example, extremely or high sensitive areas require the administrative interventions to improve the inconvenient conditions of natural ecosystem due to anthropogenic pressure.

4 CONCLUSION

Present work highlights and elaborate the challenges of coastal area classification approach in urban coastal areas. In this paper, we proposed a GIS coupled MCDM based CAI approach to classify urban coastal areas for developmental and conservational activities. The developed approach is transparent where physical characteristics of coastal areas are transformed into quantitative measurements. Utility based membership functions are developed and applied to each of the sub class of different coastal features. Application of CAI approach for coastal area of Mumbai City demonstrate the classification of coastal areas according to the usefulness of coastal features and ranking of sensitivity towards effect of developmental activities. Results for Mumbai city will facilitate the efficient management of available coastal resources. Essentially, the method is found useful for highlighting the locations which needs special consideration for sustainable growth of coastal city. This method will enable coastal cities to improve the present decision making regulations and the outcome will lead to the increase in resilience against anthropogenic development.

REFERENCES

- Alcántara-Ayala, I. (2002). Geomorphology, natural hazards, vulnerability and prevention of natural disasters in developing countries. *Geomorphology*, 47(2–4), 107–124. 10.1016/S0169-555X(02)00083-1
- Ananda, J., & Herath, G. (2003). Incorporating stakeholder v alues into regional forest planning : a v alue function approach. *Ecological Economics*, 45, 75–90. 10.1016/S0921-8009(03)00004-1
- Baud, I., Scott, D., Pfeffer, K., Sydenstricker-Neto, J., & Denis, E. (2015). Reprint of: Digital and spatial knowledge management in urban governance: Emerging issues in India, Brazil, South Africa, and Peru. *Habitat International*, 46, 225–233. 10.1016/j.habitatint.2015.01.018
- Bryan, M. (1988). Multi-Criteria Decision Making (MCDM) techniques in planning. *Progress in Planning*, 30(part I), 1–84. [https://doi.org/10.1016/0305-9006\(88\)90012-8](https://doi.org/10.1016/0305-9006(88)90012-8)
- Chouhan, H., Parthasarathy, D., & Pattanaik, S. (2016). Urban development, environmental vulnerability and CRZ violations in India: impacts on fishing communities and sustainability implications in Mumbai coast. *Environment, Development and Sustainability*, 1–15. 10.1007/s10668-016-9779-6
- Datta, S. N., Chakraborty, S. K., Jaiswar, A. K., & Ziauddin, G. (2010). A comparative study on intertidal faunal biodiversity of selected beaches of Mumbai coast. *Journal of Environmental Biology*, 31(6), 981–986.
- Feng, L., Zhu, X., & Sun, X. (2014). Assessing coastal reclamation suitability based on a fuzzy-AHP comprehensive evaluation framework: A case study of Lianyungang, China. *Marine Pollution Bulletin*, 89(1–2), 102–111. 10.1016/j.marpolbul.2014.10.029
- Gogate, N. G., Kalbar, P. P., & Raval, P. M. (2017). Assessment of stormwater management options in urban contexts using Multiple Attribute Decision-Making. *Journal of Cleaner Production*, 142, 2046–2059. 10.1016/j.jclepro.2016.11.079
- Krishnamurthy, R. R., DasGupta, R., Chatterjee, R., & Shaw, R. (2014). Managing the Indian coast in the face of disasters & climate change: a review and analysis of India's coastal zone management policies. *Journal of Coastal Conservation*, 18(6), 657–672. 10.1007/s11852-014-0339-7
- Mendoza, G. A., & Martins, H. (2006). Multi-criteria decision analysis in natural resource management: A critical review of methods and new modelling paradigms. *Forest Ecology and Management*, 230(1–3), 1–22. 10.1016/j.foreco.2006.03.023
- Murthy, R. C., Rao, Y. ., & Inamdar, A. B. (2001). Integrated coastal management of Mumbai metropolitan region. *Ocean & Coastal Management*, 44(5–6), 355–369. 10.1016/S0964-5691(01)00055-2
- Newton, A., Carruthers, T. J. B., & Icely, J. (2012). The coastal syndromes and hotspots on the coast. *Estuarine, Coastal and Shelf Science*, 96(1), 39–47. 10.1016/j.ecss.2011.07.012
- Orencio, P. M., & Fujii, M. (2013). A localized disaster-resilience index to assess coastal communities based on an analytic hierarchy process (AHP). *International Journal of Disaster Risk Reduction*, 3(1), 62–75. 10.1016/j.ijdr.2012.11.006
- Pacione, M. (2006). Mumbai. *Cities*, 23(3), 229–238. 10.1016/j.cities.2005.11.003
- Parthasarathy, D. (2011). Hunters, Gatherers and Foragers in a Metropolis: Commonising the Private and Public in Mumbai. *Economic & Political Weekly*, XLVI(50), 54–63.
- Pourebahram, S., Hadipour, M., Mokhtar, M. Bin, & Taghavi, S. (2014). Application of VIKOR and fuzzy AHP for conservation priority assessment in coastal areas: Case of Khuzestan district, Iran. *Ocean and Coastal Management*, 98, 20–26. 10.1016/j.ocecoaman.2014.05.009
- Ramesh, R., Lakshmi, A., George, A., & Purvaja, R. (2015). Building resilient coastal communities by enabling participatory action: A case study from India. In B. Glavovic, M. Kelly, R. Kay, & T. Ailbhe (Eds.), *Climate Change and the Coast* (pp. 169–184). CRC Press. doi:10.1201/b18053-11
- Schmoldt, D., Kangas, J., Mendoza, G. A., & Pesonen, M. (Eds. . (2001). *The Analytic Hierarchy Process in Natural Resource and Environmental Decision Making. Journal of Chemical Information and Modeling* (Vol. 3). 10.1007/978-94-015-9799-9
- Shirodkar, P. V., Mesquita, A., Pradhan, U. K., Verlekar, X. N., Babu, M. T., & Vethamony, P. (2009). Factors controlling physico-chemical characteristics in the coastal waters off Mangalore-A multivariate approach. *Environmental Research*, 109(3), 245–257. 10.1016/j.envres.2008.11.011
- Sudha Rani, N. N. V., Satyanarayana, A. N. V., & Bhaskaran, P. (2015). Coastal vulnerability assessment studies over India: a review. *Natural Hazards*, 77(1). 10.1007/s11069-015-1597-x

1073 MULTIPLICITY OF A METROPOLIS: A CASE STUDY OF KOLKATA METROPOLITAN AREA

ABSTRACT

Despite increasing importance of urbanization as a whole and impetus on the small and medium urban units, metropolitan region continues to remain interesting and diverse as ever before. The perception of looking or treating urban is changing, but that does not throw the limelight off the metropolitan region. In fact the region is now seen with renewed interest and in different ways. This study would be based on Kolkata Metropolitan Area (KMA). In this paper I would like to discuss that metropolitan region has grown beyond traditional or conventional functional region or a planning region. It is a space that can challenge any planning initiatives. It is a comprehensive urban comprising of a multitude of hierarchic urban as well as rural units. The range includes core cities, peripheral cities, large, medium and small towns, census and statutory towns and last but not least the villages. So it could be said a metropolis itself presents a full spectrum with diverse issues to understand and multiple challenges to be faced with. Each constituent unit, irrespective of its size and shape contributes to heterogeneity and diversity of the whole; complexities and contestations are thus not problems but inevitable process in the urban discourse. This work is essentially exploratory in nature and would be based on holistic study of a metropolitan area, Kolkata. This is also an intra urban comparative work where different units within a single metropolis would be looked into and their individual identity would be discussed vis-à-vis their role within the entire region. For the purpose, different units within KMA would be studied based on Census of India, their legal statutes as well as planning attributes and governance initiatives. The study aims to explore the position of the city at crossroads of global and post colonial. Though a metropolis is generally named after a single city, as in this case after Kolkata, a number of cities are involved with their identities and intricacies. In the policy initiatives taken up at the central, regional and local level, some gets due attention, some over-attention while others remain in the background. Taking into cognizance of every single unit, though an absolute necessity, often becomes almost impossible and herculean task making governance of the whole metropolitan region rather complex and never-ending process.

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1589 PARTICIPATORY BUDGET A TOOL OF URBAN POLICY

ABSTRACT

The issue of sustainable development, brought to the political agenda by the UN, has been developing and settled since the 1970s. With the Declaration of the UN Conference on the Environment, in 1972, the Brundtland Report of 1987 and the Rio Declaration and Agenda 21 in 1992, concern for the development of methodologies that promote the sustainable management of the territory supported by the participation of the population, has become more pronounced. The production of inclusive urban space, integrated with the trend of Inclusive Urbanism, more concerned with the participation of the population in the decisions that affect it, promoted the development of new methodologies in urban planning. In this context, the initiative Participatory Budget emerges, which has its origins in Porto Alegre, Brazil, in 1989. PB can be considered as an informal example of urban management, with the direct participation of the population in determining priorities regarding part of the municipal budget. We can identify a set of PB potentialities as a participatory and territorial management tool: the institutionalization of participation, allowing commitments to citizens in the definition of investment priorities; the balance of power and the creation of a space for direct communication and cooperation between elected representatives and voters; the promotion of an identification of the population with the destinies of its municipality and still contribute to themore sustainable development of the city. In this sense, it can be said that PB is a new form of governance based on the direct participation of citizens. Since the beginning of the first experiences, the PB has been attracting sympathy and recognition from different sectors of society. The OP as a way of giving the population the ability to decide on part of the expense that a parish or municipality does in the territory is one of the methodologies experienced in several countries from the 90's of last century. This is a worldwide phenomenon, with a presence on all continents, with particular emphasis on Latin America, Europe and, more recently, Africa. Although there is no overall statistics on the number of OP experiences, it is estimated that they currently exceed 2,000 worldwide. This research analyzes the results of the PB of the municipality of Lisbon between 2008 and 2016/2017 on various perspectives to characterize the way the projects are organized to vote, which can help to develop citizen movements. The Lisbon PB had its first edition in 2008, distinguishing itself from other similar experiences because it is a truly deliberative process, which gives decision-making power to citizens to present proposals fortheir city or neighbourhoods and to vote on the projects they consider to be priorities. The most voted projects, up to an amount equivalent to 5% of the Investment Budget of the municipality, are integrated with the proposed Budget and Activity Plan of the Municipality of the following year.

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**SS08.2. Metropolitan
Governance in a conflict,
competition and cooperation
contexts**

1561 UNLOCKING THE PRIVATE-LED HOUSING PROJECTS IN LISBON'S SUBURBIA - A TYPOLOGICAL SURVEY OF EVERYDAY'S RESIDENTIAL LANDSCAPE

ABSTRACT

The paper will explore the conceptual and methodological rationale of a research project based at CIAUD - Faculty of Architecture, University of Lisbon, aimed at surveying and analysing the residential typologies that made a considerable part of Lisbon's metropolitan fabric. The temporal and geographical focus of this research concerns the post-1940's decades and the main suburban corridors west of Lisbon city boundaries. These corridors experienced fast and considerable growth, absorbing not only people who sought Lisbon metropolis away from countryside but also residents who left the city out to the suburbs, especially after the 1960's. In a rather unique pattern, distinct from the American sprawl or European's welfare residential estates, Lisbon metropolis development resorted to considerable areas of medium-to-high rise apartment typologies, even in distant areas from the metropolitan centre. Although single family housing is a major part of the existing fabric, high density suburban areas can be found along and in-between major railroad and motorway axes. Often faced with low quality urban amenities, suffering from critical mobility gaps and strongly shaped by commuting, these urban areas have also evolved during the last decades to a state where some identity and social fabric can be found. Which relationships between architectural, real-estate rationale and everyday life patterns can be found in these landscapes? Which models and references supported their development? How can the private-led development of this de facto social housing offer be assessed, half a century after the first large scale public housing programmes started to be implemented? The research project builds on existing methodological framework already tested for public housing development in various Portuguese cities. New and relevant data are expected to be highlighted when observing, under the same lens, the private-led housing projects. Archive survey at selected municipalities will provide the basis for the database building, with a relevant selection of housing projects. A road map will be developed, helping to decode these parts of the metropolitan landscape, often criticized as unintelligible, piecemeal and fragmentary products of a purely private-led and speculative real-estate market, in which city planning has had limited capacity to control. For each housing project, three levels of information will be analysed and systematized: - The architectural and typological references; - The urban models and spatial patterns that result from this development; - The personal forms of appropriation of the housing space and its cultural and social references. Largely overlooked by architectural and urban research – often targeted at public-led projects usually associated with higher design quality –, these private-led housing neighbourhoods are the home to about half of the metropolitan population. Their acknowledgement as a research corpus is an unavoidable step to inform future policies on architectural, urban and socio-spatial qualification for these territories.

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1510 IS HOUSING FOR ALL INDEED FOR 'ALL'? A CRITIQUE OF THE 'HOUSING FOR ALL' POLICY

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ABSTRACT

The 'Pradhan Mantri Awas Yojana – Housing for All' is the national affordable housing program launched by the Government of India in June 2015 aiming to make affordable housing accessible to every citizen, especially the ones belonging to the Economically Weaker Sections and the Lower Income Groups of the country. 'Housing for All' anticipates bringing massive changes in the affordable housing market with a proposal to provide 20 million housing units in the Indian cities by 2022, 96% of which would be for the urban poor, mostly by incentivizing the private sector to participate in the ongoing redevelopment of slum communities. However, the path may not be that easy for the Government as the policy framework does not reflect the actual needs of the urban poor, and seems to be far away from the reality of the present housing requirement for people living in slums. The paper aims to critically analyze the Housing for All policy guidelines to understand the prospective implications it has on slum dwellers and the urban poor living in Indian cities, and check if the guidelines reflect the current housing situation in Indian cities. Using case studies of two-tier II cities in the states of Odisha and Chhattisgarh, the paper would highlight how the Housing for All guidelines specifically do not address the needs of smaller cities of the country, apparently highlighting the phenomenon of metropolitan bias. Based on the shortcomings, the paper would identify some possible solutions which the Government could think about and undertake for the welfare of the most vulnerable population living in cities – the urban poor.

INTRODUCTION

More than 26-37 million households (33-47% of the total urban household population) in India live in informal dwelling units due to rapid urban population growth and a shortage of planned affordable housing, according to a recent study done by the FSG group in 2016. Approximately 0.1-4% of these households live in informal housing units without any security of tenure, as their place of residence is 'unknown' to the state. People living in these informal housing units are forced to live in poor conditions having poor or no basic services such as sewage, sanitation, etc.; and also face the threat of eviction or demolition due to limited property rights (Jain et al., 2016).

The demographics and its transition from rural to urban are critical in understanding the emergence and persistence of slums in Indian cities. The country's urban population has increased from 62 million in 1951 (17% of total country's population) to 377 million in 2011 (31% of country's total population), living in 7933 urban centers including 53 cities with a population of greater than 1 million (Tiwari and Rao, 2016). India's growth over the last three decades has resulted in a significant influx of human migration coming from the rural to the growing metropolitan areas with a considerable increase in the number of towns and urban agglomerations. This continuous influx of people has oversaturated the existing urban systems in the cities leading to the creation of slums⁴⁵⁰ facing inadequate housing, sanitation, basic services, and security.

Around 65 million out of the 377 million live in inferior housing units in a situation of deteriorated or incomplete infrastructure, termed as slums (Census, 2011a). It was only in the 2011 census survey that details about amenities in informal housing units were measured for the first time. Despite 70 years of planning and policy designing since independence, the 2011 census data highlighted shocking statistics where 53% of the households do not have toilets nor access to drinking water, and 33% of the households do not have access to electricity (Census, 2011b).

With the United Nations' Sustainable Development goals aspiring to halve the population of people living in slums within each country by 2030, the Indian government has a lot of work to do. With this target in mind, the Prime Minister of India Narendra Modi launched the Pradhan Mantri Awas Yojana (Prime Minister's Housing Policy) – popularly known as the 'Housing for All' scheme in June 2015 aiming to provide affordable housing access to every citizen by 2022 (Govt. of India, 2017). The Prime Minister launched the program amidst a lot of fanfare expressing his desire, '*We have a dream for 2022. The poorest of the poor should have a house of his own. And that house must be equipped with electricity, water, and other facilities. There should be hospitals and schools in the neighborhood*' (Khan & Gupta, 2017). Noble sentiments indeed, but could this dream turn to reality with this program?

Therefore, this paper aims to critically analyze the Housing for All policy guidelines to understand the prospective implication it has on its intended target population – the slum dwellers. The study highlights the housing requirements for the urban poor today in Indian cities and goes through the major tenets on why the provisions of the Housing for All policy fall inadequate concerning the current reality in Indian cities. The study goes through all the previous significant programs implemented by the Government of India for the urban poor and looks at the reasons for their failures. Based on the learnings from the past failures, the paper concludes with a series of suggestions and possible solutions the Government should emphasize upon in addition to the proper implementation of the 'Housing for All program' to ensure that affordable housing would be accessible to everyone in the cities.

⁴⁵⁰ Slum is the term used in development regulation codes of Indian cities for a broad range of substandard, informal structures and neighborhoods. UN-Habitat defines a slum household as a group of individuals living under the same roof in an urban area lacking durable permanent housing, sufficient living space, easy access to water, access to adequate sanitation, and security of tenure (UN-Habitat, 2006).

HOUSING REQUIREMENTS FOR THE URBAN POOR

The Government of India estimates the housing shortfall to be around 18.76 million household units in urban areas, with 96% of the deficit for households belonging to Below Poverty Line (BPL), Economically Weaker Section (EWS), and Lower Income groups (LIG)⁴⁵¹ (Govt. of India, 2012). However, Tiwari and Parikh (2012) estimated this shortage to be 21.87 million with the inclusion of non-durable houses in their calculation. They predicted the total housing shortage in India to be approximately 51 million units and an additional 113 million homes nationally if semi-permanent dwellings also are considered. Such kind of large-scale intervention would not be possible by government participation alone. Thus the Housing for All policy was articulated to incentivize the private sector to participate in the redevelopment of the entire slum communities.

Local governments in India are forced to operate with very low tax bases because of the large population involved in the informal sector where most of the transactions are difficult to be recorded for taxes. Because of this phenomenon, the informal areas of the city are the most hit with low service levels (Hindman et al., 2015). Local governments see minimal incentive to spend money on improving the service levels of these areas when the population is mostly informal and are non-compliant in paying taxes. Although the level of access to services in informal housing and slums has increased over the time, there is an apparent drop in access to these services when comparing secure to that of insecure housing⁴⁵² and transitional housing⁴⁵³ (Jain et al., 2016). Most of the insecure housing units come up on the edge of cities or undeveloped land that may not have been zoned out for residential use when the house is built (Ibid, p. 9).

These housing units being not legalized in nature lack access to essential services, and also live under a constant threat of eviction. The occupants of these informal housing units cannot even get formal mortgages as their properties are not legal. The violations imply that the government can legally evict the slum dwellers and/or demolish the housing structure.

The Government of India has tried many approaches since independence in 1947 to improve the living conditions of the informal housing dwellers, but without any significant large-scale impact. It took some time for a change in the government's philosophy from relocating families to improving living conditions *in situ* providing essential services and consequently security of tenure. While many groups have opposed relocation for disconnecting the dwellers from their existing physical and social infrastructure and disrupting their livelihoods (Kapse et al. 2012); redevelopment by the government alone is economically unviable at the scale necessary for large-scale intervention (Jain et al., 2016).

PROGRAMS FOR THE URBAN POOR PRIOR 'HOUSING FOR ALL'

Chronology of Slum Development Projects in India

<p>Pre 1947 No systematic policies- either at local or national level</p> <p>1956 Passing of Slum Areas Improvement & Clearance Act aimed to improve living conditions</p> <p>1958 Launch of Urban Community Development Program emphasizing on community development and self help</p> <p>1972 Environmental Improvement of Urban Slums created to focus on physical development of the area</p>	<p>1970s and 1980s Sites and Services program where slum dwellers use their own resources to build houses in plots allotted by the government.</p> <p>1986 Urban Basic Scheme launched with the financial support from UNICEF for provision of basic social services and physical amenities</p> <p>1989 Nehru Rojgar Yojana launched to cater the economic needs of the urban poor.</p> <p>1996 National Slum Development Program launched with an aim to provide physical amenities</p>	<p>2001 Valmiki Ambedkar Yojana launched to facilitate construction and upgradation of dwelling units in slums</p> <p>2005 Basic Services to Urban Poor launched as part of JNNURM – provided a garland of seven entitlements to slum dwellers</p> <p>2011 Rajiv Awas Yojana implemented with an aim to upgrade and assign title to slum residents, and to plan accommodate the predicted growth</p> <p>2015 Housing for All launched providing affordable housing to all residents</p>
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Figure 1 - Chronology of Slum Development Programs in India

No proper study of government policies towards urban slums and squatters in India had appeared for the period before independence as there were no systematic policies, either nationally or at the local level (Basu, 1979). Some slum development programs have been implemented since the country's independence in 1947 by different governments. Tiwari and Rao (2016) mention how these programs could never attain the intended effect for they lacked continuity and

⁴⁵¹ BPL, EWS and LIG are defined by the Govt. of India as having an annual household income of no more than 27,000 Rupees (The Hindu, 2016), 100,000 Rupees and between 100,000 and 200,000 Rupees, respectively (MHUPA 2013, 5)

⁴⁵² Insecure housing has neither de jure nor de facto rights since their existence and/or location is not in any government records. These are typically new settlements and face a high risk of forced eviction. Unidentified slums can be recognized in this category.

⁴⁵³ Transitional housing exists in one or more government records and is progressively gaining de facto rights to use. Identified and recognized slums can be considered as transitional housing.

interconnectedness. In the last six decades, the role of the government has been transitioning from a provider to a facilitator.

India's first set of economic policies focused on rapid development of capital goods industries post its independence in 1947. The industrialization that followed led to migration from rural areas to cities generating a massive housing demand, which, the public sector employers provided to their employees to a certain extent, but mostly ignored the rest. Over time, migration to urban areas continued at an uncontrolled rate, creating deplorable living conditions in cities and leading to the formation of slums. The Government of India passed the **Slum Areas (Improvement and Clearance) Act, 1956** empowering the state to intervene (via notification in the official gazette) with the stated aim of improving living conditions. The Act enabled the state to notify a settlement as a slum and acquire the land under eminent domain, which curtails the landowners' right to retain or sell the land unless the state's acquisition is successfully challenged and defeated in court.

The **Urban Community Development (UCD)** Program was the first formal attempt to experiment with community development approach in cities in partnership with the Ford Foundation in 1958. 20 projects were undertaken in the next ten years emphasizing on community participation and self-help, with 50 percent of the expenditure borne by the Government of India and the rest by state governments and the local bodies (Cousins & Soudiere, 1992). However, the projects could not be replicated to other areas in the cities due to lack of funds and lack of proper training to the communities (Ibid, p.6).

The next major program was the **Environmental Improvement of Urban Slums (EIUS)** introduced in 1972, with an aim to provide an acceptable physical environment in the slum areas. EIUS was created to focus on the physical development of the area but had no component of community participation nor involvement of local NGOs working in the slum areas, which possibly was the primary reason for its negligible success (Mohanty & Mohanty, 2015). The program was also found not having a focus on social services like health, education, community development, etc. Although the scheme was partially successful in improving the physical infrastructure of the slum communities, it did not stop the emergence of new slums arising due to recent migration or natural increase in existing slums.

Sites and Services (S&S) was the most common approach in the 70s and the 80s used all across cities in developing countries. Conceptually, the Sites and Services scheme sought to minimize the public costs and subsidies required by conventional social housing programs by providing only those components individual households could not procure for themselves – land, infrastructure, and services (Wakely & Riley, 2011). The slum dwellers were supposed to build their own resources, labor, and time to develop their houses in serviced plots allotted by the government. The World Bank supported 11 'sites and services' projects across 27 cities in India between 1977 and 1997, providing around 279,000 plots to the slum dwellers (World Bank, 2016). The Sites and Services programs had many problems, including the imposition of standards of design and construction that were unaffordable, high rates of default on loans and rents, and social problems such as unemployment and exclusion (Wakely & Riley, 2011). Most of these problems arose due to the projects being located on cheap land on the urban periphery, far from jobs, transport, and social facilities. Therefore, the Sites and Services scheme was gradually replaced with the Urban Basic Scheme (UBS).

The **Urban Basic Scheme (UBS)** was initiated by UNICEF and the individual state governments in 1986 for the provision of basic social services and physical amenities in urban slums in 200 towns (Cousins & Soudiere, 1992). Central to the UBS program was the neighborhood community, constituted for every 200 families. The committee as a whole would identify the needs of the community, prioritize them keeping given the resources, prepare an action plan, and implement it after the approval of the town management community (Ibid, p.13). However, it was observed that municipalities were not trained to explain the concept and philosophy to the slum communities to enlist their support and participation. Thus, the plans were formulated by the project staff based on their perception of the needs of the community instead of reflecting their actual needs (Prasad, 1993, p.7). Political pressure and interventions was another critical factor for the program's failure. Councilors started feeling that they were overlooked, thus perceiving the committees as a threat to their leadership as well as to their sphere of influence (Ibid, p.8). The UBS scheme was merged with EIUS to form the **Urban Basic Services for the poor (UBSP)**, in 1990.

While the EIUS and 'Sites and Services' was based on an area approach, NRY under the beneficiary approach, and UBSP under the community approach; an integrated approach was still lacking (Ray, 2010, p.5). In an attempt to provide a policy with an integrated approach, the **National Slum Development Programme (NSDP)** was one of the first large-scale slum development schemes launched by the Government of India in 1986. The program was a slum upgradation project started in 1996 with an aim to provide physical amenities like water supply, stormwater drains, community baths, widening and paving of existing lanes, sewers, community latrines, etc. (Govt. Archives, 2008). It was initiated with an aim to upgrade 47,124 slums throughout India, started by identifying a target slum in each city which it planned to develop as a 'model slum.' Beneficiaries were provided loans to make improvements while the government invested in delivering community services. In the implementation of the scheme, NSDP, however, was able to disburse only 70% of its allocated funds with projects lacking proper monitoring and supervision, resulting in time-delays and misused funds (Hindman et al., 2015). The program discontinued in 2005-06 after the launch of Jawaharlal National Urban Renewal Mission (JNNURM), a national urban renewal mission.

At the same, **Valmiki Ambedkar Yojana (VAMBAY)** was another centrally sponsored scheme launched in 2001. The project aimed to facilitate the construction and upgradation of dwelling units of people living below the poverty line, and not having adequate shelter. The program was implemented in partnership with State Governments who had the

responsibility of setting up the implementation machinery, arrange the land where required, and the credit component of the housing program (Govt. of India, 2006). Although the scheme aimed to support the construction of housing for the poor but set 60,000 rupees (\$900) as a limit for the cost of construction of a housing unit to qualify – an amount which was practically impossible to construct a house at that time (Das, 2003). The policy was considered a non-starter in big metropolitan cities where land is a scarce resource, and the government has no vacant areas to consider for distribution for the housing of the poor.

The program was later subsumed into JNNURM where VAMBAY and NSDP were combined to form **Integrated Housing and Slum Development Program (IHSDP)** in 2009 (Govt. of India, 2009). IHSDP attempted to enhance public and private investments in housing and infrastructural development in urban areas, involving private developers for the first time in the slum development process at a national scale.

Basic Services to Urban Poor (BSUP) was the next large-scale slum development program to be implemented in Indian cities after NSDP. BSUP started as a part of JNNURM in 2005. The program aimed to provide essential services to the urban poor in 63 of the largest cities in India by population. It was designed to offer a garland of seven entitlements – ‘security of tenure, affordable housing, water, sanitation, health, education, and social security for poor settlements’ (ESID, 2015). However, it ultimately became a housing construction program subsidized and implemented by the government. Instead of providing incremental improvements to existing housing, many of the projects in the program involved evicting slum dwellers to clear the site and constructing contractor-built small apartments (Patel, 2013)

BSUP failed to address the issue of urban poverty and was considered a policy failure due to its shortcomings in design such as unaffordability, insufficient attention to tenure, and lack of poor urban involvement in the programs (ESID, 2015). Disproportionately low funding was allocated to BSUP compared to larger infrastructure components under JNNURM. Due to non-availability of official statistics on states’ slum populations, there was a lot of large-scale faulty planning, and the financial requirements for JNNURM were underestimated in the absence of an accurate understanding of the extent of the problem due to lack of data on slums (Killemssetty, 2013). There was low satisfaction among beneficiaries due to high costs; inconvenient sites for relocation; poor quality and design for construction; and a lack of provision for operation and maintenance in most of the projects. (Mahadevia et al., 2015).

Rajiv Awas Yojana (RAY) was the last large-scale scheme implemented in 2011 before the announcement of Housing for All after the change of political parties in the National level elections in 2014. RAY was launched in 2011 to support state and city governments to upgrade slums, assign title deeds to the slum residents, and plan to accommodate the predicted growth so that no more slums are formed (Patel, 2013). The program envisioned a ‘Slum Free India’ in five years of its commencement with every citizen having access to basic infrastructure, social amenities, and decent shelter (Govt. of India, n.d., a), something we can now state with certainty that the program failed to meet its intended targets. RAY intended to bring existing slums within the formal system and enable them to avail the basic amenities available for the rest of the city. The Government also approved the scheme of **Affordable Housing in Partnership (AHP)** as a part of RAY to increase affordable housing stock by providing loan subsidies to EWS and LIG.

Most of the schemes in RAY overlapped with other programs in JNNURM such as BSUP and IHSDP. The program failed to take off for over a year after its launch with many states expressing reluctance to comply with mandatory provisions for availing central funds such as providing security of tenure to dwellers and earmarking 25% of the municipal budget for spending in slum colonies (Dasgupta, 2012). RAY also recommended cities to allocate about 25 to 40 percent of their land in their development plans for housing; something municipalities had not been ready to accept (TheHindu, 2013). The most significant challenge that RAY faced was the scarcity of suitable land, with the Planning Commission of India (2012-17) attributing it to suboptimal land-use patterns, lack of long-term planning, and the lack of participatory planning process to determine the most efficient use of parcels of land.

JNNURM overall remained fragmented and project-based with different aspects of the program involving separate ministries at the central level, and being implemented in a very isolated way at the local level (Tiwari and Rao, 2016). Low levels of participation by the slum dwellers led to delays in housing delivery and selection of projects not best suited to the needs of the beneficiaries (Hingorani, 2011). Many scholars reported how JNNURM favored new construction over in-situ development, despite JNNURM priority given to in-situ development (Tiwari and Rao, 2016; Hingorani, 2011).

Most of the slum development programs implemented by the Government of India had good intentions for the welfare of the slum dwellers. However, financial constraints of the government combined with factors such as lack of public participation in the planning and the implementation stages showing lack of sectoral approach played an important role in impeding the aimed developments. At the same time, ad hoc interventions often driven by political and administrative objectives rather than economic considerations and the on-the-ground situations made sure that the slum development programs would not impact the target beneficiaries in the way it was supposed to.

THE PRADHAN MANTRI AWAS YOJANA (PMAY) – HOUSING FOR ALL

The Prime Minister of India, Mr. Narendra Modi in June 2015 announced the subsumption of RAY and other housing schemes in the Pradhan Mantri Awas Yojana scheme to provide affordable housing to all eligible beneficiaries. The PMAY has two components – the PMAY–for the urban poor and the PMAY – Rural for the rural poor. Our focus of research is only towards the guidelines of the urban component of PMAY. The ‘Housing for All’ program has four central provisions–the in-situ redevelopment of slums using private participation, affordable housing through credit linked subsidy,

affordable housing in partnership with the private and public sector, and beneficiary led construction/enhancement of homes (figure 2).



Figure 2: Four central Provisions of Pradhan Mantri Awas Yojana (Govt. of India, 2017)

The first central provision allows in-situ redevelopment of slum households to be carried out by private developers (Govt. of India, 2017, p.4). While the residents would be rehoused in multi-storied structures, the remaining portion of the land would be used to construct commercial/residential buildings by the private developers in the open market. By using the private sector as a financing tool in the Housing for All policy, the government took a departure from the traditional systems focusing on piecemeal upgradation efforts in slums (National Slum Development Program) or using government machinery to build public housing (Basic Services to Urban Poor). The second provision provides an interest rate subsidy as a home loan for up to 600,000 rupees (\$9300) at an interest rate of 6.5% for the weaker section (Ibid, p.6). The third provision mandates 35% of the housing in a particular project to be reserved for the Economically weaker sections (EWS), and each beneficiary would receive a subsidy of 150,000 rupees (\$2300) (Ibid, p.9). And the fourth provision allows an individual to avail a subsidy for beneficiary-led individual housing construction (Ibid, p.10). The four provisions altogether have been framed to rehabilitate slum dwellers and reduce the number of evictions and demolitions, commonly happening before. However, a closer look of these provisions shows the harsh reality on why each of them is grossly inadequate.

The most important criteria for a slum household to be eligible for any developmental activity through the Housing for All policy is by being included in the 'beneficiary list' (Ibid, p.2) prepared by the Government. A beneficiary list is prepared with a defined criterion and only the families on the beneficiary lists are awarded the benefits. The requirements for beneficiary lists could vary from residence in the settlement at the time of cut-off date assigned by the government to income, and so on (Jain et al., 2016). However, the slum dwellers in most of the cases would have very few documents to prove their eligibility, making them ineligible. As families living in a slum for a long time become victims of frequent demolitions, a lot of paperwork required to prove the eligibility often goes missing during the chaos of the evictions. In most of the cases, the land and property records in the country are in such poor records. Many people would continue living in their ancestral home, whose title deeds may be in the name of their deceased forefathers (Deb, 2017). The current occupants, who would arguably be the target beneficiaries of the development program would be unlikely to have title documents.

Occupants would want to get into the lists and thus would leave no stone unturned in gathering the evidence to make them qualify for the beneficiary lists. As transactions and agreements are not recorded in government registers for informal housing, the task becomes all the more arduous. Renters would typically have proof of their identification but not of their address, since rental agreements are mostly informal and unwritten. Thus, many households automatically get excluded from the proposed developmental activities and cannot even apply to claim for one without these documents. The residents end up facing a problem where to prove eligibility for a provision; the resident would have to submit a water/electricity bill. However, to get a water/electricity connection, he would have to prove his residence.

The Deepak Parekh Committee (2008) constituted by the Ministry of Housing and Urban Poverty Alleviation (MHUPA), Govt. of India framed the definition of an affordable house. They defined it to be 'something meaning more than a roof over one's head – having adequate privacy, space, accessibility, security, lighting, heating and ventilation, and basic

infrastructure – all of which to be available at affordable cost (p.7). Later, the Wadhwa Committee (2009), defined that an affordable housing for people living below poverty line (BPL), economically weaker section (EWS) and Lower Income groups (LIG) should be financeable by home loans with estimated monthly installments not exceeding 5% for the BPL 20% for the EWS and 30% for LIG, respectively. Using the definitions provided by the Wadhwa Committee, a person belonging to either BPL, LIG and EWS category would not be able to pay more than 1350 rupees (\$20), 5000 rupees (\$77), and 10000 rupees (\$154) respectively annually as his home loan,

As mentioned before, the 'Housing for All' policy guidelines mention provision of a central assistance of 150,000 rupees (\$2300) or a loan of 600,000 rupees (\$9300) at an interest rate of 6.5% annually for a period of 15 years (Govt. of India, 2017, p.10) for construction of a new house for eligible EWS and LIG individuals. Using basic simple interest calculations, an individual would have to pay approximately 79,000 rupees (\$1200) per year just for repayment of the loan for 15 years, an amount equal to three-fourths of the maximum income an individual from EWS would earn, and one-third of that of LIG. For someone below the poverty line, a person would prefer being in his original situation than be burdened with paying something three times of what he could earn. With income constrained to such an extent that low-income families would find it difficult even to afford for adequate food, it is a huge challenge to fill the gap to pay for a house. It is interesting to observe that the policy favors middle-class families more than the urban poor to acquire new homes. The program incentivizes young middle-class couples to be first-time homebuyers by helping them subsidies for loans up to 1.2 million rupees (Chandran, 2017) – an amount which is half of the loan amount fixed for the EWS and one-fourth for LIG as compared that of the middle-class.

Builders in India today project affordable homes to be costing between 2-4 million rupees (\$29,400 - \$59,400) for a unit of up to 55sq meters (Chandran, 2017), an amount which is 76 times to that of the annual income of a person below the poverty line. Central assistance of 150,000 rupees (\$2300) only takes care of 7.5% of the problems a poor person would have, leaving him with a lifetime of debt for taking care of the remaining amount. Affordable housing finance is estimated to be 6 lakh crore rupees (\$93.12 billion) business opportunity by 2022, a date by when the Government of India seeks to achieve housing for all citizens (Bhunia, 2017). This amount provides enough incentives for the private players to be interested in the housing market.

The entire policy plan of providing loans to EWS and LIG makes very little sense when a majority of the poor lack steady incomes and documents essential to secure bank loans. An estimated 165 million Indians do not have bank accounts, with its unbanked population can stand as the seventh-largest country in the world, by population (Dey & Govindrajana, 2016). Given many migrant workers living in the slums of the cities, the banking process is intimidating, unnecessary, and expensive for them to maintain. The Ministry of Labor and Employment, Govt. of India states that 65-70% of the workers in urban areas work in the informal sector (Hindman et al., 2015). As the workers get paid in real cash, they lack collateral, formal records of identification, thus to be underserved by the Housing Finance Companies. Keeping this in mind, the Government of India launched the Pradhan Mantri Jan-Dhan Yojana (Prime Minister's People Money Scheme) in 2014, a national mission to ensure access to financial services for the poor. The scheme has been able to bring down the number of unbanked people in the country from 557 million in 2011 (Nair, 2015) to 165 million in 2016 (Dey & Govindarajana, 2016) especially in the rural areas. But surely, there is a long way to go in making it more accessible to all for the urban poor.

The policy guidelines conveniently only consider homeowners for any subsidies (Govt. of India, 2017, p.10), leaving aside a large chunk of renters living in the slums. One-third of urban dwellers have been found to be renters, living in poorly equipped homes (Ahmed, 2015). It is difficult to expect a large number of homeowners in a slum community, especially among groups who are struggling to meet their daily expectations. In most of the cases, it would be the slumlords having ownership for most of the household pockets (Gilbert, 2008). Greatly benefiting from these redevelopment schemes, the slumlords evict the renters and get the opportunity to charge the newly redeveloped homes at a higher price than before. Moreover, the guidelines make it clear for states/cities to exclude temporary migrants from taking any advantage of the housing scheme (Govt. of India, 2017, p.12). The guidelines make no effort in defining permanent and temporary migrants leaving it to the state and the local governments to decide. More importantly, a decision to exclude temporary migrants from any of the provisions would mean only half or probably less than half of the urban poor would be able to take advantage of the policy. The census data stands as substantial evidence to highlight the increasing migration of people from rural areas to the cities, most of whom would end up settling in the squatter settlements and non-notified slum pockets looking for better prospects.

Although 'Housing for All' guidelines advocate only for the redevelopment of existing slums without any evictions, it is interesting to observe that only 2.2 percent of the total approved housing under the program has been for in situ development till August 2017 (Bhunia, 2017). Moreover, the policy guidelines do not mention anything on the provision of transit accommodation for dwellers while their slums are being redeveloped, leaving the poor to fend for themselves without any support not knowing anything about the time it would take for redevelopment. Experiences from previous policies should have taught the Government of India by now about the need to have focused primarily on in-situ upgradation which not only would require lower costs for implementation, but would also help build and maintain the social capital of the communities. Having in-situ upgradation becomes a crucial factor considering the scarcity of land as a recurring theme behind the implementation of any new infrastructure project in the Indian cities. Approximately 2 lakh hectares of land would be needed to satisfy the housing shortage of 18 million units as planned by the Government (Ibid, 2017), a prospect challenging to comprehend considering the land scarcity existing in the Indian cities. Keeping this in mind, the Government has made efforts to unlock the land potential by providing Transfer of Development Rights (Govt.

of India, 2017, p.3) to incentivize private developers to undertake affordable housing development programs. While this could be effective in metropolitan cities like Mumbai or New Delhi, the economics won't hold steady in smaller towns where the land values are not that high, and developers would be unable to recover the costs.

Going in line with the previous policies, the 'Housing for All' too does not elaborate a proper framework for incorporating greater community participation in the decision making and the implementation stages. The guidelines mention the approval of detailed project reports by the State Level Sanctioning and Monitoring Committee (Govt. of India, 2017, p.14) but nowhere says if the project reports would be put for public review for submission, or even incorporates citizen inputs in the designing of the project. As mentioned before, lack of community participation was one of the primary reasons why previous slum development policies failed to meet its intended targets.

If the target of providing 18 million houses is to be met by new units alone by 2022, approximately 44,000 homes are to be built every day, which is a tall order to fulfill. Considering the target of creating 18 million new housing units by 2022, the pace of implementation for the Housing for All program has been slow, with only around 380,000 housing units built since 2015 and 4.19 million houses approved as on April 2018 (Govt of India, 2018). Looking at the average time for construction of an affordable home in India being 53 months (JLL, 2012) and the rate in which the houses are currently being built, the Government would surely need to revise its targets of completing the construction of 18 million housing units in 7 years.

CONCLUSION

The pathway to achieving 'Housing for All' is not as simple as the rhetoric given by the Prime Minister and the Government of India. States have still been following their old ways or evicting slum dwellers in the name of effective developmental practices. Many reports show large-scale evictions and demolitions of slums across the country even in 2018 (Khan & Gupta, 2017). While evictions continue being the norm, the government of Maharashtra at the same time decided to cut 14% of its allocation of funds for housing this year, thus showing the indifference of the government towards the massive housing problem that the city faces (Pawar, 2017). Meanwhile, the Government in the State of Odisha passed the Odisha Land Grabbing (Prohibition) Bill 2015, with a provision of seven-year jail term for anyone, including the homeless for encroaching on government land (Govt of Odisha, 2015).

As seen before, targeting to provide affordable homes to EWS and BPL through the Housing for All policy means that around 92% of the cost of the home is borne by the individual even after supposedly making it 'affordable.' The absence of formal financial structures for the poor communities further widens the gap between the purchasing power of the poor neighborhoods to the actual market price. These communities do not have any accumulated or inherited wealth, therefore not having the capability to afford neither the downpayment nor the monthly installments.

There is not only an urgent need to increase the supply of low-income housing as envisaged by Prime Minister Modi while launching the Housing for All policy, but also improve the living conditions for those living in informal housing, especially those in insecure housing and squatter settlements. India urgently needs a law that recognizes housing as a fundamental human right, which would ensure the protection of minimum nature of shelter to the needy for him/her to have a dignified life. Without the security of tenure, the access and quality of services and infrastructure in informal housing would largely depend on the welfare policies of the state and the local politics.

The need of the hour is not just providing cheaper loans, but increased allocations for homeless shelters and social renting housing in urban areas for migrant workers and the poor. Social renting housing as a concept that has slowly started warming up in the policy circles. The National Urban Rental Housing Policy 2017 is currently awaiting the Cabinet's approval (Bhunia, 2017). The most significant advantage of opting for a social renting housing program is that it would absorb floating population of seasonal and temporary migrants, who would not want to invest in a fixed, immovable property in the city – however, subsidized or cheap it is. Conceptually, social rental housing needs a more significant push by the government in the cities, considering the rental housing for commercial purpose is well rooted in the metropolitan cities. Last measured, around 10 million houses lay vacant in the commercial market which has not entered the rental market (Ibid, 2017). A vast majority of these property owners are private citizens who prefer leaving their house vacant, rather than offer it on rent. Property owners often fear that they may lose their property to tenants, leading to under-utilization of their assets. These vacant housing units would take care of half of the estimated housing shortage in the country. In addition to creating new capacity, one needs to study why the owners of the vacant houses do not see any merit in renting out the vacant properties.

However, a major challenge remains defining a standard criterion for allocating property rights to prevent vested interests and/or unintended beneficiaries such as slumlords and high-income families. States would need to simplify the process of updating property records, which would allow citizens help obtain legal documents to entirely be able to access the subsidies offered by the Housing for All program. There is an urgent need to derive a different typology of housing structures that provide variations in sizes of houses, structural quality, infrastructure services, and tenure types to meet the requirement of various income groups and having the essential requirements for a basic home, yet being affordable.

Policies cannot be designed with an overdrive of infrastructure alone, but would also need incorporation of behavioral insights of the intended beneficiaries for them to be successful and achieve its outcomes. Thus, a program like the Housing for All, with all its good intentions can succeed if it can resolve issues of unclear land titles and ensuing claims, build instruments to facilitate affordability of housing by all segments, encourage social rental housing, building adequate

financial resources for affordable housing programs, and overcoming market segmentation. With the incorporation of all of these parameters, someday it would be finally possible for all citizens in a city to live in a home adequate with all the essential services.

WAY FORWARD

The study would like to test the arguments presented in the paper to investigate how does the PMAY respond to the needs of the smaller cities by conducting a comparative case study across four cities along the eastern region of the country. The paper would compare the progress of the PMAY programs in two tier 2 cities – Bilaspur (Chhattisgarh) and Brahmapur (Odisha), and compare it to the progress occurring in two metropolitan cities also located in the eastern part of the country – Kolkata (West Bengal) and Visakhapatnam (Andhra Pradesh). The four cities are selected for the contrast they present not only with respect to the difference in population across the cities but also considering the variation of the political party in power across each state. The research first plans to study the existing deprivation in the slum households for each of the four cities based on the 2011 census data and other secondary sources available. The next phase would involve observing the extent of housing projects covered in each city under PMAY with respect to the deprivation present in each city, and the proportion of the population it is covering. Finally, the study plans to have qualitative interviews with the slum dwellers who would ideally be the intended beneficiaries. Detailed personal interviews with the slum dwellers would give information on their tenure status, number of years of their stay in the slums, annual income and so on. The interviews would provide information on the extent of the eligibility status of the slum dwellers for the Housing for All program. This information would be supplemented with market studies to understand the housing market with respect to information such as the scale of affordable housing in the city, and the average price of a home for the particular city. in each of the four cities. All these details can be used to build a quantitative model to find the correlations between the Housing for all provisions to the actual needs of the slum dwellers in each city, which thus could help us investigate the extent of PMAY coverage concerning both the metropolitan and the smaller cities of the country.

REFERENCES:

- Ahmed, Sohail. (2015). Housing Poverty and Inequality in Urban India. *Poverty Reduction Practices and Policies in Developing Asia*. Asian Development Bank and Springer International Publishing, ISBN 978-981-287-419-1
- Basu, Dilip K (ed.) (1979). *The Colonial Port City in Asia*; Centre for South Pacific Studies; University of California, Santa Cruz;
- Bhunia, Abhirup. (2017). Affordable Housing, a costly affair? Hindu Business Line. November 10, 2017. Retrieved from: www.thehindubusinessline.com/opinion/affordable-housing-india-low-cost-problems-demand/article9953414.ece. Last Accessed: December 15, 2017
- Census of India (2011a). Primary Census Abstract for Slum. *Census of India 2011*. Retrieved from: <http://www.censusindia.gov.in/2011-Documents/Slum-26-09-13.pdf>. Last Accessed: November 30, 2017
- (2011b) Provisional Population Totals – urban Agglomerations and cities. *Census of India 2011*. Retrieved from: http://censusindia.gov.in/2011-Common/NSDI/Houses_Household.pdf. Last accessed: April 28, 2018
- Chandran, Rina (2017). India's affordable housing plan won't fix homelessness, say campaigners. Reuters. January 30, 2017. Retrieved from: <https://www.reuters.com/article/us-India-land-rights-housing/Indias-affordable-housing-plan-wont-fix-homelessness-say-campaigners-idUSKBN15E1AN>. Last Accessed: November 30, 2017
- Cousins, William J. & Soudiere, Marie de la (1992). Urban Basic Services in India – A Preliminary View. *UNICEF Report*. Retrieved from: https://www.unicef.org/about/history/trim/urban_child/doc/doc373425.PDF. Last Accessed: December 01, 2017
- Das, P.K. (2003). *Slums: the continuing struggle for Housing*. Edited by: Sujata Patel & Jim Massel, Oxford University Press
- Dasgupta, Moushumi (2012). Rajiv Awas Yojana back on draft board, to get a facelift. Hindustan Times. July 09, 2012. Retrieved from: <http://www.hindustantimes.com/delhi-news/rajiv-awas-yojana-back-on-draft-board-to-get-a-facelift/story-2KffUFd6a07bSV3D3QMfEO.html>. Last Accessed: December 1, 2017
- Deb, Shriya (2017). Housing for All: There's a lot to be built. July 9, 2017. Retrieved from: <http://www.thehindubusinessline.com/opinion/housing-for-all-pmay-and-shortage/article9756490.ece>. Last Accessed: December 15, 2017
- Deepak Parekh Committee. 2008. Affordable Housing for All. Delhi: National Real Estate Development Council under the Ministry of Housing and Urban Poverty Alleviation. <http://www.naredco.in/pdfs/report-high-level-task.pdf>. Last Accessed: April 28, 2018
- Dey & Govindarajan. (2016). The Urban poor aren't convinced of the value of opening a bank account. *Scroll.in*. November 26, 2016. Retrieved from: <https://scroll.in/article/822539/the-urban-poor-arent-convinced-of-the-value-of-opening-a-bank-account>. Last Accessed: November 30, 2017
- ESID, (2015). Lessons from India's Basic Services for the Urban poor programme . *ESID Briefing Paper No. 13*. Retrieved from: http://www.effective-states.org/wp-content/uploads/briefing_papers/final-pdfs/esid_bp_13_BSUP.pdf. Last Accessed: November 30, 2017
- Gilbert, A. (2008). Slums, tenants and home-ownership: on blindness to the obvious. *International Development Planning Review*, 30(2), i-x.
- Govt. Archives (2008). National Slum Development Programme (NSDP): Archives. *Govt. of India Archives*. Retrieved from: <https://archive.india.gov.in/citizen/health/viewscheme.php?schemeid=1156>. Last Accessed: November 30, 2017
- Govt. of India (2018). Pradhan Mantri Awas Yojana – Housing for All (urban). State Wise Progress Update. Retrieved from: [http://mohua.gov.in/upload/uploadfiles/files/All_India_PMay\(U\)\(1\).pdf](http://mohua.gov.in/upload/uploadfiles/files/All_India_PMay(U)(1).pdf). Last Accessed: April 28, 2018
- Govt. of India (2017). Pradhan Mantri Awas Yojana – Housing for All (Urban). *Ministry of Housing and Urban Poverty Alleviation, Govt. Of India*. Retrieved from: http://mhupa.gov.in/User_Panel/UserView.aspx?TypeID=1493. Last Accessed: April 28, 2018
- (2012). Housing Data Tables. Delhi: Government of India, Ministry of Housing and Urban Poverty Alleviation. http://www.nbo.nic.in/Images/PDF/housing_data_table.pdf. Last Accessed: April 28, 2018
- (2009). Modified Guidelines for Projects of Integrated Housing and Slum Development Program (IHSDP). *Ministry of Housing and Urban Poverty Alleviation, Govt. of India*. Retrieved from:

- <http://mhupa.gov.in/writereaddata/Revised%20Guidelines%20IHSDP%202009.pdf>. Last Accessed: December 1, 2017
 ----- (2006). Annual Report 2006-07. *Ministry of Housing and Urban Poverty Alleviation, Govt. of India*. Retrieved from:
<http://mhupa.gov.in/writereaddata/UploadFile/AR0607eng.pdf>. Last Accessed: December 1, 2017
 ----- (n.d.,a). Rajiv Awas Yojana. *Ministry of Housing and Urban Poverty Alleviation, Govt. of India*. Retrieved from:
http://mhupa.gov.in/User_Panel/UserView.aspx?TypeID=1282. Last Accessed: December 1, 2017
 Govt. of Odisha. (2015). The Odisha Land Grabbing Prohibition Ordinance 2015. Retrieved from:
http://lawodisha.gov.in/files/acts/act_26604_1478583862.pdf. Last Accessed: April 28, 2018
 Hindman, Michelle; Lu-Hill, Olivia; Murphy, Sean; Rao, Sneha & Zhu, Zeqi. (2015). Addressing Slum Redevelopment Issues in India. *Dow Sustainability Fellowship 2015*. Retrieved from: <http://sustainability.umich.edu/media/files/dow/Dow-Slum-Redevelopment-India.pdf>. Last Accessed: November 30, 2017
 Hingorani, P. (2011, November). Revisiting Low Income Housing: A Review of Policies and Perspectives. In *India Urban Conference*.
 Jain, Vikram; Chennuri, Subhash & Karamchandani, Ashish. (2016). Informal Housing, Inadequate Property Rights. *FSG Mumbai*.
 December 2016. Retrieved from: <https://www.fsg.org/sites/default/files/publications/Informal%20Housing%20Inadequate%20Property%20Rights.pdf>. Last
 Accessed: November 30, 2017
 JLL. (2012). Affordable Housing in India. Retrieved from: http://www.jll.co.in/india/en-gb/Research/Affordable_Housing_in_India_2012.pdf. Last Accessed: April 28, 2017
 Kapse, V., Pofale, A., Mathur, M. (2012). Paradigm of Relocation of Urban Poor Habitats (Slums): Case Study of Nagpur City” *International Journal of Social, Behavioral, Educational, Economic, Business and Industrial Engineering*
 Khan, Bilal & Gupta, Ane. (2017). Will Modi be able to Provide Housing for All. April 18, 2017. *The Wire*. Retrieved from:
<https://thewire.in/125113/housing-for-all-modi-mumbai/>. Last Accessed: December 15, 2017
 Killmsetty, Namesh. (2013). Understanding the evolution of slums in Ahmedabad, through the integration of survey data sets. In A. M. Garland (Ed.), *Innovation in urban development: Incremental housing, big data, and gender* (pp. 127-145). Washington, DC: Woodrow Wilson International Center for Scholars
 Koppikar, Smruti (1995). Failing to Deliver. *India Today*. February 15, 1995. Retrieved from:
<http://indiatoday.intoday.in/story/despite-spending-rs-3800-crore-jawahar-rozgar-vojana-fails-to-alleviate-poverty-in-states/1/288302.html>. Last Accessed: December 17, 2017
 Mahadevia, Darshini, Abhijit Datay, and Aseem Mishra. “Foisting Mass Housing on the Poor: Lessons from Social Audit of BSUP.” CUE Working Paper Series 21 (2013): CEPT. Oct. 2013. Web. Sept. 2015
 Mohanty, L.N.P. & Mohanty, Swati. (2015). *Slum In India*. APH Publishing Corporation. ISBN: 81-7648-892-5
 Nair, Vishwanath. (2015). India’s unbanked population halves to 233 million. *Livemint*. October 14, 2015. Retrieved from:
<http://www.livemint.com/Industry/v4zrym0BCjNvXg3qcUD30K/Indias-unbanked-population-halves-to-233-million.html>. Last
 Accessed: November 30, 2017
 Patel, Sheela (2013). Upgrade, rehouse or resettle? An assessment of the Indian government’s Basic Service for the Urban Poor (BSUP) Program. *Environment and Urbanization*. Vol. 25(1). Pp.-177-188
 Pawar, Yogesh. (2017). Maharashtra Budget 2017-18: 15% cut in housing budget. *DNA India*. 24 March 2017. Retrieved from:
<http://www.dnaindia.com/india/report-maharashtra-budget-2017-18-14-cut-in-housing-budget-2367031>. Last Accessed:
 December 15, 2017
 Prasad, Ravindra (1993). Urban Basic Services Programme in India: A Critical Evaluation. *Regional Centre for Urban and Environmental Studies*. Retrieved from: <https://www.ircwash.org/sites/default/files/822-IN93-13407.pdf>. Last Accessed: December 01, 2017
 Ray, C.N. (2010). Livelihoods for the Urban Poor: A Case Study of UMEED programme in Ahmedabad. Centre for Urban Equity Report. Retrieved from:
http://cept.ac.in/UserFiles/File/CUE/Working%20Papers/Revised%20New/08CUEWP8_Livelihoods%20for%20the%20Urban%20Poor%20A%20Case%20Study%20of%20UMEED%20Programme%20in%20Ahmedabad.pdf. Last Accessed: December 1, 2017
 The Hindu (2013). Slum-free Cities. Editorial. October 17, 2013. Retrieved from:
<http://www.thehindu.com/opinion/editorial/slumfree-cities/article5241153.ece>. Last Accessed: December 1, 2017
 Tiwari, P., & Rao, J. (2016). *Housing Markets and Housing Policies in India* (No. 565). Asian Development Bank Institute.
 Tiwari, P., & Parikh, J. (2012). Global housing challenge: A case study of CO2 emissions in India. *SPANDREL Journal*, 5, 96-104.
 Wakely, Patrick & Riley, Elizabeth. (2011). The Case for Incremental Housing. *Cities Alliance Policy Research and Working Papers*. Series No. 1
 Wadhwa, K. (2009). Affordable Housing for Urban Poor. New Delhi: National Resource Centre, School of Planning and Architecture, New Delhi. <http://www.spa.ac.in/NRC/ThemePaperAffordableHousing.pdf>. Last Accessed: April 28, 2018
 World Bank (2016). Success when we deemed it failure? Sites and Services 20 years later. Retrieved from:
<http://blogs.worldbank.org/sustainablecities/success-when-we-deemed-it-failure-revisiting-sites-and-services-20-years-later>. Last
 Accessed: December 1, 2017

1380 EMPIRICAL STUDY OF THE EFFECT OF FLOOR-AREA-RATIO REGULATION IN JAPAN

ABSTRACT

Local governments in Japan set upper limits on the allowable floor-area-ratio (FAR) with the aim of controlling population growth and externalities. The FAR limit has been treated as a variable in empirical models of real estate prices in Japan. A low-enough value of the maximum acceptable FAR necessitates low building heights, but beyond a certain value it does not have any direct effect on the actual heights of buildings. There are, however, indirect (negative) effects on real estate prices from possible tall buildings in the surroundings. Our hypothesis is that the mechanism by which the FAR control affects real estate prices depends on the relation between the privately determined optimal FAR and the regulatory FAR values. To test this hypothesis, we conduct empirical research using the real estate transaction price datasets from the Ministry of Land, Infrastructure and Transport since 2000. First, each sample is divided into two subsets. In one, the regulation constrains the actual heights. In the other, it does not. The percentage of constrained heights in a municipality reflects the local public policy on population growth. Estimation of spatial econometric models measures strategic interdependence among neighboring municipalities on height regulation. Next, we estimate an optimal FAR function using constrained samples. This estimated function is used to predict the population changes caused by changes in FAR regulation. It also provides a guideline as to whether the FAR limit should be treated as an explanatory factor in models of land price. Finally, we simulate the urban population level without FAR regulations. In other words, we can confirm how much the population concentration in Japanese cities is suppressed by FAR regulation.

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1567 FROM THE CITIES TO THE 'NEW CENTRALITIES' IN ANGOLA: INTERCONNECTION BETWEEN URBAN SPACES

ABSTRACT

This article is intended to address the subject of urban space typologies in the “new centralities” of old colonial cities in Angola and their space and time connection. Due to the civil war (1975-2002) informal expansions were created in the borders of cities. They heralded precariousness, the lack of housing and the need of inclusion in the urban tissue. This phenomenon covers the whole Angolan territory and includes 80% of the country’s urban population. Thus, in the beginning of the 21st century, this large urban and demographic transformation and the lack of housing gave way to the present intervention practices (re)designing the national territory. The situation also led the State to create the National Urbanism and Housing Program (PNUH – Programa Nacional de Urbanismo e Habitação) implemented since 2009, under which 1 million dwellings have been built up to 2017. If in the colonial past these planned cities used to integrate pre-existing areas, rendering structure to urban expansion, the present process of the new centralities, distinct in form and content, is distant from the past in terms of time and space, suggesting new ways of living-working connections are now based on very different urban contexts, origins, growth and public spaces. Despite the new interventions, old towns will always remain an inexhaustible source of life, reference and identity: the personal and collective identity of a people, a place and a country. In the wide territory, the memory of the cities and the way in which they have been appropriated in usage and form along the years turn each of them into a space of collective identity. There, each square, each street and avenue, each block and building are urban elements determining different ways of living. And they raise the following question: 40 years after the independence of Angola are these new centralities, far away from the city, the key to new ways of living?

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**SS08.3. Metropolitan
Governance in a conflict,
competition and cooperation
contexts**

1249 BHISTIS OF KOLKATA-A VANISHING TRIBE

ABSTRACT

Bhists were once a very important part of Kolkata’s water supply is now in apathetic state,they are fast vanishing tribe of Kolkata. The word bhisti probably originated from the Persian word bhisti, meaning paradise. This was probably because of the importance of water and its supplyas there was a serious crisis of water supply. During the British rule they were known for their loyalty and efficiency. Bhists were once the employees of CMC area, butsoon they lost their prime position as suppliers of water after carriages were introduced and plumbing also made things worse. But due to the inefficiency of KMC and poor plumbing experience many houses did not get water and bhists became indispensable. Today a handful bhists operates in a few pockets of Kolkata. The Bow Barracks in Bou Bazar area is the place where only they are found. The bhists of Kolkata will soon be history and the next generation will be unaware of their services and they will only remain as a abstract modern art in front of City Centre 1. This paper will reveal the present condition of the bhists along with their socio-economic, and occupational structure.

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1117 LIVABILITY CLUSTER DEVELOPMENT FOR ASSESSING REGIONAL COMPETITIVENESS, -A CASE OF KOLKATA METROPOLITAN AREA (KMA)

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ABSTRACT

Livability is an all-inclusive paradigm of human development and community wellbeing based on an expansion of the identical environmental, socio-economic and socio-cultural dimensions of a regional space. At present, livability is an elementary benchmark to evaluate quality of life (QoL) and overall wellbeing of any communities. Today 54% of the world's population is settled in the urban areas and is expected to reach 66% by 2050. The impact of the rising population pressure on the urban environment is a key concern for all the policymakers and researchers from a regional competitiveness point of view. The present paper is trying to ascertain the key aspects of livability and delineate Kolkata Metropolitan Area (KMA) into significant livability clusters to appraise its regional competitiveness.

Keywords: community wellbeing, livability, metropolis, regional competitiveness

1 INTRODUCTION

Livability is an all-inclusive paradigm of human development and community wellbeing based on an expansion of the identical environmental, socio-economic and socio-cultural dimensions of a regional space. Pre-assuming good socio-economic conditions, the capacity to inhabit in a certain regional space is a requirement for livability. At present time livability is an elementary benchmark to appraise the quality of life (QoL) and overall wellbeing of any communities and the essential induced prosperity within any regional space.

The concept of livability reveals its importance for community wellbeing (Tilaki et al. 2014). Livability is a holistic idea (Jomehpour 2015) and a very close aspect of community development and metropolitan management (Wyatt, 2009). It embraces broad human needs ranging from nourishment, shelter and safety to cultural manifestations (Bardhan et al. 2011). Partners for Livable Communities define, livability as the sum of the factors that add up to a community's quality of life, including the built and natural environments, economic opportunities, social equity, educational and health opportunity, and cultural expressions (National Research Council 2002). The dimensions of livability have a direct association with a community's wellbeing and decision making to contrive a region more competitive (Badland et al. 2014). It endeavours to stimulate urban spaces towards an ideal level to improve the overall community's QoL (Tilaki et al. 2014). Numerous researchers have been argued about the concept and dimensions of livability and its association with regional competitiveness (Kennedy & Buys 2009). First, Kevin Lynch augmented five elements of livability, to make a region more livable and competent, namely liveliness, wisdom, fit, access and control (Leach et al. 2017). Secondly, Douglass has initiated labour force, economic opportunities, good governance and quality of environment (Uysal et al. 2012) to understand regional competitiveness. Reham and Elsemary have conducted a research to understand the qualitative conceptions of livability between theory and applications in Egypt based on land use, sense of place, civic amenities and public safety (Momtaz & Elsemary 2015). So most of the cases researchers have used various parameters to understand the association between livability and regional competitiveness based on their own perspectives and propositions pinched from their research setups.

Today, 54% of the world's population is settled in the urban areas and is expected to reach 66% by 2050 (Department of Economic and Social Affairs 2014). The impact of this increasing population pressure on the urban environment is a key concern for all the policymakers and researchers from a regional competitiveness point of view (Cicerchia 2014). From this standpoint, metropolitan livability assessment approach has appeared in regional science to assess a profound and comprehensive relationship between community wellbeing and their urban environment (Tilaki et al. 2014; Paul & Sen 2017). The present paper is trying to identify the key aspects of livability and delineate Kolkata Metropolitan Area (KMA), the largest multicultural metropolis in India into significant livability clusters for appraising its regional competitiveness.

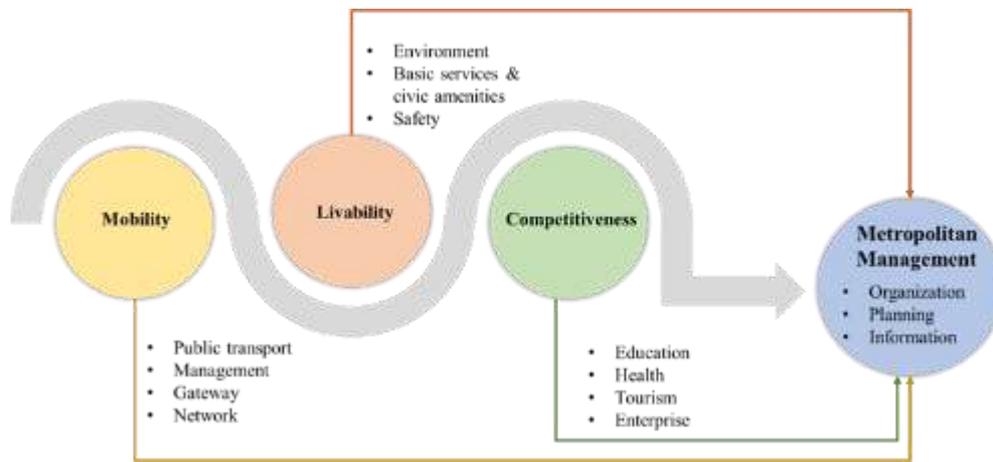


Figure 108 Conception of the Research

2 RESEARCH APPROACH

The research is forwarded in four segments (Figure 2). In the first segment, research background, mainly literature review and need of the research have been assimilated followed by case study selection. After that cluster analysis has been identified for livability cluster development to assess its regional competitiveness. In the final segment the secondary research outcome has been validated based on Residents Reaction survey.

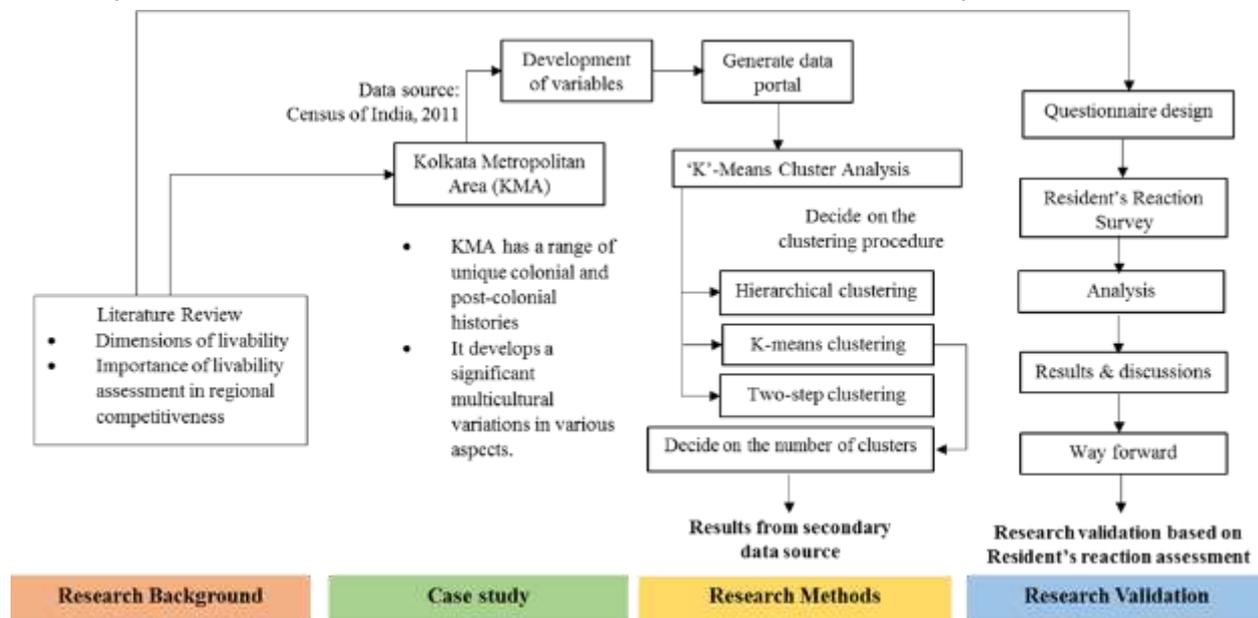


Figure 109 Research Approach

2.1 Development of variables

Data used in this study were obtained from Census of India 2011. To validate the secondary data results, a Residents Reaction survey has been done.

2.2 Selection of case study

KMA is the third largest urban agglomerations in India following Mumbai and Delhi. It extends over 1886.67 Sq.km area and is formally managed by 4 municipal corporations namely, Kolkata, Howrah, Chandannagar and Bidhan Nagar. It also contains, 36 Municipalities, 72 towns and 527 villages across the metropolis (Kolkata Metropolitan Development Authority 2000). The study has only focused on the urban agglomeration of KMA (4 municipal corporations and 36 municipalities). The population density within KMA is quite high (7,480 per km²). But the economic activities and civic amenities are not equally distributed within KMA. Most of these facilities are concentrated within Kolkata and Bidhan Nagar (Bardhan et al. 2011). These features have initiated a sub-regional livability variation based on civic services and facilities within KMA (Paul & Sen 2017). The present paper has adopted a sub-regional clustering approach in analyzing livability variations of KMA.

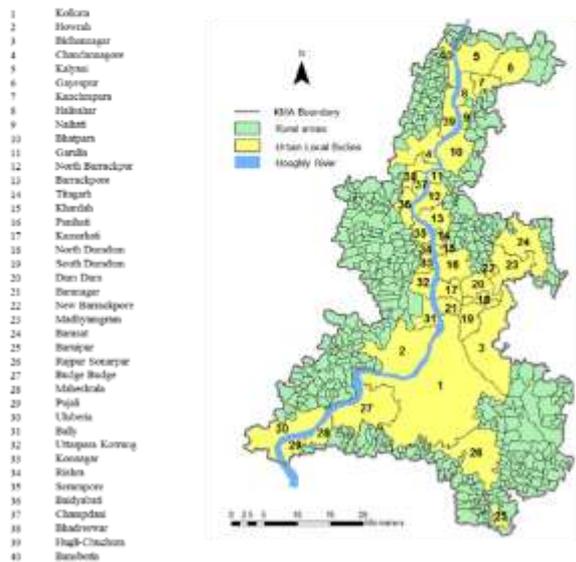


Figure 3 Location of KMA

2.3 'K'-Means Cluster Analysis

This paper has used cluster analysis to delineate KMA into 'N' number of clusters. Cluster analysis is a well-accepted method for statistical classification (Cheong & Lee 2008) of a set of measured variables into defined homogeneous groups (Cornish 2007). In general there are three approaches in cluster analysis namely hierarchical clustering, K-means clustering and two-step clustering, which is largely a combination of the first two methods (Mooi & Sarstedt 2011). To cluster KMA based on its livability variations, the paper has been selected K-means clustering.

3 RESULTS AND DISCUSSIONS

3.1 Clustering urban centers within KMA

Peter J. Rousseeuw (1986) had innovated Silhouette method to determine the actual number of clusters in 'K' means clustering (Kodinariya & Makwana 2013). This method refers the interpretation and validation of consistency within clusters of data. The technique provides a concise graphical representation of how well each object lies within its cluster. The concept of silhouette width involves the difference between the within-cluster tightness and separation from the rest. Specifically, the silhouette width $s(i)$ for entity i is defined as;

$$s(i) = \frac{b(i) - a(i)}{\max(a(i), b(i))}$$

Where $a(i)$ is the average distance between i and all other entities of the cluster to which i belongs and $b(i)$ is the minimum of the average distances between i and all the entities in each other cluster. The silhouette width values lie in the range from -1 to 1. If the silhouette width value for an entity is about zero, it means that, the entity could be assigned to another cluster as well. If the silhouette width value is close to 1, it means that the entity is misclassified. If all the silhouette width values are close to 1, it means that the set I is well clustered (Kodinariya & Makwana 2013). This paper has been identified (Figure 4) that at cluster 5 the quality of clusters are very close to the highest value, when it assume the cluster number is 6, the level of cluster quality has been decreased. So from this technique if the cluster number would be 5 then the Silhouette measure of cohesion and separation value comes very close to 1, which signifies the cluster quality is good. The present paper has delineated KMA into five clusters to understand the inherent livability variations.

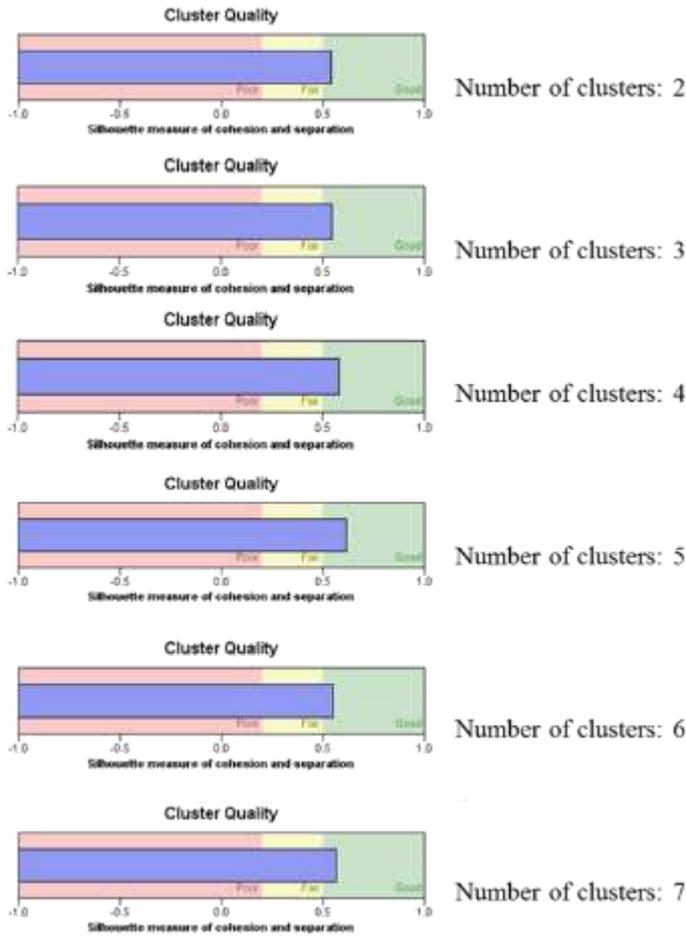


Figure 110 Silhouette measure of cohesion and separation based on quality of clusters

Table 47 Schedule of Agglomeration

Stage	Cluster Combined		Coefficients	Stage Cluster First Appears		Next Stage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	19	32	.001	0	0	5
2	12	22	.002	0	0	21
3	6	20	.002	0	0	6
4	23	24	.002	0	0	16
5	19	28	.003	1	0	9
6	6	27	.004	3	0	23
7	36	39	.005	0	0	13
8	26	31	.006	0	0	16
9	7	19	.007	0	5	21
10	30	38	.007	0	0	11
11	3	30	.007	0	10	14
12	11	33	.008	0	0	23
13	17	36	.012	0	7	19
14	3	13	.012	11	0	24
15	15	37	.013	0	0	29
16	23	26	.013	4	8	18
17	2	14	.014	0	0	26
18	23	29	.016	16	0	20
19	16	17	.017	0	13	30
20	8	23	.019	0	18	25
21	7	12	.020	9	2	24
22	9	40	.021	0	0	31
23	6	11	.024	6	12	32
24	3	7	.025	14	21	29
25	8	21	.031	20	0	32
26	2	10	.035	17	0	33
27	18	34	.041	0	0	38
28	25	35	.049	0	0	38
29	3	15	.049	24	15	30
30	3	16	.060	29	19	35
31	5	9	.072	0	22	35

32	6	8	.083	23	25	36
33	2	4	.090	26	0	34
34	1	2	.131	0	33	37
35	3	5	.143	30	31	36
36	3	6	.197	35	32	37
37	1	3	.225	34	36	39
38	18	25	.387	27	28	39
39	1	18	.644	37	38	0

Table 48. Initial Cluster Centers

	Cluster	Mean Square	df	Mean Square	df	Error
Population Density	8.297	4	0.166	35	49.959	
Housing Density	8.398	4	0.154	35	54.366	
Employment Rate	6.839	4	0.333	35	20.559	

In Initial Cluster Centers (Table 2) denotes the Euclidean distances between the cluster centers. Larger distances indicate more differences within the algorithm. In this case, the groups are shaped intentionally in accordance with the distances between them.

Table 2 shows that the selected variables have an impact in cluster development and employment rate has the minimum impact in it. The F-test used for graphic purposes, to maximise the differences among cases in different clusters. It indicates the probable standards of each variables within predefined groups vary from one another. In Table 2 the positive and large F values of the variables signify the higher contribution of variables to the categorizing the clusters.

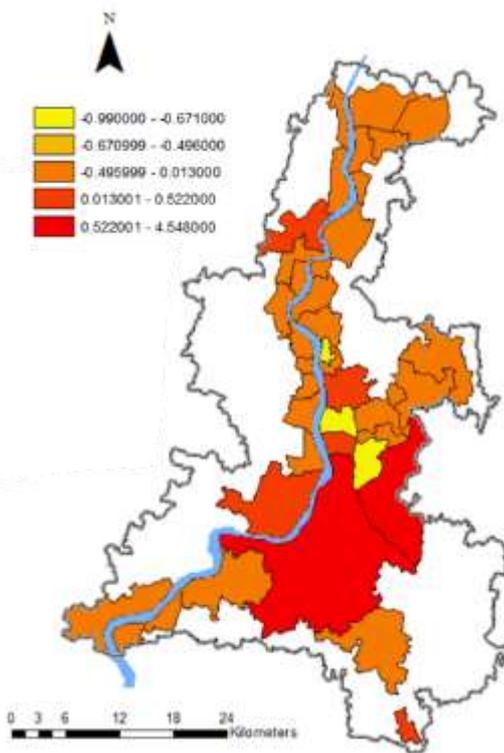


Figure 5 Livability clusters within KMA

From the cluster analysis results, five cluster explanations were used to demarcate KMA. Figure. 5 shows the characteristics of the five clusters. On a standardized scale, cluster 1 has higher and positive values of population and housing density and Employment rate than the other clusters. Cluster 2 has higher positive values of population and housing density and higher negative value on the Employment rate. Cluster 3 has negative population and housing density. Cluster 4 has the positive population and housing density but negative value for the Employment rate. Cluster 5 contains lower positive values of the selected variables.

3.2 Existing and desired livability variations

To understand the association between livability variations within KMA and its regional competitiveness, the paper has carried out a resident’s reaction survey within the selected five clusters within KMA. Kolkata (Cluster 1), Kamarhati (Cluster 2), Chandannagore (Cluster 3), Rishra (Cluster 4) and Howrah (Cluster 5) have been selected for the assessment based on their urban settings and good connectivity with the primate city. Kolkata, and Kamarhati located along the east bank of the Hooghly River. The urban local body of Kolkata develops as the primate core having highest concentration of good physical and social infrastructure compared to others. Whereas, Chandannagore, Rishra and Howrah are located

along the west bank, where comparatively native settlement pattern and their associated colonial heritages have been observed.

A total of 67 residents have been interviewed based on simple random sampling. Residents reaction has acquired based on five-point likert rank approach. Respondents were 51.3% male and 48.7% female. High literacy rate has been observed in cluster 1, 3 and 5. 40.1% residents were engaged in full-time employment while 16.4% respondents were devoted into various business oriented activities. It was also evident that, 16.4% of the respondents within KMA moved to the present community due marriage, 23.9% moved to succeed a desired livable setting for family, within Kolkata and Howrah. Along the east bank, 70.7% respondents are from older communities' residing there for last 50 years. On the whole, it is evident that core Kolkata still provides good to better quality of physical and social infrastructure in comparison to other urban centers to improve the regional competitiveness. Most of the cases rest of the other urban centers are dependent on Kolkata for better and reliable health options, educational facilities and economic opportunities.

Variables	Level of satisfaction	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
Economic possibilities and job opportunities	Very Satisfied	13.3	0.0	15.4	0.0	5.9
	Satisfied	26.7	60.0	23.1	33.3	41.2
	Neither satisfied nor dissatisfied	40.0	40.0	7.7	8.3	17.6
	Dissatisfied	13.3	0.0	15.4	16.7	17.6
	Very Dissatisfied	6.7	0.0	38.5	41.7	17.6
Level of social infrastructure (Health & educational facilities)	Very Satisfied	20.0	0.0	15.4	16.7	17.6
	Satisfied	13.3	90.0	30.8	25.0	35.3
	Neither satisfied nor dissatisfied	40.0	0.0	30.8	33.3	29.4
	Dissatisfied	26.7	0.0	23.1	16.7	5.9
	Very Dissatisfied	0.0	10.0	0.0	8.3	11.8
Affordable public transportation options	Very Satisfied	20.0	10.0	7.7	0.0	5.9
	Satisfied	0.0	90.0	30.8	8.3	41.2
	Neither satisfied nor dissatisfied	6.7	0.0	15.4	41.7	23.5
	Dissatisfied	40.0	0.0	30.8	16.7	5.9
	Very Dissatisfied	33.3	0.0	15.4	33.3	23.5
Level of safety & security	Very Satisfied	13.3	0.0	0.0	0.0	5.9
	Satisfied	26.7	30.0	15.4	8.3	29.4
	Neither satisfied nor dissatisfied	20.0	20.0	23.1	58.3	47.1
	Dissatisfied	26.7	50.0	38.5	25.0	17.6
	Very Dissatisfied	13.3	0.0	23.1	8.3	0.0

To comprehend the existing living standard, comfort and economic opportunities available within KMA, the paper has finally assessed the resident's contentment. Within KMA, most of the respondents prefer to stay in Kolkata and Howrah for availability of best civic amenities and facilities. 43.7% respondents have shifted to Kolkata and its surrounding areas for jobs and diverse employment opportunities. So the demand for rental housing is much higher in core Kolkata and Howrah. 37.3% respondents prefer to live in apartments (mostly in 1 BHK and 2 BHK) in Kolkata. But the situation is much different in Chandannagore, Panihati and Rishra, where 60% of the respondents seek to have their individual house in a relatively less dense and economically affordable livable settings.

4 CONCLUSIONS

The present paper has identified two research outcomes to perceive the effective way to evaluate livability variations within KMA. The first outcome has attempted to identify the variables to determine livability variations within KMA by clustering approach. Application of Silhouette method to determine the number of clusters in the clustering algorithm. The present paper accordingly has delineated KMA to understand the existing livability variations.

The second outcome was to establish the significance of livability variations within KMA. In this segment, a residents' reaction survey has been accompanied to observe the existing metropolitan livability variations and its impact on the regional competitiveness. From the result, cluster 1 (Kolkata) and 5 (Howrah) have pledge much livable than the others based on the existing civic amenities and facilities.

The present paper has mainly focused on clustering KMA and evaluating the metropolitan livability variations. Therefore the research endorses further subsequent investigations to examine the dynamics of livability potential within these clusters and also understand the good livability flow assessment between these clusters to ensure the overall community wellbeing and metropolitan decision making of the metropolitan indwellers.

REFERENCES

Badland, H. et al., 2014. Urban liveability: Emerging lessons from Australia for exploring the potential for indicators to measure the social determinants of health. *Social Science and Medicine*, 111, pp.64–73.
 Bardhan, R. et al., 2011. Linking Urban Form & Quality of Life in Kolkata, India. *ISOCARP Congress*, 47(section 2), pp.1–12.
 Cheong, M.-Y. & Lee, H., 2008. Determining the number of clusters in cluster analysis. *Journal of the Korean Statistical Society*, 37(2),

pp.135-143.

Cicerchia, A., 2014. Indicators for the Measurement of the Quality of Urban Life : What Is the Appropriate Territorial Dimension ? Author (s): Annalisa Cicerchia Source: Social Indicators Research, Vol. 39, No. 3, Papers from the First World-wide for the measurement. Springer, 39(3), pp.321-358.

Cornish, R., 2007. Cluster Analysis Hierarchical agglomerative methods. Analysis, pp.1-5.

Department of Economic and Social Affairs, 2014. World Urbanization Prospects, New York: United Nations.

Jomehpour, M., 2015. Assessing the Livability of the New and Old Parts of Tehran, Municipality Districts 22 and 10 of Tehran. OIDA International Journal of Sustainable Development, 8(9), pp.87-96.

Kennedy, R. & Buys, L., 2009. Dimensions of Liveability : A Tool for Sustainable Cities. In Sustainable building conference. pp. 1-11.

Kodinariya, T.M. & Makwana, P.R., 2013. Review on determining number of Cluster in K-Means Clustering. International Journal of Advance Research in Computer Science and Management Studies, 1(6), pp.2321-7782.

Kolkata Metropolitan Development Authority, 2000. Settlement Pattern in Future, Vision 2025.

Leach, J.M. et al., 2017. Improving city-scale measures of livable sustainability: A study of urban measurement and assessment through application to the city of Birmingham, UK. Cities, 71(September 2016), pp.80-87.

Lynch, K. (2010, September 6). Architecture+Urbanism. Retrieved May 20, 2016, from The Image of the City:

Mohammad Javad Maghsoodi Tilaki, Aldrin Abdullah, Azizi Bahauddin & Massoomeh Hedayati Marzbali. (2014). The Necessity of Increasing Livability for George Town World Heritage Site: An Analytical Review. Modern Applied Science, 123-133.

Momtaz, R. & Elsemary, Y., 2015. Qualitative Conceptions of Livability between Theory and Applications in Egypt. In International Conference on IT, Architecture and Mechanical Engineering. Dubai, pp. 74-80.

Mooi, E. & Sarstedt, M., 2011. A Concise Guide to Market Research

National Research Council, 2002. Community and Quality of Life: Data Needs for Informed Decision Making, Washington, D.C.

Partners for Livable Communities. (2016). Retrieved May 24, 2016, from what is livability?

Paul, A. & Sen, J., 2017. Livability assessment within a metropolis based on the impact of integrated urban geographic factors (IUGFs) on clustering urban centers of Kolkata. Cities, 74(December 2017), pp.142-150.

Paul Knox, Steven Pinch. (2010). Urban Social Geography. Pearson.

Ronita Bardhan, H. Kurisu, Kiyoo & Hanaki, Keisuke. (2011). Linking Urban Form & Quality of Life in Kolkata, India. ISOCARP Congress, 1-12.

Rosemary Kennedy, L. B. (2009). Dimensions of Liveability: A Tool for Sustainable Cities. Sustainable building conference, (pp. 1-11).

Urban Geography. (2016, April 2). Retrieved May 30, 2016, from Urban Geography:

Tilaki, M.J.M. et al., 2014. The Necessity of Increasing Livability for George Town World Heritage Site : An Analytical Review. Modern Applied Science, 8(1), pp.123-133.

Uysal, M., Perdue, R. & Sirgy, M., 2012. Handbook of tourism and quality-of-life research: enhancing the lives of tourists and residents of host communities M.J.Sirgy, ed., USA: Springer.

Wyatt, R. (2009). Heuristic Approaches to Urban Livability. Malaysian Journal of Environmental Management, 43-65.

SS09.1. Analytical Approaches to Climate Change at Multiple Scales

1465 ASSESSING U.S. STATE EFFORTS TO INTEGRATE TRANSPORTATION, LAND USE AND CLIMATE CHANGE

ABSTRACT

Climate change is increasingly recognized as a threat to life on earth. “Continued emission of greenhouse gases will cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems. Limiting climate change would require substantial and sustained reductions in greenhouse gas emissions” (International Panel on Climate Change 2014, 8). The transportation sector accounts for almost one-third of all greenhouse gas emissions (GHG) in the United States. Reducing GHG from transportation rests on the “three-legged stool” of improving vehicle efficiency, reducing the carbon content of fuels, and reducing vehicle miles traveled (VMT). But “technological improvements in vehicles and fuels are likely to be offset by continuing, robust growth in VMT” (Ewing et al. 2007, 2). Thus, a crucial strategy in curbing GHG from transportation relies on reducing total VMT by promoting alternative modes of transportation hand-in-hand with promoting development patterns that support the use of such modes, possibly along with attaching a price to GHG. In developing climate action plans, states have begun to acknowledge the connection between transportation and development patterns. This paper examines state level approaches to mitigate greenhouse gas emissions from transportation, focusing on the integration of land use and transportation in California, Maryland, Oregon and Washington. Though greenhouse gas emissions extend beyond state boundaries, the political boundaries are well-suited to addressing greenhouse gas emissions from transportation. This paper highlights the analytical approaches for identifying strategies to reduce GHG and describes the models used at the state level. Then, this paper moves beyond the models to identify political barriers to implementing various strategies to reduce GHG from transportation.

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1467 PLANNING FOR EXTREME HEAT: A VULNERABILITY-ORIENTED APPROACH

ABSTRACT

This paper presents an approach for mapping and addressing the negative impacts of extreme heat events on vulnerable populations. The authors assess distribution of surface temperatures in the Chicago metropolitan area using Daymet dataset [maintained by the Oak Ridge National Laboratory and hosted by the NASA-supported Distributed Active Archive Center]. Separately, they identify locations of populations most vulnerable to extreme heat events using Census data and maximum likelihood factor analysis to derive an index that captures where residents exhibit greater sensitivity and/or lower adaptive capacity to extreme heat. Using overlays and scenario analysis, the authors identify areas with the greatest need for emergency response in case of future extreme heat events, and well as areas that need long term adaptation and mitigation in the long term. Finally, the authors illustrate a web-based tool developed to assist organizations like Chicago's Office of Emergency Management. Please note: This abstract is submitted towards the special session Analytical Approaches to Climate Change at Multiple Scales, organized by Professor Gerrit-Jan Knaap.

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1468 AUTONOMOUS VEHICLES, ENERGY PRICES, AND DEMOGRAPHIC CHANGE IN THE BALTIMORE-WASHINGTON REGION: SCENARIO ANALYSIS WITH LOOSELY COUPLED MODELS

ABSTRACT

Demographic Change, autonomous vehicle technology, energy price volatility and the regulatory environment could have dramatic but uncertain impacts on development patterns, travel behavior, and environmental quality in metropolitan areas of the United States over the next several decades. In the context of this uncertainty, exploratory scenario analysis has become an increasingly common practice in metropolitan and regional planning. Unlike normative scenario analysis, exploratory scenario analysis does not take development patterns as choices, but instead takes development patterns as the outcome of exogenous driving forces and policy choices. Policy choices are thus better informed when driving forces and their impacts on development patterns are well understood. In this paper, we report the latest results of a multi-year exploratory scenario exercise for the Baltimore-Washington region. To develop four scenarios, we formed a Scenario Advisory Group and asked them to identify driving forces that could have important but uncertain impacts on the Baltimore-Washington region in the near future. From these driving forces, we constructed four exploratory scenarios that vary in assumptions regarding economic growth, the uptake of transportation technologies, energy prices, and more. The assumptions behind these scenarios were then conveyed as input values to a suite of integrated models. This suite of models-- that includes economic, transportation, land use, air and water emissions, and health impact models--is then used to derive for each scenario parameter values for development patterns, travel behavior, GHG emissions and water quality, human morbidity, mortality, and more. The results suggest that plausible differences in critical driving forces could have important ramifications for the sustainability of the region. Rapid growth, autonomous cars and low fuel prices, for example, could escalate urban sprawl, vehicle miles traveled, greenhouse gas emissions and water quality degradation. The rapid adoption of electric vehicles, however, in a high growth and high fuel price environment, could encourage more compact growth, transit ridership, reductions in GHGs and improved water quality. Alternative assumptions, reflected in the other two scenarios yield different results. We then conducted policy experiments in each of the four scenarios to identify robust strategies that yield more sustainable outcomes under a range of driving forces. We also identify key flags to monitor in the trends in key indicators in real time. We also set targets for some of the indicators that reflect the desired set of robust actions.

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SS09.2. Analytical Approaches to Climate Change at Multiple Scales

1236 EVALUATING HEAT STRESS IN URBAN INFORMAL HOUSING THROUGH SPATIAL ANALYSIS: A CASE OF MUMBAI

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ABSTRACT

This paper proposes indicator based approach to investigate urban heat island in urban areas to mitigate its adverse impacts on human wellbeing like heat stress. UHI investigation becomes exigent in rapidly urbanising and fast –growing cities like Mumbai, that has high density of population with varied built forms. The uncontrolled growth of informal housing in Mumbai has emerged as a prominent built form that has transformed the built environment of the city. The current study examines impact of informal housing on the thermal conditions of the city through indicators of thermal profile. The Informal housing areas are examined at two levels of atmosphere using thermal profile indicators that are defined as 1) surface heat island intensity, estimated using land surface temperature (LST) and, 2) Screen level heat stress (at 2m height) which is measured using air temperature profile. The spatial pattern of both indicators is then computed to identify hot spot areas of heat stress through geo-spatial statistical analysis. Results of spatial patterns of heat stress indicates high vulnerability of informal housing compared to formalised housing in the city.

Keywords: urban heat island; Informal housing; land surface temperature; spatial analysis; heat stress vulnerability

1 INTRODUCTION

Mumbai, once known as the India’s most premier city because of its high economic growth, has fallen prey to its own development policies. Past urban development policies in a certain way have led to the growth of informal housing - which is concentration of low income population in the city (Bardhan, Sarkar, Jana, & Velaga, 2015; Nolan, 2015).The growth of informal housing has become inevitable consequence of rapid urbanisation pattern in similar rapidly developing megacities of the world (Ooi & Phua, 2007). Informal built typology has distinct structure which can be characterised as typically low rise compact built form, that currently houses about half of its population in 9% of total land. The ‘informal’ housing could be categorised majorly as ‘slum’ or ‘chawls’ in Mumbai. One of the major character of informal housing is the way it is interwoven in the landscape of urban built areas and spread as a large mass of impervious built-up land. As per the Census of India (2011), the city has 12.5 lakh slum households comprising 41.5 per cent of its population — that is over 60 lakh people residing in informal housing. Figure 1 gives account of slum population in each ward of Mumbai.

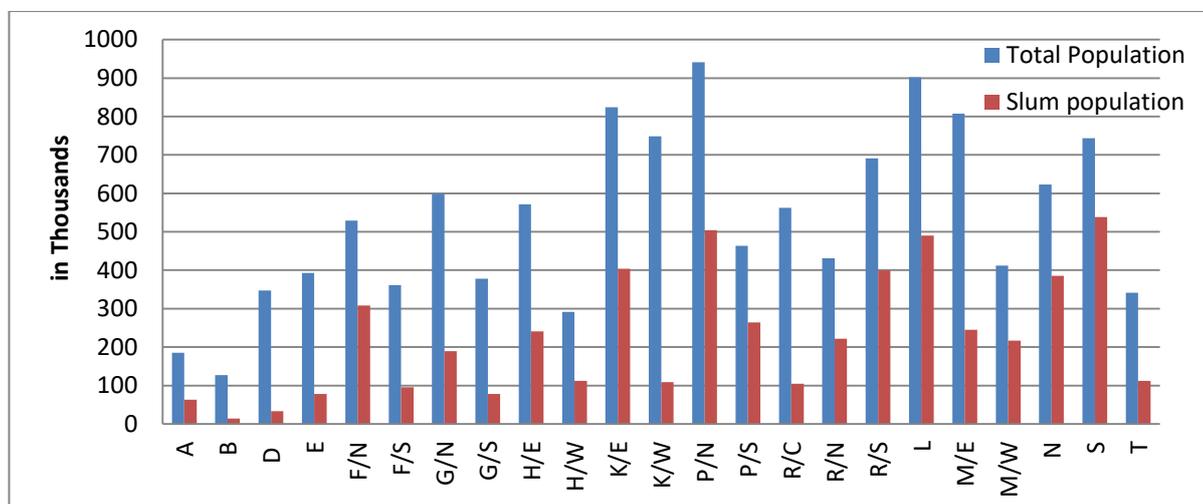


Figure 111:Ward wise total population and slum population (source: 2011 census)

Some wards have more than 50% of population as slums (P/N, N, S wards). Dharavi in ward G/N, is known to be biggest slum having 79 slum clusters that house about 6 lakh population in 1 lakh hutments. Andheri east (K/E) has 281 slum clusters housing about 8 lakh population (see Figure 2). The sudden proliferation of slum clusters in the landscape of Mumbai is large enough to have high ecological impact on the surroundings. Due to its density and typical built characteristics, informal housing has emerged as a prominent urban built form typology in Mumbai and therefore needs detail investigation of its vulnerability to heat stress as well as its thermal impact on environment.

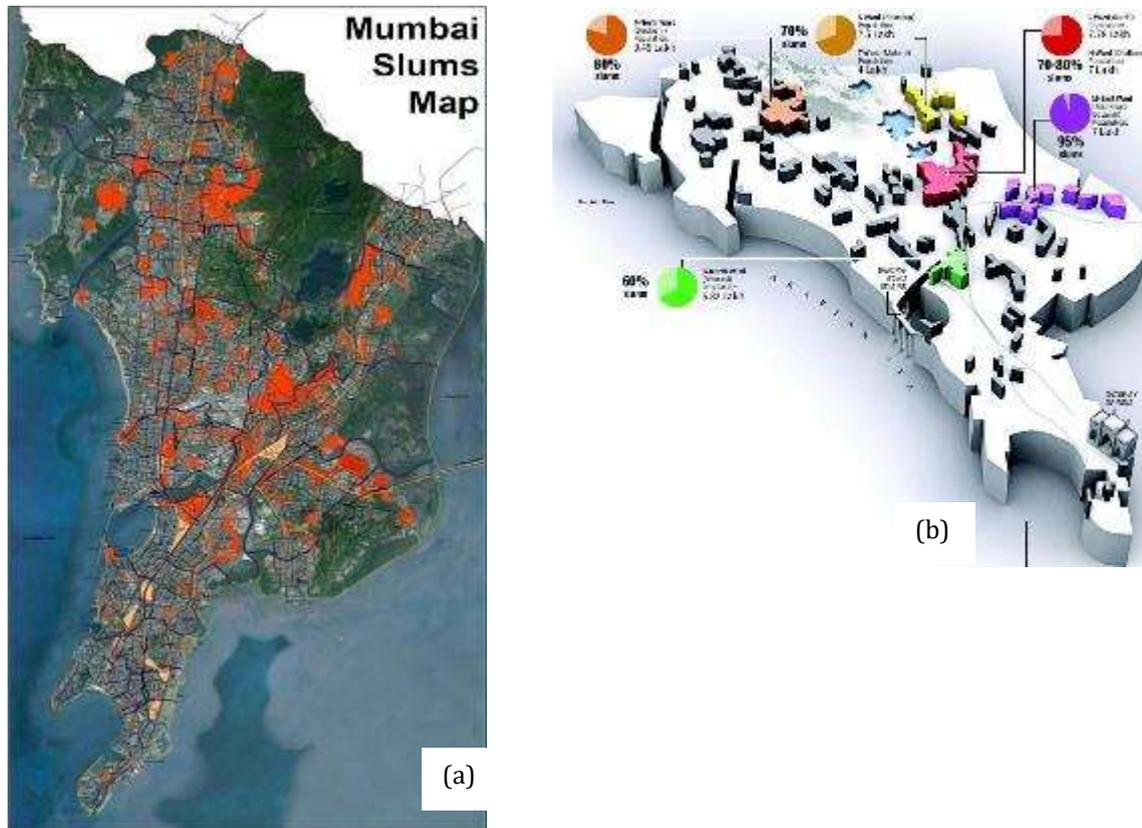


Figure 112: (a) Mumbai slum map and (b) schematic Representation of new slums areas in Mumbai city map (Lewis, 2011)

1.2 Past literature and Gaps

In last decade, there have been extensive study on urban built form characterisation and thermal profile. Urban climate studies have showed that the geometrical and structural parameters of urban form have direct significant impact on UHI (L. Chen & Ng, 2012; J Unger, 2004; Janos Unger, 2006). However, informal areas are not considered for evaluation in most of the urban built studies. The study holds importance due to its unique structural form that creates extensive horizontal spread in urban landscape. Apart from physical transformation, these urban forms also impact environmental, social and economic structure of the urban area.

Investigation of urban surface have been widely carried out using land surface temperature (LST) derived from satellite images that provide thermal images of urban area. It provides synoptic view of thermal characteristics of urban surface for urban heat island studies (Y. C. Chen, Chiu, Su, Wu, & Cheng, 2017; Javed Mallick & B.D.Bharath, 2008; Mehrotra, Ronita, & Krithi, 2016; Song, Du, Feng, & Guo, 2014). However, the heterogeneity of urban forms at local level and atmospheric noise between urban surface and satellite, pose limitation of LST for urban form thermal analysis. This substantiates the need of local level thermal monitoring methods to investigate heat stress differences between informal and formal built forms with empirical evidence. For local level monitoring of thermal profile, air temperature is widely used variable in urban climate studies (Eliasson, Geography, & Sciences, 2003; Fenner, Meier, Bechtel, Otto, & Scherer, 2017; Nazarian, Fan, Sin, Norford, & Kleissl, 2017; Stewart, Oke, & Krayenhoff, 2014). Thus, by recognising the variability of thermal processes at different level of urban atmosphere, we have used two indicators for heat stress investigations. LST is an important indicator of urban surface thermal variations which is used an UHI indicator and secondly, we have used air temperature variations as an indicator of UHI at local level (Jérémy, Marjorie, Isabelle, Erwan, & Pascal, 2015; Schwarz, Schlink, Franck, & Großmann, 2012). Both the indicators are used to identify thermal hotspots using spatial analysis. Due to stochastic nature of microclimatic variables, spatial analysis has been used for identifying hotspots of heat at local urban level. The heat stress profile at local level is then correlated to locations of heat stress identified using LST.

With this conjecture that informal areas have distinct thermal profile, different from formal areas, this study aims to investigate thermal profile in informal housing clusters of Mumbai and derive empirical evidence of its thermal variability compared to planned housing areas.

This study is structured in two parts: - In the first part, we have identified distinct areas informal housing in the landscape of Mumbai. In the second part, we have modelled spatial pattern of land surface temperature which was further investigated for its location of hotspots. Next part deals with local thermal profile using field measurements and correlating it with LST hot spots identified by spatial statistics. The study is an attempt to determine the how informal housing – an emerging and wide spread typology in megacities like Mumbai contributes to heat stress in an urban area.

2 STUDY AREA

Mumbai has high density and heterogeneity of residential typologies. Among this heterogeneity of built typologies, there exist high percentage of informal housing in all areas of Mumbai. As evident from Figure 2, the slum clusters- a major type of informal housing⁴⁵⁴ has extended in almost every ward. More over some wards have about more than 50% of population residing in slum clusters. The slum clusters have basic facilities like electricity and water but lack acceptable housing conditions due to scarcity of space.

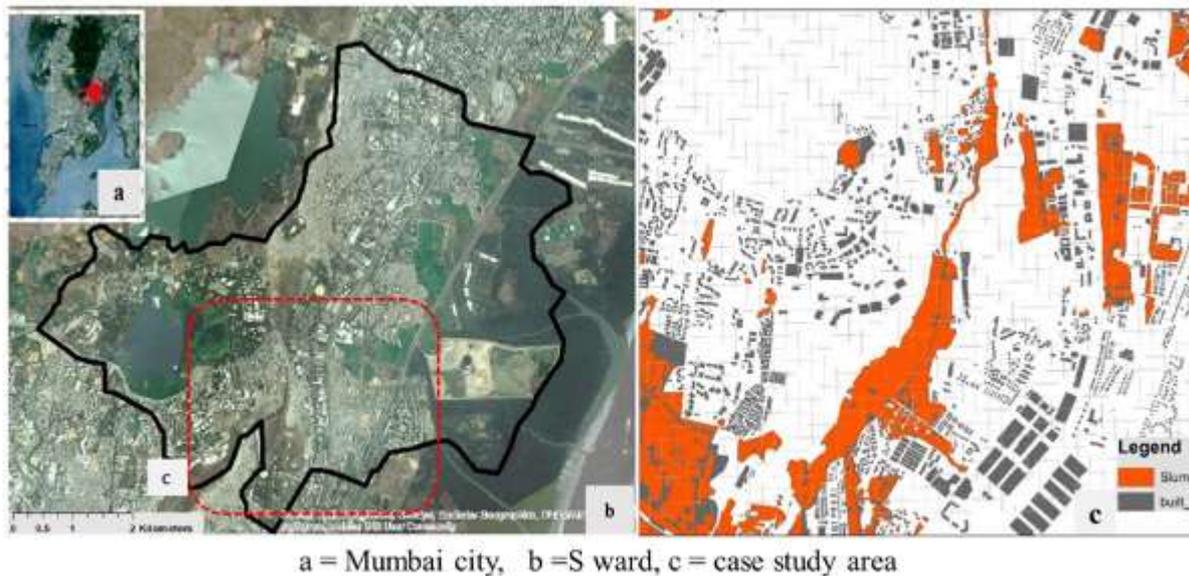


Figure 113: a, b and c showing case study area with slum and planned housing areas

Mumbai is chosen as a backdrop of the study and for detail investigations at local level a central part of Mumbai – ‘S’ ward is chosen. The study area houses a large percentage of informal housing along with a variety of built typologies. The ‘S’ ward has about 5,37,900 of slum population as per the Census (2011) which accounts to about 70% of the total population.

3 DATA AND METHODS

Thermal profiles in both formal and Informal built typologies were analysed at two different level of atmosphere, i.e. at above the surface of urban area and secondly at screen level using indicators in a stepwise manner. The methodological steps are explained below:

Step 1. Land use map of Mumbai is procured from MCGM and converted to GIS layers using ArcGIS 10.1. The residential areas were converted into slum areas and planned residential areas.

Step 2. Thermal satellite image- Landsat 8 OLI/TIRS is used to capture surface urban heat island (SUHI) on the surface of urban areas using land surface temperature (LST). Based on SUHI, hotspots of surface temperature forming heat islands are identified.

Step 3. Investigation of thermal characteristics at local level was carried out using sensor-based field measurements at multiple locations during both day and night time. Near ground air temperature was measured using environmental sensors, that measures micro-meteorological variables like ambient air temperature (Ta) and relative humidity (Rh) to out to identify heat -stressed areas in the urban areas.

Step 4. Spatial analysis is carried using ArcGIS 10.2 geo statistical tools. Inverse weighted distance (IDW) interpolation of Ta gave a continuous surface showing spatial and temporal variation of Ta. The association between the two housing typologies and LST were. Heat stress Index, an index of heat stress conditions was used to compare thermal comfort conditions at local level.

The flowchart of methodology is given below as Figure 4:

⁴⁵⁴ Informal housing includes identified, notified and illegal slum as per the census definition

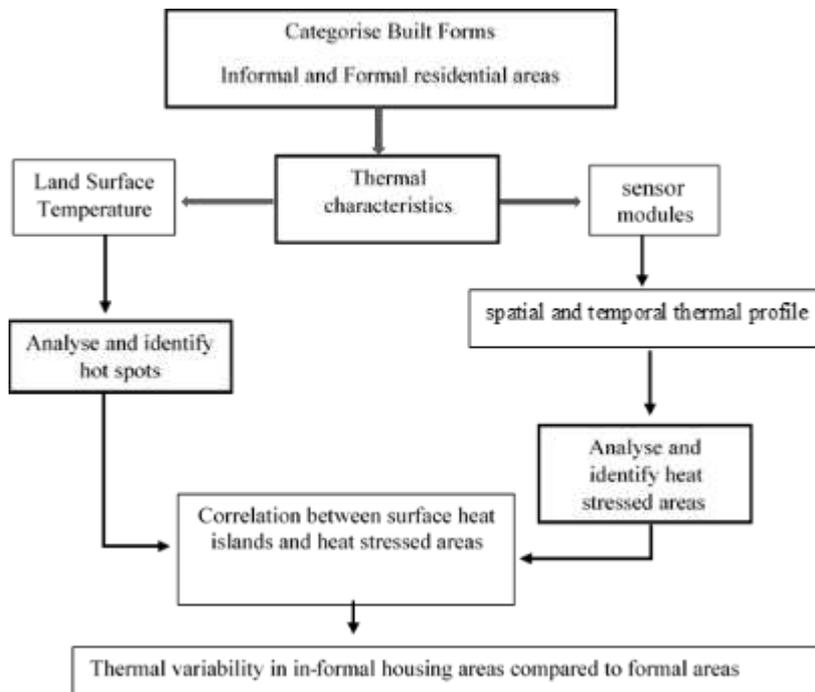


Figure 114: Methodological frame work

3.1 Preparation of LST

As shown in Figure 6, the heat stress profile is measured. The land surface temperature is computed using Landsat imagery of 2016 October for the city of Mumbai (Mehrotra et al., 2016). The emissivity-based radiative transfer methods are used to derive Land surface temperature using single channel (TIRS band) of the Landsat image. The brightness temperature is derived using radiative transfer equations, that measures top of the atmosphere (TOA) radiances from which blackbody temperatures are derived using Planck’s law (Li et al., 2013). Figure 7 shows LST of S ward captured at 30 m resolution and resampled into 100m grids for spatial analysis. Later to see spatial clustering of high LST, local Getis-ord spatial statistic is employed for the study.

3.2 Slum Area Demarcation

Urban residential areas both planned and informal areas – predominantly slum clusters are converted into vector format in GIS using Mumbai development plan 2034 (Municipal Corporation of Greater Mumbai, 2014). The Mumbai data was converted into grids of 100m x 100m for spatial analysis and analysed for s ward of Mumbai (see Figure 5).

3.3 Air temperature

To determine local level heat stress areas, environmental sensing instruments LSI heat stress meter and sensor modules that measures Ta and relative humidity (Rh) were placed at about 12 locations in built-up areas, both in formally planned areas having high-rise, mid-rise open, mid-rise compact housing as well as at two types of informal housing - slum and SRA, as shown in Figure 6 for the case study.

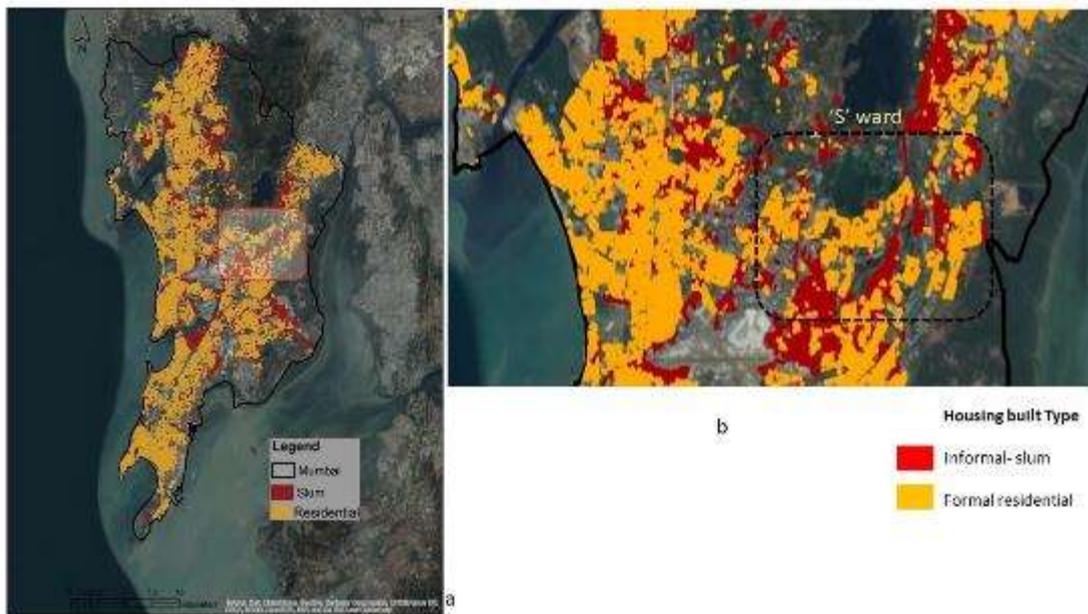


Figure 5: Mumbai residential and slum areas. Source: Municipal Corporation of Greater Mumbai (MCGM), 2014.

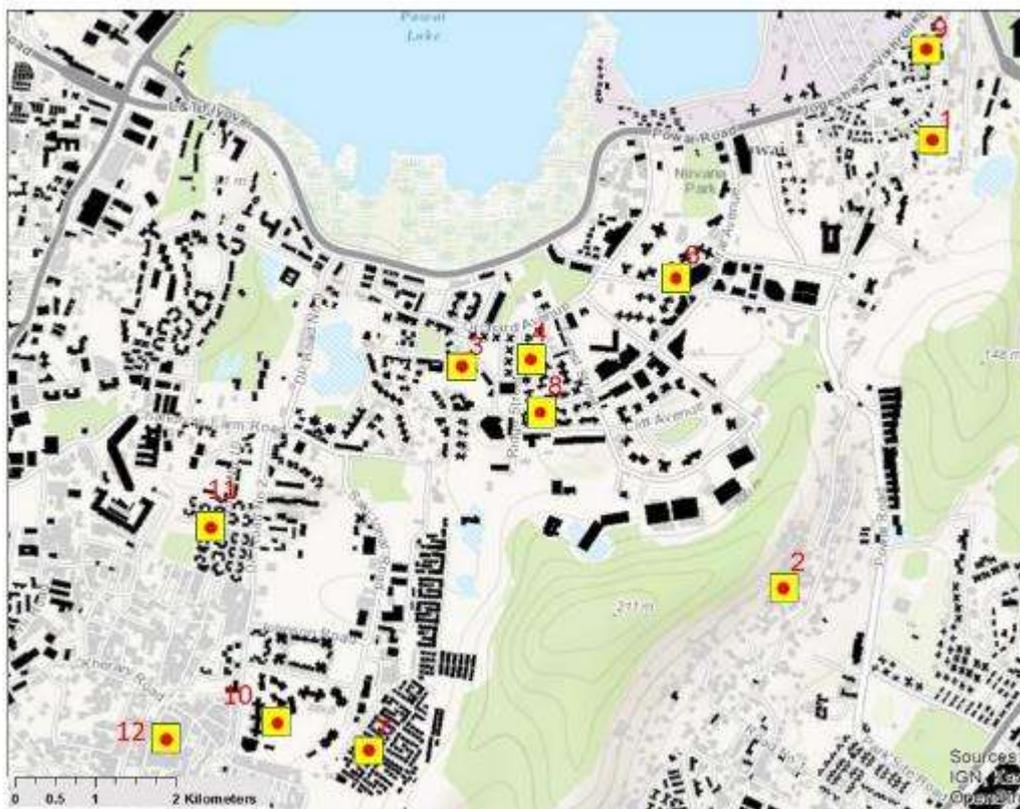


Figure 6: Placement of sensor modules in the study area.

Sensor instruments used in the study for monitoring air temperature were made by readily available off the shelf modules. For ease of handling, a low-powered, low-cost sensor unit for measuring temperature and humidity was made. The stand-alone prototype sensor module was prepared using a microcontroller (Arduino Nano v3.0 board) attached to two units of DHT22 humidity/temperature sensor operating at 3.3-5.5V DC with an accuracy of $\pm 2\%$ and $\pm 0.2^\circ\text{C}$. A Real Time Clock (RTC) (DS3231) for real time stamping attached to the microcontroller. DHT22 sensors are calibrated, digital sensors that give high precision data. Two sensors were placed in one module to improve accuracy. The sensor units are powered by a battery (3.7v 5000mAh Li-on battery) had the capability to log sensed data at the 10 minute frequency for about 30 days.

Deployment of the sensor at right location was carefully done such that effect of building parameters like height and distance between the buildings is accurately sensed and captured by sensor modules (Figure 6). To assess pedestrian level thermal comfort, the sensors were placed at a 2-meter height above ground as per the standards adopted in outdoor monitoring studies (Johansson, Thorsson, Emmanuel, & Krüger, 2014; Oke, 2004). The sensors modules are could be

easily mounted on poles or trees trunks and were shielded from the direct sunlight. Sensors were placed inside an inverted insulated material covering that allows free airflow across the sensors but shields from the direct sun. The data was collected from 12 number of sensors at 10 min frequency continuously for a week time and then analysed in ArcGIS for spatial variance.

3.4 Spatial analysis methods

Spatial analysis tools of ArcGIS 10.1 S/W is used to spatially identify the clustering of high surface temperature locations, signifying the heat hotspot areas using land surface temperature (LST) as indicator 1. Secondly, the air temperature data from the sensor data is used create spatial temporal hotspots in the study area using geostatistical tools in ArcGIS 10.2 ESRI software. Spatial variability of the air temperature was assessed for four-time periods of the day using Inverse distance weighted interpolation method (IDW) predicts values of non-measured locations assuming spatial autocorrelation. These time period indicate peak heating, peak cooling and transition time of the day. We have mapped the air temperature data obtained from 12 sensors at formal and informal areas (shown in Figure 6). The variance in two groups of housing is then analysed using above indicators.

4 RESULTS

4.1 Spatial clustering of High Land surface temperature (LST) - Indicator 1

To find clusters of high LST, Getis-ord G_i^* tool of spatial statistics tool (ArcGIS 10.1) is used. The Figure 7 below provides results of hotspot analysis showing z-scores, computed on LST data. Spatial map of z-scores and p-value tells where high or low clustering of features in space exist. This analysis indicates locations where high LST is surrounded by neighbours of high values of LST, just creating hotspot areas. For creating weights, inverse distance squared function is used. Local Getis-ord G_i^* is calculated as given in Equation 1 and S is given by Equation (2) and

$$G_i^* = \frac{\sum_{j=1}^n w_{i,j} x_j - \bar{X} \sum_{j=1}^n w_{i,j}}{S \sqrt{\frac{n \sum_{j=1}^n w_{i,j}^2 - \left(\sum_{j=1}^n w_{i,j}\right)^2}{n-1}}} \quad 1$$

$$S = \sqrt{\frac{\sum_{j=1}^n x_j^2}{n} - (\bar{X})^2} \quad 2$$

where, w_i is weight of attribute at j , \bar{X} is mean of X_j and w_{ij} is spatial weights between features i and neighbour j . G_i^* is the z-score.

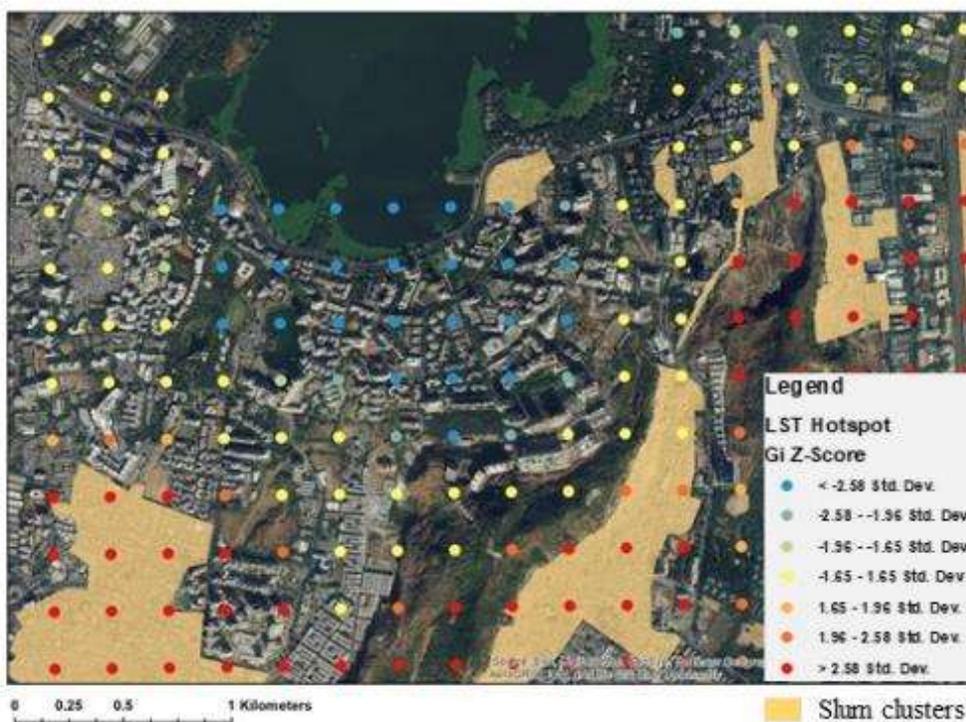


Figure 7: The clustering of high LST given by Gi Z score and slum clusters

The positive z-score with high values and low p-value indicate that there exist spatially statistically significant clustering or dispersion of LST. As observed from the analysis high Z- score were largely concentrated at slum housing areas (see figure 7). It clearly depicts that slum areas were correlated with the hotspot areas of LST.

4.2 Spatio- temporal variation of air temperature (Ta)

The IDW interpolation of Ta data, show spatial and temporal variation in Ta calculated for 12 am, 6pm, 6am and 12 pm hours. Ta undergoes diurnal variations, but for current study we have considered the heat stressed areas during a single time period for comparison with LST that captures image at 11:00 hours. The spatial data of Ta was converted to grids of 100 m resolution for correlation analysis. Morning hour Ta was considered to correlate with LST data. Figure 8 shows spatial patterns of two indicators of heat stress. The correlation between LST and Ta is depicted by scatter plot with shows a relationship of $R^2 = 0.65$ (Figure 9)

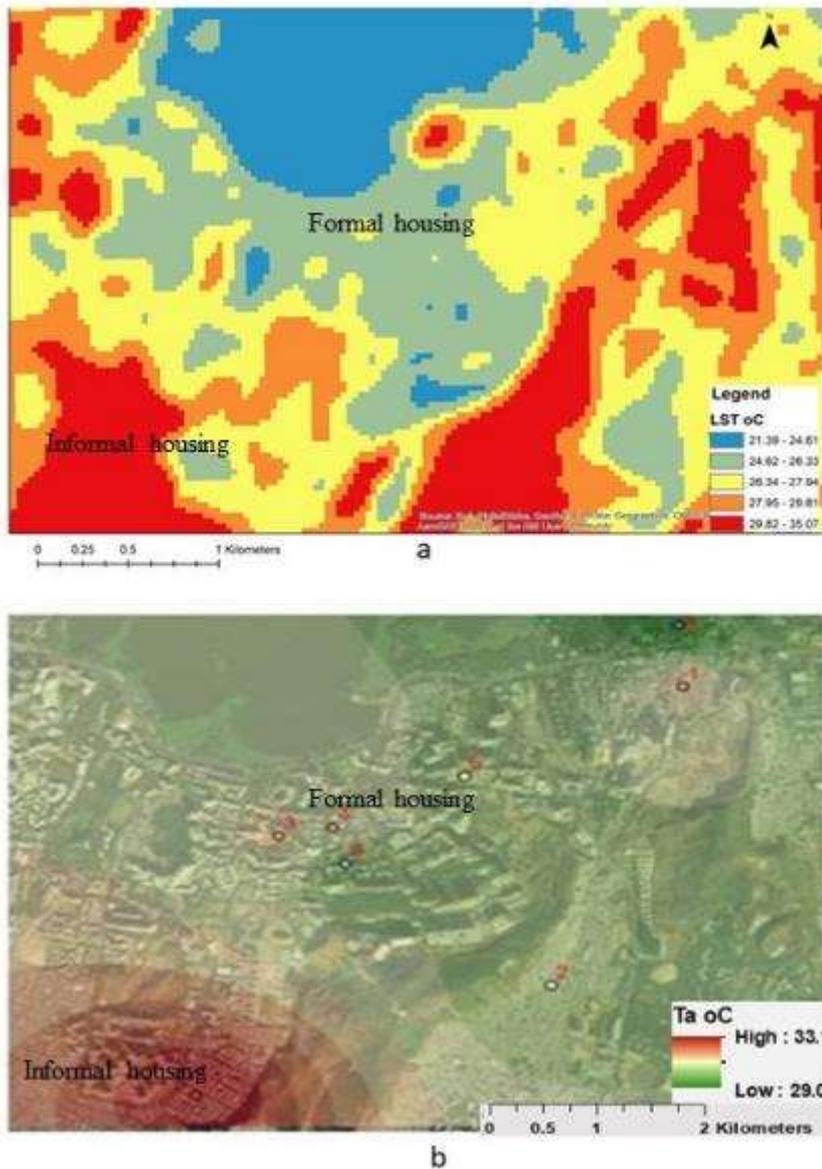


Figure 8: Hotspot areas of (a) LST and (b) ambient air temperatures (Ta) in the study area.

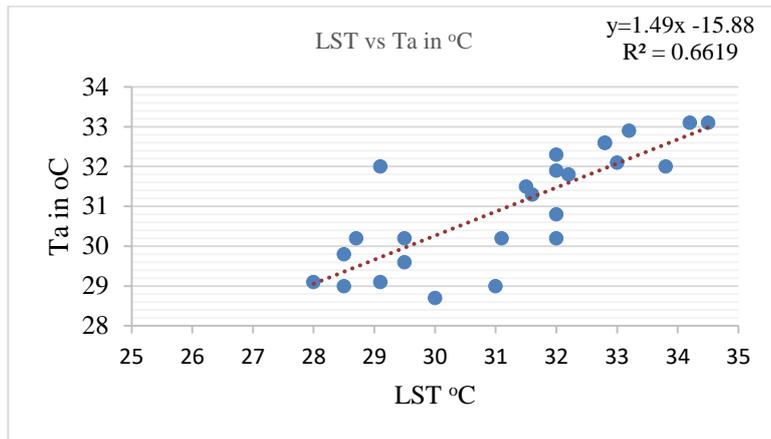


Figure 115: Scatterplot between LST (°C) and Ta (°C) at screen height (1.5 m)

4.3 Results and Discussions

The study presents results of spatial analysis of two thermal indicators: Land surface temperature (LST) and ambient air temperature (Ta), both representing different levels of urban heat stress areas. First indicator LST reveals a statistically significant spatial clustering of LST using Getis-ord z-score in Informal housing area. The figure 8 shows that grids of high LST clusters with high z-score coincides with the slum areas location.

Figure 9 shows LST values ranging from 21°C to 35°C. We found higher variation in LST compared to ambient air temperatures in the study area. The high LST range was found to be ranging from 29.3 °C to 35°C which could be attributed to variable forms of built area. LST was substantially high in Slum areas, which was assessed at 11:00 am, during the time of pass of satellite image.

Second indicator Ta revealed variable thermal profile in two housing groups at various time periods. Ta profile interpolated over the study area for day and night hours (12:00 hrs, 18:00 hours, 24:00 hours and 6:00 hours) show that hotspot of Ta varied in day and night hours. After 12:00 pm the formal areas were higher in Ta but after sunset Informal areas showed hotspots of Ta. From Figure 9, it could be inferred that hotspots of LST and high Ta is spatially concentrated in informal areas. Also, there exist LST difference between the formal and informal housing typologies which could be because of high variation in structure of two housing patterns. Ta profile also show hotspot over informal clusters that correlated with LST thermal profile.

Temporal variations in build typologies are extremely sensitive to environmental parameters. Sensor modules were able to capture the hourly variation for each typology. Slum areas were having high temperature during night time and early hours of the day due to trapped heat in the built form. The formal areas show high temperature during the day after 13:00 hours but cool down by night. And the hotspot moves from formal areas to informal areas during the night and early morning hours. Thus finding from this study is that through spatial analytical tools like hotspot analysis and spatial interpolation we can identification of distinct time-based hotspot areas and their spatial variance.

The form and type of built structure in informal housing is different from the formal housing. They have large impervious roof structures that have high heat retention capacity. This necessitates the need of appropriate policy interventions for improving the quality of economically backward class by providing affordable housing which is climate adaptive and resilient. In depth study regarding form of informal areas will be carried out as future extension of this work.

5. CONCLUSIONS

Results from the case study show that by using indicators of thermal profile at two different levels - LST and ambient air temperature, we could analyze the spatial thermal patterns of thermal heat stress. Also, the hot spots of LST and air temperatures obtained by spatial analysis emphasise on vulnerability of informal areas compared to formal areas. However, at local level we found high diurnal variability in air temperatures in built areas. The thermal variability was found to be low in slum areas, depicting long exposure to heat stress specially during the late hours of the day extending to early morning hours. The spatial non-stationary and scale-dependent relationships between built environment and thermal profile was accurately analyzed through spatial analytics. Although for better accuracy, no of sensors and locations should be increased for continuous monitoring of thermal environment. The correlation between LST and Ta was significant with $R^2 = 0.6$. However, a detail analysis would be required to build and validate the relationship between informal housing and LST. The study brings under our knowledge the thermal variations in informal areas compared to other areas of urban built up areas and how it would help to aid suitable policies for affordable housing, that adapts to climate change.

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REFERENCES

- Bardhan, R., Sarkar, S., Jana, A., & Velaga, N. R. (2015). Mumbai slums since independence: Evaluating the policy outcomes. *Habitat International*, 50, 1–11. <https://doi.org/10.1016/j.habitatint.2015.07.009>
- Census. (2011). *Provisional population totals*. New Delhi, India.
- Chen, L., & Ng, E. (2012). Outdoor thermal comfort and outdoor activities: A review of research in the past decade. *Cities*, 29(2), 118–125. <https://doi.org/10.1016/j.cities.2011.08.006>
- Chen, Y. C., Chiu, H. W., Su, Y. F., Wu, Y. C., & Cheng, K. S. (2017). Does urbanization increase diurnal land surface temperature variation? Evidence and implications. *Landscape and Urban Planning*, 157, 247–258. <https://doi.org/10.1016/j.landurbplan.2016.06.014>
- Eliasson, I., Geography, P., & Sciences, E. (2003). Spatial air temperature variations and urban land use – a statistical approach, 149, 135–149. <https://doi.org/10.1017/S1350482703002056>
- Fenner, D., Meier, F., Bechtel, B., Otto, M., & Scherer, D. (2017). Intra and inter 'local climate zone' variability of air temperature as observed by crowdsourced citizen weather stations in Berlin, Germany. *Meteorologische Zeitschrift*, 1–23. <https://doi.org/10.1127/metz/2017/0861>
- Javed Mallick, Y. K., & B.D.Bharath. (2008). Estimation of land surface temperature over Delhi using Landsat-7 ETM+. *J. Ind. Geophys. Union*, 12(3), 131–140. Retrieved from <http://www.igu.in/12-3/5javed.pdf>
- Jérémy, B., Marjorie, M., Isabelle, C., Erwan, B., & Pascal, K. (2015). Urban heat island and inertial effects : analyse from field data to spatial analysis.
- Johansson, E., Thorsson, S., Emmanuel, R., & Krüger, E. (2014). Instruments and methods in outdoor thermal comfort studies - The need for standardization. *Urban Climate*, 10(P2). <https://doi.org/10.1016/j.uclim.2013.12.002>
- Lewis, C. (2011). Dharavi in Mumbai is no longer Asia's largest slum. Times of India, pp.
- Mehrotra, S., Ronita, B., & Krithi, R. (2016). *BUILT FORM DETERMINANTS OF URBAN LAND SURFACE TEMPERATURE: A CASE OF MUMBAI. Expanding Boundaries- Systems Thinking in the Built Environment Sustainable Built Environment (SBE) Regional Conference Zurich 2016*. Zurich: ETH Zurich. <https://doi.org/10.3218/3774-13>
- Municipal Corporation of Greater Mumbai. (2014). *Development Plan for Greater Mumbai 2014 - 2034* (Vol. Paper-1). Mumbai.
- Nazarian, N., Fan, J., Sin, T., Norford, L., & Kleissl, J. (2017). Predicting outdoor thermal comfort in urban environments: A 3D numerical model for standard effective temperature. *Urban Climate*, 20, 251–267. <https://doi.org/10.1016/j.uclim.2017.04.011>
- Nolan, L. B. (2015). Slum Definitions in Urban India : Implications for the Measurement of Health Inequalities. *Population and Development Review*, 41(March), 59–84.
- Oke, T. R. (2004). Siting and exposure of meteorological instrument at urban sites. *27th NATO/CCMS International Technical Meeting on Air Pollution Modelling and Its Application*, 1, 25–29. https://doi.org/10.1007/978-0-387-68854-1_66
- Ooi, G. L., & Phua, K. H. (2007). Urbanization and slum formation. *Journal of Urban Health*, 84(SUPPL. 1). <https://doi.org/10.1007/s11524-007-9167-5>
- Schwarz, N., Schlink, U., Franck, U., & Großmann, K. (2012). Relationship of land surface and air temperatures and its implications for quantifying urban heat island indicators — An application for the city of Leipzig. *Ecological Indicators*, 18, 693–704. <https://doi.org/10.1016/j.ecolind.2012.01.001>
- Song, J., Du, S., Feng, X., & Guo, L. (2014). The relationships between landscape compositions and land surface temperature: Quantifying their resolution sensitivity with spatial regression models. *Landscape and Urban Planning*, 123, 145–157. <https://doi.org/10.1016/j.landurbplan.2013.11.014>
- Stewart, I. D., Oke, T. R., & Krayenhoff, E. S. (2014). Evaluation of the “local climate zone” scheme using temperature observations and model simulations. *International Journal of Climatology*, 34(4), 1062–1080.
- Unger, J. (2004). Intra-urban relationship between surface geometry and urban heat island: review and new approach. *Climate Research*, 27, 253–264. <https://doi.org/10.3354/cr027253>
- Unger, J. (2006). Modelling of the annual mean maximum urban heat island using 2D and 3D surface parameters. *Climate Research*, 30(3), 215–226.

1423 MODELING THE RELATIONSHIP BETWEEN LANDSCAPE STRUCTURE AND LAND SURFACE TEMPERATURE - A CASE STUDY ON BARASAT MUNICIPALITY, WEST BENGAL, INDIA

ABSTRACT

Rapid urbanisation has hastened the conversion of vegetation and agricultural land to impervious surface, and engenders urban heat island (UHI) effect. UHI refers to the relative atmospheric warmth of a city in contrast to its countryside. At present UHI is considered to be a conspicuous problem of human civilisation. In the regions of humid climate like India, the development of heat island increases discomfort and potentially raises the threat of heat stress and mortality. It also has an impact on rising cost of air conditioning and the demand for energy. Land Surface Temperature (LST) is widely used to measure UHI effect. For sustainable urbanisation, evaluation of the complex interaction between the spatial structure of the landscape and LST deserves more research. This paper proposes an integrated approach to investigate and identify distribution-pattern characteristics of heat landscape by gradient analysis, landscape matrix and correspondence analysis. Landscape matrix and gradient analysis of thermal landscape were employed along the urban-rural transect. The influence of landscape structure on elevated LST has been recognised through correspondence analysis. In this paper, Barasat Municipality is taken as the study area. The area has experienced unprecedented urbanisation and consequent rapid environmental degradation during last few decades. For this work the land surface temperature at the pixel size of 30m×30m was derived from Landsat image. Landscape metrics and gradient analysis of heat pattern of the study area were computed by using GIS and remote sensing platform, FRAGSTATS, SPSS. We have selected few key landscape matrices which are effectively used to characterise the landscape spatial structure of the study area, including: patch density (PD), edge density (ED), mean nearest neighbour distance (MNN) and area weighted mean shape index (AWMSI). Correlation between landscape metrics and LST is analysed for both the class and landscape levels. As a major finding it has been observed that connected urban patches are positively correlated with higher LST neighbourhood values in the study area. Different landscapes along the transect exhibit diverse heat characteristics. From correspondence analysis it has been observed that high temperature type is associated with dense built-up and bare land. Medium temperature and low temperature types are allied with the rural land use categories. Heat pattern in the fringe area exhibits a complex relationship resulted from the existence of mixed land use.

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1462 DOES ISTANBUL ENVIRONMENTAL PLAN CONTRIBUTE TO URBAN RESILIENCE?

ABSTRACT

Metropolitan areas and cities are threatened by external shocks such as; economic crisis, natural disasters, climate change, terrorism, etc. Those uncertain externalities are the main challenges of cities. The impacts of threats and risk should be reduced to sustain a safe environment for citizens and viability of the city system. Therefore, cities and metropolitan areas should be evolved into more resilient structure and prepared for the threats. Increasing resilience of cities is important to avoid being under continuous threat and vulnerable to any external shocks. The critical part is defining the strategic roadmap to more resilient structure. Istanbul is the biggest metropolitan city of Turkey with more than 15 million citizens. It has a critical role for the country in terms of cultural, historical, social and economic aspects. Therefore, the resilience of Istanbul is an important issue that should be considered comprehensively. This paper discusses the context and decisions of Istanbul Environmental Plan in terms of whether it contributes to more resilient urban structure. In this context, the resilient city framework that suggested by Jabareen (2013) have been conducted. Jabareen tries to answer the question of “what cities and their urban communities should do in order to move towards a more resilient state in the future” and defines the conceptual framework for resilient city and resilient community by his study. That conceptual framework has been the basis for this study. Istanbul Environmental Plan has been examined within 4 concepts as defined by Jabareen; “Urban vulnerability matrix analysis, Uncertainty oriented planning, Urban governance and Prevention”. This study investigates whether the plan includes the resilient city key measurements defined under those 4 concepts and how the plan decisions have considered resilient development. This paper has addressed the question whether Istanbul environmental plan context and decisions contribute to urban resilience. Through considering the resilient city framework, expected results of this study are to distinguish missing parts of plan regarding urban resilience and to determine issues to be more emphasized. It is critical to evaluate the environmental plan considering the resilient city framework in order to make more accurate and effective decisions for future plans at national and local scale.

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SS09.3. Analytical Approaches to Climate Change at Multiple Scales

1608 THE ECONOMIC IMPACTS OF CLIMATE CHANGE ON AGRICULTURE IN TURKEY

ABSTRACT

Many regions are under various forms of climate related stress (e.g., drought, floods, rainfall variability, etc.) that coupled with low adaptive capacity, make them highly vulnerable to climate change. The Mediterranean Basin is one of the most vulnerable regions in the world to the impacts of global warming. The sectorial and regional analyses show that the impacts of climate change spread across all sectors and all regions, nevertheless the largest negative consequences are found in the health and agriculture sectors and coastal zones. Being located on the Mediterranean Basin, Turkey is one of the most affected countries from the climate change. The estimated impacts of climate change in Turkey are: (i) an increase in temperatures – 2oC increase in the next 50 years according to the best scenario –, (ii) a decrease in precipitation – an approximately 20% decrease – and therefore; (iii) an inevitable drought. The changes in temperature and precipitation are expected to have severe impacts especially on the agriculture sector which is one of the most important economic sectors in Turkey. This paper analyses the economic impacts of climate change in Turkey with a particular focus on agriculture sector. In order to assess the economic impacts of climate change, Computable General Equilibrium (CGE) Model is employed. By this model; different socio-economic structures and different exposures of climate change effects at regional level are compared and the projected economic impacts are visualized for the future development alternatives. Finally, strategies and policy choices for climate change adaptation and mitigation are discussed and the challenges are highlighted. The study reveals the inevitable economic impacts of climate change on the agricultural economy, fills the gap of scientific researches on climate change in Turkey and enlightens the strategic path towards a more resilient future by addressing adaptation and mitigation policies.

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1633 MAPPING REGIONAL DICHOTOMY OF GREEN GROWTH: 175 GW RENEWABLE CAPACITY & INDIAN STATES (E3-INDIA SESSION)

ABSTRACT

The paper evaluates dynamics of change across regional boundaries as India adds 175 GW of grid connected renewables by 2022. The decision to transform energy mix also brings with it concerns of distributional impacts across Indian states given the geographic availability of conventional resources (i.e. coal is available mostly in five eastern states while renewables more prevalent in the western and southern states). The analysis compares and contrasts sustainability impacts of meeting designated state-level targets for renewable capacity additions in three (Gujarat, Madhya Pradesh & Jharkhand) distinctly positioned states i.e. i) High renewable energy generation (RET) capacity state ii) Coal Bearing State with high RE capacities iii) Coal bearing state with low RE capacities using E3- India model. The model provides an integrated evaluation of economic, energy and environmental linkages dynamically using a macro-econometric framework at the state level for India. This not only allows estimation of crucial energy and environmental indicators but also bring in state specific economic structures within the assessment framework. The assessment mapped economic and social indicators like GDP, investments, employment and real personal income along with environmental benefits of renewable capacity addition in terms of reduction in emissions (CO_x, NO_x, SO_x) at the state level. Preliminary results reveal that under Business as Usual scenario the existing RET targets will have strikingly different manifestations for the three different categories of states. Fulfilling the existing renewable energy technology (RET) deployment targets can induce GDP growth of over 6.01 % in coal bearing high RET capacity states like Madhya Pradesh, it may also lead to decrease in GDP for a coal bearing state like Jharkhand due to reduction in coal use. While in high RET state like Gujarat indicates moderate GDP increase. Similarly, investments, employment generation and personal incomes due to RE capacity addition are higher in Madhya Pradesh and Gujarat as compared to Jharkhand where RET capacity installation is low and backlash of idled capacities is significant due to overall reduction in coal consumption nationally (30%) with 175 GW of new renewable addition. The results of the study highlight the existing dichotomy in the Indian green growth agenda from a spatial and sustainability perspective. The work also demonstrates relevance of an integrated quantitative assessment framework like E3-India to analyse distributional impacts of an existing policy target at regional level thereby enabling and informing various stakeholders for suitable policy interventions. Regional Models, Sustainability, Renewable energy, Green Growth

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1714 CLIMATE CHANGE DISPLACEMENT: SPATIAL-DYNAMIC MODELING OF OCCURRENCE, EFFECTS, AND ADAPTATION

ABSTRACT

In the coming decades, climate change displacement of residents of coastal communities in the United States and other countries is likely to affect large portions of national populations. Estimates of sea-level rise are constantly being revised upwards and it is not clear that strategies proposed to make coastal areas more resilient to coastal flooding—including sea walls of various design—will be effective. Clearly, both short-run and long-run response strategies are needed. (See Donaghy, 2017.) Not only physical attributes of communities but also social, political, and economic institutions of communities must be relocated to higher ground. A major concern is that in making current assets more robust to the effects of climate change and in relocating communities a form of ‘climate gentrification’ may be effected and existing inequalities of access to public amenities and safety from extreme weather events may be reproduced or exacerbated. Given the failure of climate change mitigation strategies (for a large number of reasons, many of which are political) the challenges to the regional science community include 1) developing reliable projections of sea-level rise, coastal flooding, and extreme-weather event incidence; 2) working out social, economic, and environmental impacts of climate-change-related effects, 3) exploring response strategies that are effective in the short run but which put communities on the ‘right paths’ in the long run. In this paper I review existing sea-level-rise response programs for several large east-coast U.S. municipal areas, review adaptive response plans for extreme-weather events, sketch a spatial-dynamic integrated assessment model for supporting adaptive response planning over the short- to long-run planning horizons, and demonstrate the appropriateness of the model with proof-of-concept simulations and assess its performance properties. Donaghy, K.P., 2017, “Making an Integrated Assessment of the Boston Harbor Barrier Proposal,” presentation made to the School for the Environment, University of Massachusetts at Boston, April 14th.

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SS10.1. Rural Transformation

1006 HOUSEHOLD DIETARY DIVERSITY SCORE AS FOOD SECURITY MEASUREMENT: THE CASE OF MAIZE FARMERS PARTICIPATING IN BUFFER STOCK OPERATIONS IN GHANA

ABSTRACT

Food security is not only a development issue but in recent years it has become a human right issue as well. The right to an adequate standard of living and well-being implies that every individual has the right to freedom from hunger and adequate food. Food security is an essential measure of welfare, especially for low-income families in developing countries. Policy makers are aware of the harm food insecurity has on vulnerable households (Magan- Lemus and Lara-Alvarez, 2015). As a multi-dimensional concept, several indicators and approaches to measuring food security has evolved over the years. The implementation of agricultural output price support through the National Buffer Stock Program in Ghana is not only to stabilize food prices but to also to improve the food security status of the farmer’s household. This paper employs the household dietary diversity score (HDDS) as a proxy for measuring household food security status of the rural farmer in Ghana. We use cross-sectional data from 305 rural households from maize growing communities both from the policy on and policy off areas of the country by way of multinomial logistic regression and the Blinder- Oaxaca Decomposition technique to analyze the determinants of HDDS and the effect of the program on household’s food security. We find that marital status, sex of the household head, household size, access to fertilizer and irrigation facilities, and engagement in off farm activities are the determinants of HDD. We also conclude that buffer stock operations have had positive impacts on the rural household’s dietary diversity score. The findings suggest that investment in rural infrastructure such as warehouses for capacity improvement of the buffer stock operations can effectively enhance the food security of rural farmers. Policies that are targeted to addressing food security should not only focus only on agricultural activities but also on non-farm economic activities that have the potential to increase the income of the rural household. Therefore, programs that target food security could be implemented as an integrated program to include both agricultural and off-farm livelihood activities in a bid to transform rural Ghana.

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1076 PEASANTS' INCOME DIVERSIFICATION AND COPING STATUS: A CASE OF NORTHWESTERN BANGLADESH**Md Shafikuzzaman Joarder**

University of Rajshahi, BANGLADESH

ABSTRACT

Considering the agricultural 'optimistic' and 'skeptical' views, peasants' income diversification is an autonomous and reactive process as some of them are drawn to it while others are forced. The peasants of Bangladesh, to whom agriculture acts more as a source of food and labor than that of growth, are facing substantial challenges to secure their livelihood from a single source of income. From a skeptical point of view, evidence shows that the sole reliance on farming sometimes makes the peasants' livelihood fragile if production fails or they face a deficit in returns from production due to climate variability, volatile market, lack of access to services, unfair tenancy arrangements and so on. Consequently, they are likely to give immense efforts to earn more from different off-farm sectors to avoid chronically insufficient farm income and to cope with challenges. Some of them also apply different cropping strategy to ameliorate their capability for future investment. To investigate further of the association between incomes and coping, the study purposively selected two villages from a drought-prone northwestern Bangladesh. All the households occupying 0.2 ha to 0.40 ha of farmland (56 and 47 from Babupur and Haripur villages respectively; 103 in total) were interviewed by a questionnaire survey. Qualitative tools were also applied to get insight into the socio-historical context of the peasants' livelihood. Findings show that drought and climate variability reduced crop production of 69 percent of the respondents. About 70 percent of the respondents stated that they experienced seasonal unemployment of two to three months each year while 88 percent of them reported that their input costs for cultivating crop stepped up significantly in comparison to the return. Responding to these different constraints, peasants diversified their income sources in many informal sectors including changing of cropping pattern. According to the study, the off-farm sectors contributed more than half of the respondents' total household incomes. Animal husbandry was the most preferable activities under this sector followed by wage employment and fishery. Transformation of paddy field into mango orchards also got high preference among some of the peasants having limited irrigation facility. Some of them found this transformation process as an opportunity in the agriculture sector to step up their income. Despite taking various strategies, 88 percent of peasants earned less than US\$ 2 per capita income. It indicates a high rate of poverty among peasants. As a result they descended far behind to cope with different constraints while 34 percent of peasant households coped partially. Coping moderately was claimed by 16 percent of the respondents. Only 10 percent of households acclaimed successful coping. Avoidance coping strategies i.e., reducing food intake, taking loans or selling household assets and labor in advance undermined the further coping ability of many peasants. Livestock rearing and transforming crop-field into mango-orchard, however, showed a positive association with successful coping. The mango cultivation, however, has an investment cost as it usually takes 3 to 5 years to give return. Many resource poor peasants cannot afford the cost of this transitional period. Overall, the study shows that multiple sources of income may enhance resilience of the peasants to different shocks at some extents. But, they are not strongly tied up with the investment capacity of the peasants for their future welfare.

Key words: Peasants, livelihood, income diversity, coping.

INTRODUCTION

The nature, social bases and socioeconomic consequences of peasantry were among the most longstanding foci in rural sociological research that received a substantially increased attention and exhibited considerable theoretical reformation in the 1970s and 1980s in many countries (Buttel *et al.* 1990). However, 'peasant as a concept' is still complicated because it's contentious history. In many parts of the world the word 'peasant' used to imply criminality, villain, rustic, devil, robber, brigand or looter (Edelman 2013). In general, it is often referred to poor and landless farmers and agricultural laborers who have low social status (Webster 1926). These derogatory meanings indicate both of peasants' extreme subordination and of a ubiquitous elite practice of blaming peasants for a variety of economic and social ills. From a social point of view, peasants are always treated as a subjugated community in most part of the world (Freedman 1999) because of their lower strata and position in the social, political and economic hierarchy (Singharoy 2004, Shanin 1971, Wolf 1966). In Bangladesh, the peasants have paradoxical social identities over times. Beteille (1974) defines peasants of Indian subcontinent from three major perspectives, such as (a) they are attached to land either as owner, tenant, or sharecropper (b) they occupy a lower economic and political position in the society, and (c) oppression and exploitation of the peasants have a political dimension. Many scholars indentify them as rural cultivators, for whom subsistence agriculture is the most important means of livelihood (Sivakumar and Hansen 2007, Schüren 2003, Bernstein *et al.* 2003).

Historically, the peasants accomplish a major share of their entire livelihood from agriculture which is highly sensitive to weather, climate variability and availability of water (Wreford *et al.* 2010, Salinger *et al.* 2005). Bangladesh as being one of the most vulnerable countries in the world (Ericksen *et al.* 1997) suffers more in this regard as the pace of technology generation, innovation and adoption do not allow her to counteract effectively to the adverse effects of varying environmental conditions. A well-functioning market, however, can shape livelihood of the farming community through many avenues, including generating their incomes (Rapsomanikis 2015). But, seasonal price fluctuation of major food grains is a serious concern for Bangladesh economy (Chowdhury and Haggblade 2000, Dorosh 2000 and Chowdhury 1992). The farmers experience seasonal variation in prices — lower prices during the immediate post-harvest months and higher prices during the pre-harvest or off-season months each year (Salam *et al.* 2012, Dorosh and Shahabuddin

2002). The peasants usually sell out major share of their production immediately after harvesting as they run out of money whereas they have to buy rice during off-peak season in high price. 'Distress-sale' is another important aspect that represents the vulnerable situation of the peasants in which they are forced to sell their product or labor in advance or at a very low price if they face income shortage. More to the point, land-tenure system also has a major impact on agricultural productivity of the peasants. About forty percent of farmland in Bangladesh is cultivated under different kind of tenancy arrangements (Taslim 1995). A significant number of the tenants are peasants. These tenants hardly have any say in the arrangement of contracts because of their lower position in the society and their fear of eviction from farmland.

Overall, they face prodigious challenges to get access to service and resources, and are more vulnerable to the market and vagaries of weather since a long. They get limited assistance from development agencies to cope with this kind of constraints as their problems and voices can easily be ignored. Besides, a number of changes have taken place in recent economic and agricultural sectors of Bangladesh, so are in the peasants' livelihood. Evidence shows that the share of agriculture to gross domestic product (GDP) of Bangladesh had fallen sharply from 55 percent in 1970 to 16 percent in 2015. In contrast, the total population of the country shot up from 71 million to 160 million (nearly 2.5 times higher) during the same period. Consequently arable land per person had decreased from 0.128 hectares (ha) in 1975 to 0.049 ha in 2013. However, the country had made its gross national income (GNI) doubled from US\$ 540 in 2005 to US\$ 1212 in 2015 (World Bank 2015). A precipitous fall in contribution of agriculture to GDP does not necessarily depict that the importance of agriculture is also declining. Recent data depicts that the largest proportion (45.1 percent) of the employed population of Bangladesh is engaged in agriculture sector. If we count the informal sector employment, then agriculture counts nearly 90 percent of rural employment generation (BBS 2015). For the majority of people living in rural Bangladesh agriculture is not all about growth, but its importance is embedded in employment generation, food production as well as in a total livelihood system of the society. Agriculture and agriculture centered economy have always been the dominant and an integral part of rural and national economy. The country has made significant progress in different sectors including agriculture, but a crucial concern arises here, whether this development has empowered the farmers or peasants similarly or not. In reality, the benefits of the development hardly have percolated to the peasant community over the last few decades. They suffer from low level of resources that can be used for the productive sectors further. Fundamentally, as Madalgi (1969) stated many years ago, the emergence and growth of small farmers or peasants are still mainly the result of population pressure and lack of employment opportunities outside farming. Hence, the recent trends of changes in economic structure, employment sector and living standard of the country show that the agriculture sector alone is unable to provide a secured income to maintain a sustainable livelihood especially of the people who depend on agriculture at subsistence level and for whom poverty is defined by their economic and political marginalization. Thus, the peasants, to whom agriculture acts more as a source of food and labor than that of growth, face an increasing need of looking for alternative income sources to supplement their small scale agricultural activities (Yizengaw *et al.* 2015, Khatun and Roy 2012, FAO 2001) and to hedge against social, climatic and other market risks. As an immediate response they employ a diverse set of activities to explore their income opportunities at various levels outside crop cultivation. Most of the cases, they engage them in wage employment and animal husbandry if they face income constraints due to seasonality, or face a deficit in return from agricultural production. Some of them also change their cropping patterns. As Ellis (2000) indicated, the peasants diversify their income sources to construct an increasingly diverse portfolio of activities and assets in order to survive and to improve their standard of living. Ellis also noted that there were two opposing theories regarding the actual driving force that causes the emergence of rural livelihood diversification — the 'agriculture optimistic' and 'agriculture skeptic' theories. Agriculture optimist stance is related to the emergence of diversification as a result of success in agriculture while the agriculture skeptic view sees diversification as responding to the failure of agriculture to generate secure livelihoods for those in rural areas. Both the views are basically derived from success and failure of agriculture. Reardon *et al.* (1992), however, found diversification process as a self-insurance by which individuals mitigate their risk exposures eventually. But, the major difficulty to analyze peasant economy is the inseparability of economic functions within a peasant household (Hayami *et al.* 1978). There are many reasons inducing income diversification out of farming. Sometimes diversification is born of desperation, sometimes of opportunity. Some diversifications are related to low-return from labor or land due to market failure, unfavorable tenancy arrangement and climate change. Still, some are attributed to frictions for mobility or to entry into high-return niches. Besides, diversification of income does not necessarily ensure better income and successful coping. Coping refers to the specific efforts that people employ to master, tolerate, reduce, or minimize stressful events, and it requires continuing awareness, resources and good management, both in normal times as well as during crises or adverse conditions (UNIDR 2009). In general, there are two types of coping strategies such as (i) active coping strategies and (ii) avoidant coping strategies. Active coping strategies are thought to be better ways to deal with stressful events, whereas avoidant coping strategies appear as adverse responses to stressful life events (Holahan

& Moos 1987). With limited resources in hand, the peasants are always in harsh position to cope with constraints. Dercon (2009) stated that lack of human capital, limited access to infrastructure, market and technologies sometimes put smallholder farmers to pursue more subsistence-oriented activities that ultimately causes smallholders' poverty to persist.

Hence, the study intends to understand the peasant livelihood from a sociological point of view, and to investigate the pattern of income and coping strategies among the smallholders, and in what extent(s) they are associated.

METHODOLOGY

The study is exploratory in nature and was conducted in August, 2016. Primarily Sapahar upazila of Naogaon district was selected purposively after carefully reviewing the poverty and drought maps of Bangladesh as developed by the World Bank⁴⁵⁵ and Bangladesh Agriculture Research Council (BARC)⁴⁵⁶ respectively. At the second stage, two adjacent villages namely Babupur and Haripur from Tilna union of Sapahar were selected based on the secondary data collected from the department of agriculture extension office and consultation with the agriculture extension workers of Sapahar upazila. The study also considered the fact that the majority of households of the villages would be engaged in farming or crop cultivation. Household was the unit of analysis, and household heads were interviewed as respondents. Peasant household is considered as the marginal or small farmer whose primary occupation is farming, and depends on agriculture at subsistence level. The study used BBS's classification in identifying marginal and small farmers based on their ownership of farmland. According to BBS 1986 marginal and small farmers occupy 0.2 ha to 0.40 ha of farmland respectively (quoted in Orr *et al.* 1995). Hence, all the marginal and small farmers from two villages (56 and 47 from Babupur and Haripur villages respectively; 103 in total) were interviewed by making personal visits to the selected peasant households with the help of structured questionnaire. To identify all the marginal and small farmers, the study collected a baseline survey report of 2014 and secondary data from a local NGO (Dabi Moulik Unnayan Sangstha of Naogaon, Bangladesh) working in the villages, and from upazila offices respectively. The questionnaire is mostly closed ended for taking the advantage of analyzing data with ease, and to collect data in a shorter period of time. It was divided into three sections. The first section dealt with the basic demographic information of the respondents while section two was for collecting data on different income sources at household level. Income in this paper is defined as the cash or cash-equivalent yield from a peasant household's assets. It is typically classified into three groups by its sources, such as (i) income from crop cultivation, (ii) off-farm income and (iii) income from current transfer from non-government organizations or/and government organization. The categorization of income sources is adapted from income diversity as classified by the International Labor Organization (ILO 2004, Quoted in Canberra Group Handbook 2011⁴⁵⁷). The sum of income from the farm and household production of services for own consumption is referred to as income from crop cultivation. The terms 'off-farm', 'non-farm', and 'nonagricultural' appear routinely and in seemingly synonymous ways. However, there are some differences in opinion regarding the issues 'off-farm' and 'non-farm' income. One controversial point is whether non-farm means only non-agricultural activities or whether it should refer to all non crop activities (Bakht 1993). Makita (2007) stated that if the non-farm is regarded as the same as the non-agricultural, the non-farm sector does not include homestead-base agricultural production (e.g., raising vegetables and fruits) and other non-crop agricultural production such as raising livestock and poultry, fish cultivation, sericulture, apiculture and silviculture. However, some argue that wage employment in the agricultural sector can be considered in agricultural income. But, according to Haggblade (2002) off-farm income includes agricultural wage employment in other's farm along with all other activities outside agriculture. In classifying income of rural households, Ellis (2000) also includes labor as off-farm income. Thence, the study includes wage employment (either in agricultural sector or other sector), petty business, handicrafts, rickshaw-van pulling, construction works etc. under the off-farm income activities. Transformation of agriculture to mango orchard is a unique characteristic of the study area. Plantation, harvesting, management and marketing strategies of mango farming are somehow different from that of traditional agricultural practices. So, it is also taken under the off-farm income. Precisely, off-farm income is meant in this study as the income from all other activities outside crop cultivation and current transfer received. Current transfers are receipts that the peasants get from government organizations (GO) and/or nongovernment organization (NGO) under safety-net programs at regular intervals, and for which they don't give anything to the donor in direct return for the receipts. 'Total income' is the sum of the income from production, off-farm income and transfer income.

The third section focused on major exposure to risks of the peasants and their strategies for coping. The term 'coping' refers to the strategies that are medium-term ex-post strategies in response to unanticipated failure in major resources necessary to make ends meet (Zoomers 1999). Since there is a little data on strategies taken by the peasant community of rural Bangladesh to counteract different vulnerabilities and that can be classified as adaptation strategy, the study uses 'coping' as strategies taken by the peasants to overcome constraints for shorter to relatively longer period. Both erosive and non-erosive coping strategies are considered at different stages to classify the status of coping of the peasant community. Overall, the capacity to cope is the capacity to respond to, and to recover from stressful events. By coping, the study refers to actions that peasant households take to deal with income constraints resulting from drought/climate variability, volatile/erratic market, unfavorable tenancy arrangements and seasonality. Respondent's perception regarding his position of coping was categorized in five scales, i.e., (i) failed to cope – the condition of the household is deteriorating as they are cutting of food intake substantially, loaning shark and locking into debt, selling both productive and non-productive household assets, and depending on aid; (ii) neither failing nor succeeding – socioeconomic status did not change much; (iii) coping partially – households that minimize risk and loss at small scale, compromise with food intake at minimum level, sale stack rarely; (iv) coping moderately – enhanced income or asset base of the household at such a point that is potential for further development of the household, but had to compromise with some aspects; and (v) coping successfully – households gain potentials for adaptation.

Besides, a total of four group discussions and key informant interviews with different stakeholders were conducted to collect information on income diversity, socioeconomic constraints and coping strategy. Both quantitative and qualitative

455 Source: <http://www.wfp.org/sites/default/files/Poverty%20Map%202005%20Technical%20Report.pdf>

456 Source: https://www.researchgate.net/figure/Map-showing-drought-in-Bangladesh-Courtesy-of-Bangladesh-Agriculture-Research-Council_fig1_319177868

457 Source: <http://www.unecp.org/fileadmin/DAM/stats/documents/ece/ces/2011/3.add.1.e.pdf>

techniques were applied to analyze the field data. At first data were processed with SPSS software by using simple statistical techniques. Then, the quantitative data were analyzed through frequency distribution tables and chi-square tests. Different descriptive statistics such as frequency analysis, cross tabulation, graphical presentations and Pearson chi-square test were applied to analyze data. Qualitative data collected through group discussions and key informant interviews by using ‘qualitative analysis’ technique in which data are examined and interpreted non-numerically (Babbie 2013) through a narrative approach (Lichtman 2014) and analytic description (Warren and Karner 2015).

RESULTS AND DISCUSSIONS

Pattern of total household income and its sources

Considering sector-wise contribution to the total household income, it is observed from table 1 and figure 1 that all 103 peasant households produce crop for market and get about 33 percent of their total income on an average. The income ranges from 50 thousand taka (US\$ 625 @ 1 US\$ = 80 taka) to 237 thousand taka (US\$ 2962.5). All the respondents but four produce for their own consumption also. The market value of the household consumables contributes nearly 13 percent to their total income. In total, crop cultivation generates 46 percent of total household income.

Off-farm income sector contributes substantially to the total income of the peasant households. It constitutes more than half of total household income (52.38 percent). Findings show that households with little farmland depend heavily on off-farm employment for their livelihoods. Especially the marginal farmers seek employment in the rural off-farm sectors to add to their chronically insufficient farm income. Off-farm employment typically includes animal husbandry, fruit gardening, fishing, tailoring, engaging in petty business etc. Animal husbandry is the most preferable activities under the sector. It not only provides food and animal protein – meat, milk and eggs for sale or home consumption – but also yields manure for use as fertilizer. Oxen are used for tillage as well. In addition, livestock are assets that can be sold in emergencies to provide essential cash. Peasants in the study area are more likely to keep poultry, sheep, goats and cattle. A total of 96 (93 percent) respondents are engaged in livestock and poultry rearing. In calculating income from animal husbandry, the study has considered the consumption of meat and milk at household level, as well as the earnings from selling of livestock and poultry. The average income from livestock or poultry rearing is about 23 thousand taka that ranges from 5 thousand to 83 thousand taka. It depicts that small-scale livestock husbandry is very common among the peasant households. On the other hand, 55 percent respondents have changed their farmland into mango orchards and get nearly 48 thousand taka on an average. There are 44 households (43 percent) who earn their significant share of income from wage employment. The income ranges from 9 thousand to 90 thousand taka. Fishery is also preferable among 30 households (29 percent) followed by petty-business (11.7 percent) and van-rickshaw pulling (10.7 percent). Only 8 households get salaried income. The peasants get nearly 1.6 percent of their income under different safety-net programs implemented by the government and non-government agencies. Overall, the analysis reveals that peasant households are getting their income from a diverse set of activities. However, crop production as a single source still contributes majority of the total household incomes.

Table 1: Total household income and their sources of the peasant households

#	Income components	N	Minimum	Maximum	Percentage	Mean (in BDT)
1	Income from Crop Production					
1a	Return from crop production (production for market)	103	50000	237000	33.40	55310
1b	Income from the production of household services for own consumption	99	2000	68600	12.66	24157
Sub-total (1)			11200	355400	46.06	78529
2	Off-farm Income					
2a	Wage employment	44	9000	90000	7.60	34197
2b	Livestock and poultry rearing	96	5000	83500	12.57	23483
2c	Mango orchard	55	7000	350000	16.34	47916
2d	Fishery	30	1000	121200	2.98	17577
2e	Petty business	18	12000	100000	3.06	45000
2f	Salaried employment	8	30000	250000	4.15	98667
2g	Van/rickshaw pulling	14	20000	108000	3.86	55510
2i	Others (handicrafts, tailoring etc.)	10	1200	90000	1.82	31720
Sub-total (2)					52.38	84263
3	Financial Support/Current Transfer from GO or NGO					
3a	Financial support from GO	43	1200	60000	0.96	2514
3b	Financial support from NGO	6	600	30000	.60	13600
Sub-total (3)					1.56	2788
Total Household Income		103	52,100	52,5500	100	1,65,580

(Source: field study 2016)

Table 2 compares the different types of income group in two villages. Annual household income is categorized into five groups. The table shows that nearly 53 percent of the total households earn less than 150 thousand taka yearly. A total of 17 households (16.5 percent) earn in between 150 thousand to 200 thousand taka, while 9 households earn 200

thousand to 250 thousand taka. A total of 22 households are earning over 250 thousand taka. On the other hand, annual household income less than 100 thousand taka comprises more in Babupur (15 out of 23).

Table 3.3: The distribution of income groups in the study villages

Annual Income Classification (in thousand taka)	Village Name		Total
	Babupur	Haripur	
50 to < 100	15 (26.8%)	8 (17.0%)	23 (22.3%)
100 to < 150	16 (28.6%)	16 (34.0%)	32 (31.1%)
150 to < 200	8 (14.3%)	9 (19.1%)	17 (16.5%)
200 to < 250	5 (8.9%)	4 (8.5%)	9 (8.7%)
More than 250	12 (21.4%)	10 (21.3%)	22 (21.4%)
Total	56 (100.0%)	47 (100.0%)	103 (100.0%)

(Source: field study 2016)

Table 3 depicts that about 41 percent of the households are having per capita income of less than 80 taka (US\$ 1.0). These households are certainly living under the poverty line. Per capita income from 80 to less than 120 taka accounts for about 27 percent households. In both cases, most of the households are from Babupur. In contrast, the percent of earning more than 120 taka per person per day cuts high in Haripur. A total of nine households have per capita per day income of 160 to less than 240 taka. Seven out of these nine households are from Haripur. The numbers of peasant households having more than 240 taka per capita income are shared among two villages. Overall, nearly 88 percent of the peasant households have less than US\$2 per capita income, that in turn indicates a high rate of poverty among peasant households.

Table 3: Per capita income of the peasant households

Per capita income (per person per day)	Village Name		Total	Cumulative figure
	Babupur	Haripur		
less than 80 taka (Less than US\$ 1.0)	27 (48.2%)	15 (31.9%)	42 (40.8%)	42 (40.8%)
80 to 120 taka (US\$ 1.0 to less than US\$ 1.5)	16 (28.6%)	12 (25.5%)	28 (27.2%)	70 (68.0%)
120 less than 160 taka (US\$ 1.5 to less than US\$ 2.0)	9 (16.1%)	11 (23.4%)	20 (19.4%)	90 (87.4%)
160 to less than 240 taka (US\$ 2.0 to less than US\$ 3.0)	2 (3.6%)	7 (14.9%)	9 (8.7%)	99 (96.1%)
More than 240 taka (More than US\$ 3.0)	2 (3.6%)	2 (4.3%)	4 (3.9%)	103 (100.0%)
Total	56 (100.0%)	47 (100.0%)	103 (100.0%)	-

(Source: field study 2016)

Pattern of secondary occupation of the respondents

In many parts of rural Bangladesh, full employment is achieved through the introduction of high yielding variety (HYV) or *boro* cultivation and by expansion of irrigation and technological facility. But the study area is prone to drought and has partial irrigation coverage. The farming community, especially of Haripur village usually depends on the rain-fed *aman* crop. Considering a whole year employment it is revealed from the group discussions that the peasants face a slack or lean period of 2 to 3 months each year. It ultimately generates seasonality in livelihoods of the peasants, eventually uneven income flows disrupts continuous household consumption needs. Findings show that the most serious problem facing peasant households remains how to cope with agricultural slack seasons. The off-farm income sources, however, play an important role in livelihood management during this slack period. The major concern is whether peasant communities can overcome seasonal fluctuations by involving them in a number of non-crop production sectors.

With little productive capital, marginal and small farmers depend on off-farm unskilled agricultural labor far more than their larger counterparts. The smaller the farm is, the higher the share of wage employment in household income. Figure 3.4 shows that nearly 30 percent of the total respondents do not have any secondary occupation, and most them are living in Babupur. Wage employment is the most dominant secondary occupation (29 percent) followed by petty business (17.50 percent) and van/rickshaw pulling (13.60 percent).

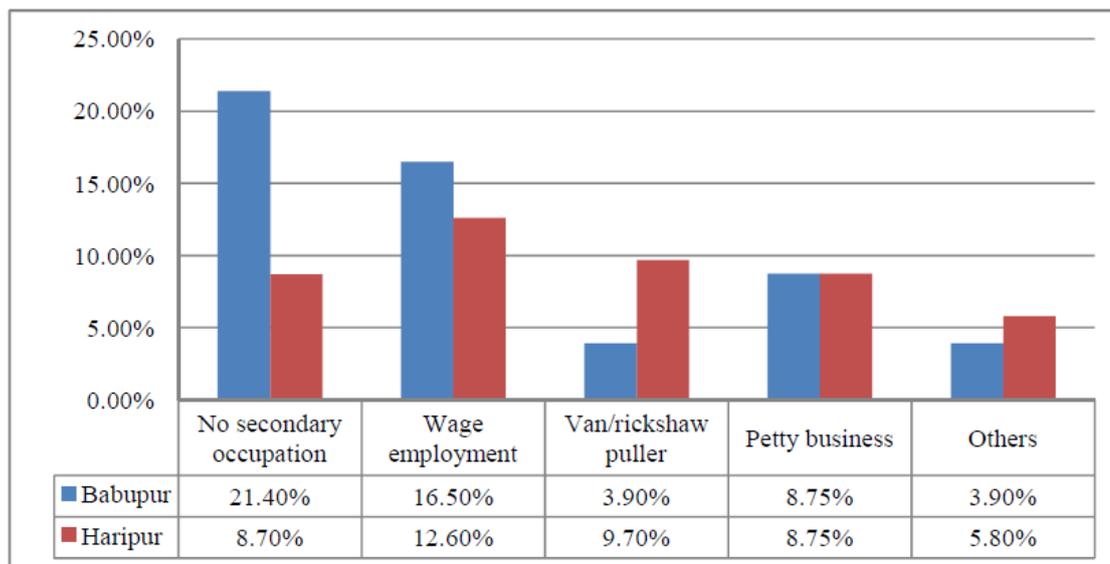


Figure 1: Pattern of secondary occupation among the respondents (Source: field survey 2016)

Total household income and secondary occupation

The table 4 represents that most of the respondents whose total household incomes are more than 250 thousand taka per year, are less inclined in having secondary occupations. In contrast, 20 out of 30 households with less than 150 thousand taka earnings per annum are earning from wage employment. Interestingly, three households despite having more than 250 thousand taka per year are engaged in wage employment. On the other hand, most of the respondents having an income more than 150 thousand taka are willing to invest in different kinds of petty business. Hence, it can be said that the total household income of the respondents has a positive relationship with their secondary occupation. It also has an impact on what kind of job the peasants will involve in.

Table 4: Respondents' secondary occupation and status of households' total income

HH head secondary occupation	Annual Income Classification (in thousand taka)					Total
	50 to <100	100 to <150	150 to <200	200 to <250	More than 250	
No secondary occupation	4 (12.9%)	7 (22.6%)	4 (12.9%)	5 (16.1%)	11 (35.5%)	31 (100.0%)
Wage employment	9 (30.0%)	11 (36.7%)	4 (13.3%)	3 (10.0%)	3 (10.0%)	30 (100.0%)
Van/ rickshaw puller	5 (35.7%)	3 (21.5%)	3 (21.5%)	1 (7.1%)	2 (14.2%)	14 (100.0%)
Petty business	3 (16.7%)	4 (22.2%)	5 (27.8%)	0 (.0%)	6 (33.3%)	18 (100.0%)
Others	2 (20.0%)	7 (70.0%)	1 (10.0%)	0 (.0%)	0 (.0%)	10 (100.0%)
Total	23 (22.3%)	32 (31.1%)	17 (16.5%)	9 (8.7%)	22 (21.4%)	103 (100.0%)

2Pearson Chi-square test value (df = 20; χ^2 value = 31.535; p-value = .049)

(Source: field study 2016)

Nature of major challenges peasants face in the study area

The peasants usually depend on agriculture both for food security and for household income. Apart from having limited size of farmland and drought, peasants face a considerable period of slack season each year. There are four major causes were identified through group discussions and key informant interviews that reduce income and induce production losses of the peasants. Data in the table shows that the majority of farmers (88.35 percent) reported that their input costs (seeds, fertilizers, pesticides, etc.) for cultivating crop increased significantly in terms of the return they got from market after selling their product. The percent of claiming this was almost similar in two villages. About 71 percent of peasants indicated that they experienced seasonal unemployment of two to three months almost every year. The percent is quite high among the peasants living in Haripur than Babupur. The former village has a very limited irrigation facility, and single crop cultivation (rain-fed *aman*) is the only option resulting in higher seasonal unemployment. A similar pattern is also observed regarding impact of drought on crop cultivation. Drought and climate variability reduced crop production about 69 percent of the respondents. But, this rate is two times higher in Haripur than that of Babupur. In contrast, a majority of peasants (64 percent) from Babupur claimed that a grave share of their profit from crop cultivation went to the pockets of the landlords due to an unfavorable tenancy arrangement. The percent (26 percent) is quite low in Haripur. Lack of irrigation facility is another important factor that does not allow the landlords of Haripur to impose a large discriminating arrangement onto the tenants. Overall, marginal and smallholder farmers are at great risk from the impacts of different kind of social and environmental constraints.

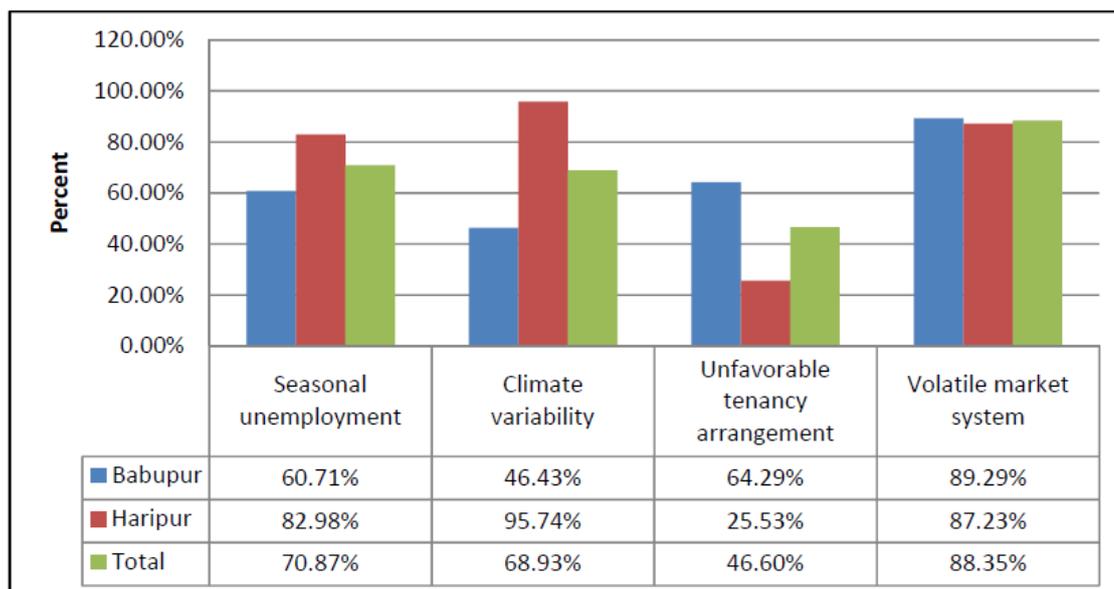


Figure 2: Major causes of deficit in income and loss of production (Source: field study 2016)

Nature and pattern of coping strategies

There is a little information available on how peasants prepare and cope with drought and other socioeconomic problems in this region. The study finds a number autonomous response among the local people. The strategy differs considerably if access to asset and service varies. The study mainly considers the coping strategy of the peasants due to unemployment, income deficiency, and losses of production. Peasants have to invest their financial resources for different inputs of the production like seeds, fertilizer, and labor-cost and they receive the return after the harvest. So, most of the peasant households, especially marginal farmers face challenges to ensure sufficient food and other basic needs for their families during this period. Since these groups live from hand to mouth round the year, and they often have to spend their surplus to pay back loans, they hardly can save some resources to cover their basic needs during lean seasons. As a result, they are facing great challenges to prevent their families from food and income insecurities. The table 5.1 and figure 5.2 depicts different kinds of coping strategies adopted by villagers. Among them, engaging in wage employment is the first choice of the peasant households (60 percent) followed by transformation of paddy field into mango orchards (about 54 percent). The transformation of agriculture rate is higher in Haripur than that of Babupur. In contrast, the percent of behavioral or avoidance coping strategies like reducing food intake, getting aid (mostly food) from neighbors, and selling household asset are high in Babupur. A considerable percent of peasant households (37 percent) took loans from different sources to cope with constraints. However, result from group discussions indicated that taking loan created further vulnerability to the peasants as the interest rate is very high. Selling labor in advance is another very common coping strategy found among the peasants which counts about 40 percent of the total respondents.

Table 5: Type of coping strategies in two villages

#	Type of coping strategies	Village Name		Total (N=103)
		Babupur (n=56)	Haripur (n=47)	
1	Engaging in wage employment	57.1%	63.8%	60.2%
2	Taking loan	41.1%	31.9%	36.9%
3	Engaging in petty business	14.5%	20.5%	17.5%
4	Transforming paddy field into mango orchard	48.2%	60.7%	53.4%
5	Changing time of crop cultivation	8.9%	12.8%	10.7%
6	Selling labor in advance by accepting low wage	37.5%	42.6%	39.8%
7	Getting aid from neighbors	45.7%	22.3%	34.0%
8	Reducing food intake	48.2%	23.4%	36.9%
9	Selling household assets (productive and non- productive)	26.8%	10.6%	19.4%
10	Others (fishing, handicrafts, rickshaw pulling, etc.)	19.6%	31.8%	25.2%

(Source: field study 2016)

Status of coping

Considering the above discussion, the study asked the respondents to posit themselves in overall coping status of the household. A five-scale statement was used in this regard. A significant number of peasants (23 HHs) claimed that they were falling far behind to cope with different constraints. The number is almost two times higher in Babupur than that of Haripur. About 23 percent of the peasants (24 HHs) reported that their position had not been changed so much comparing to near past. A total of 30 peasant households (29.10 percent) had been coping partially. Coping moderately was claimed by 16 percent. Only ten households (9.70 percent) acclaimed successful coping (figure 5.3). The figure also states that there are some differences regarding coping status between two villages except 'neither failed nor succeeded'. Haripur has a greater number of respondents who are coping partially (34 percent) and coping successfully (12.8 percent) in comparison to that of Babupur.

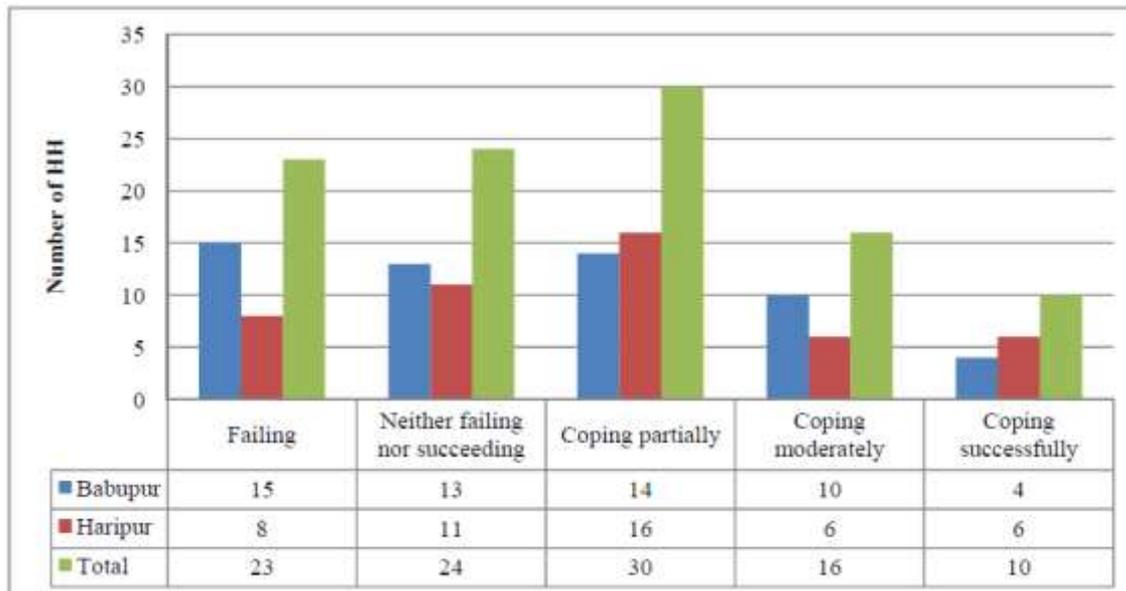


Figure 3: The percent of overall coping status of the peasant households (Source: field study 2016)

ASSOCIATION BETWEEN INCOME DIVERSIFICATION AND COPING

Coping strategies and total household income

Peasant households just do not undergo the consequences of various idiosyncratic shocks, rather they apply different strategies to cope with the challenges. Most of the cases income determines the nature and pattern of coping strategy. As discussed earlier, majority of the peasants face persistent poverty which in turn causes entry barrier for choosing a sustainable coping strategy. Hence, peasants apply informal risk-managements such as selling labor in advance, taking loan with high interest, selling household assets and/or engaging them in informal wage-sectors. These kinds of strategies are only able to provide limited protection, and leaving many peasant households exposed to further vulnerability.

The table 6 depicts that peasants engaging themselves in wage-employment are mostly having income less than 150 thousand taka. The percent of taking loans stand high in the same group. Households going for petty business are mainly having an income over 100 thousand taka. About 90 percent of the households selling assets as well as reducing food-intake are earning less than 150 thousand taka per year. Getting assistance from neighbors during shock periods is almost evenly distributed among the income groups. The percent of selling labor cuts very in the income group of 100 thousand to less than 150 thousand taka. In contrast, the percent of peasants who transformed their traditional cropland into mango orchards are distributed in all income groups. However, the percent of such transformation rate is higher among the households having income over 100 thousand taka. Despite taking different kind of coping strategies, however, poverty- driven risks remain high.

Table 6: Association between coping strategies and total household income

Type of coping strategies	Category of total household income (in thousand taka)					Total (N= 103)	Pearson Chi-Square test (P- value)
	50 to <100	100 to <150	150 to <200	200 to <250	More than 250		
Engaging in wage employment	17 (27.42%)	19 (30.65%)	9 (14.52%)	7 (11.29%)	10 (16.13%)	62 (60.20%)	.254
Taking loan	15 (39.47%)	11 (28.95%)	8 (21.05%)	2 (5.26%)	2 (5.26%)	38 (36.90%)	.002
Depending on earning from petty business	1 (7.14%)	7 (50.00%)	3 (21.43%)	0 (0.00%)	7 (50.00%)	14 (17.50%)	.268
Transferring paddy field into mango orchard	6 (10.71%)	18 (32.14%)	8 (14.29%)	8 (14.29%)	16 (28.57%)	56 (54.40%)	.004
Changing time of crop cultivation	3 (27.27%)	3 (27.27%)	5 (45.45%)	0 (0.00%)	0 (0.00%)	11 (10.70%)	.038
Selling labor in advance by accepting low wage	8 (19.52%)	20 (48.78%)	7 (17.07%)	5 (12.19%)	1 (2.44%)	41 (39.80%)	.794
Getting aid from neighbors	6 (17.14%)	11 (31.43%)	4 (11.43%)	3 (8.57%)	11 (31.43%)	35 (34.00%)	.408
Reducing food intake	21 (55.26%)	14 (36.84%)	2 (5.26%)	0 (0.00%)	1 (2.63%)	38 (36.90%)	.000
Selling household assets (productive and non-productive)	17 (85.00%)	3 (15.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	20 (19.40%)	.000
Others (fishing, handicrafts, rickshaw pulling, etc.)	6 (23.08%)	6 (23.08%)	6 (23.08%)	0 (0.00%)	8 (30.77%)	26 (25.20%)	.191

(Source: field study 2016)

Coping status and total household income

Poverty and economic stress remain realities of daily life for a substantial proportion of the peasants in the study area. It is observed from the table 5.4 that almost all the households falling behind of coping belong to the less than 150 thousand taka of annual income groups. A total of 18 out of 23 households having incomes less than 100 thousand taka have all failed to cope with different constraints. Only 4 households of the same income group are coping partially. There are 32 households in the income group of 100 thousand to less than 150 thousand taka. Among them, 20 households have been coping partially followed by 8 who are in a neutral position. Most of the households coping moderately have an income over 150 thousand taka annually. Only 10 households (9.70 percent) are coping successfully who belong to the income group of over 250 thousand taka earnings per year. Hence it can be said that there is a very significant relationship between household income and status of overall coping of the peasants.

Table 7: Coping and total household income

Overall coping status at household level	Category of total household income (in thousand taka)					Total
	50 to < 100	100 to < 150	150 to < 200	200 to < 250	More than 250	
Failing	18 (78.3%)	4 (17.4%)	1 (4.3%)	0 (.0%)	0 (.0%)	23 (100.0%)
Coping partially	4 (13.3%)	20 (66.7%)	6 (20.0%)	0 (.0%)	0 (.0%)	30 (100.0%)
Neither failing nor succeeding	1 (4.2%)	8 (33.3%)	6 (25.0%)	5 (20.8%)	4 (16.7%)	24 (100.0%)
Coping moderately	0 (.0%)	0 (.0%)	4 (25.0%)	4 (25.0%)	8 (50.0%)	16 (100.0%)
Coping successfully	0 (.0%)	0 (.0%)	0 (.0%)	0 (.0%)	10 (100.0%)	10 (100.0%)
Total	23 (22.3%)	32 (31.1%)	17 (16.5%)	9 (8.7%)	22 (21.4%)	103 (100.0%)

2 Pearson Chi-square test value (df = 16; χ^2 value = 131.113; p-value = .000)

(Source: field study 2016)

Relationship between coping strategy and coping status

On the other hand, findings show that the peasants of the study villages take different coping strategies ambiguously. The table 5.3 illustrates that some of the coping strategies such as reducing food intake, selling productive and non productive household assets, selling labor in advance and taking loans are undermining their coping capacity significantly. In contrast, transforming crop-field into mango-orchard shows a positive correlation with coping status. All other strategies are not significantly tied up with the status of coping (see chi-square result in the table).

Table 8: Relationship between coping status and coping strategy

Coping strategy		Status of coping					Total	Pearson Chi-square P-value
		Failing	Neither failing nor succeeding	Coping partially	Coping moderate ly	Coping successful ly		
Engaging in wage employment	Yes	15	13	19	11	4	62	.571
	No	8	11	11	5	6	41	
Taking loan	Yes	13	11	12	2	0	38	.005
	No	10	13	18	14	10	65	
Engaging in petty business	Yes	2	4	8	2	2	18	.274
	No	21	20	22	14	8	85	
Transferring paddy field into mango orchard	Yes	6	15	14	12	8	55	.005
	No	17	9	16	4	2	48	
Changing time of crop cultivation	Yes	4	4	1	2	0	11	.294
	No	19	20	29	14	10	92	
Selling labor in advance	Yes	11	10	8	7	5	41	.005
	No	12	14	22	9	5	62	
Getting aid from neighbors	Yes	14	14	7	0	0	35	.224
	No	9	10	23	16	10	68	
Reducing food intake	Yes	21	3	12	2	0	38	.000
	No	2	21	18	14	7	65	
Selling household assets	Yes	17	1	2	0	0	20	.000
	No	6	23	28	16	7	83	

(Source: field study 2016)

Total number of coping strategies and coping status

The total number of coping strategies taken by each household is also not significantly linked with the status of coping (see table 9). However, it does not depict any significant connection between successful coping and diversity of income or occupation.

Table 9: Overall coping status and total number of strategies taken by each household

Overall coping status at household level	Total number coping taken by each household						Total
	One	Two	Three	Four	Five	Six	
Failing	1 (4.3%)	6 (26.1%)	5 (21.7%)	7 (30.4%)	3 (13.0%)	1 (4.3%)	23 (100.0%)
Neither failing nor succeeding	0 (.0%)	2 (8.3%)	8 (33.3%)	10 (41.7%)	4 (16.7%)	0 (.0%)	24 (100.0%)

Coping partially	0 (.0%)	5 (16.7%)	10 (33.3%)	10 (33.3%)	4 (13.3%)	1 (3.3%)	30 (100.0%)
Coping moderately	0 (.0%)	1 (6.3%)	6 (37.5%)	7 (43.8%)	1 (6.3%)	1 (6.3%)	16 (100.0%)
Coping successfully	0 (.0%)	2 (20.0%)	4 (40.0%)	3 (30.0%)	0 (.0%)	1 (10.0%)	10 (100.0%)
Total	1 (1.0%)	16 (15.5%)	33 (32.0%)	37 (35.9%)	12 (11.7%)	4 (3.9%)	103 (100.0%)

(Source: field study 2016)

CONCLUSION

The participation in diversified income generating activities by peasant community is not new but the dimensions of activities are taking new shapes. The study depicts that the peasants are increasingly earning their major share of household income from off-farm sectors. Return from income diversification also varies across time or among individuals within households or community as asset-bases and intra-household skills are heterogeneous. Since the returns to on-farm labor are high during wet period, peasant households in the study area allocate their labor to on-farm activities during this time. On the other hand, they reallocate their labors to non-farm activities during the dry season or during the period when crops fail. Usually small landholders exhibit greater demand for diversification for the purpose of ex-ante risk mitigation. There is a very significant relationship between household income and status of overall coping status. But, it is observed from the study that almost all the households indicated falling behind of coping are all belong to having less than 150 thousand taka of annual income. Only 10 households coping successfully have been earning more than BDT 250 thousand annually. The study reveals a very strong association between income and successful coping as an increase of household income is likely to have a positive impact on coping. However, it does not depict any significant connection between successful coping and diversity of income, occupation or coping strategies. Besides, total number of coping strategies taken by each household is also not significantly linked with the status of coping. It is quite evident that a large share of peasants' income constraints as well as vulnerability is typically a result of many factors. Apart from climate variability or drought impact, they also face a number of social and economic challenges in their everyday life. Some coping strategies such as selling labor in advance, reducing food intake and selling out of household assets (both productive and non-productive) create further vulnerability of the peasant households in many regards. On the other hand, multiple sources of income, transformation of agriculture to more profitable crop, having secondary jobs etc. enhance resilience of the peasants to different shocks. The analysis suggests that that income constraint and limited farm ownership of the peasants are hindering their ability to cope with shocks as well as to invest for their future welfare. On a whole, evidence shows that income and occupational diversification contributes in lessening vulnerability by ameliorating risk and reducing the adverse consumption effects of seasonality in some extents. But, the off-farm income opportunities are poorly distributed in the study area. The peasants face entry barriers to many productive sectors due to lack of investment capabilities that ultimately limiting their capacity for effective ex-post coping. Some of their risk management efforts are also limiting their ability to build up an asset base that may take them out of poverty.

Given the complex nature of rural development, income diversification should be part of a broader integrated policy goal to protect peasant livelihood. Multi-sectors developmental strategy or approach is needed to assist the peasant community as well. Since peasants or smallholder farmers are the major food producers of the country, there is an urgent need for government and donor agencies to come up with strategies that can help farmers to build up their capital. It will ultimately help peasants to invest in their farms while not exposing them to horrendous financial risks.

REFERENCES

- Andre Beteille. (1974). *Studies in Agrarian Social Structure*, Ely house, London Oxford University Press.
- BBS (Bangladesh Bureau of Statistics). 2015. *Report on Labor Force Survey (LFS) Bangladesh 2013*, Dynamic Printers. Dhaka, Bangladesh. [http:// www.bbs.gov.bd](http://www.bbs.gov.bd)
- Borras, S.M. 2009. Agrarian change and peasant studies: changes, continuities and challenges – an introduction, *The Journal of Peasant Studies*, 36:1, pp 5-31.
- Buttel, F.H., Olaf, F.L. and Gilbert, W.G.1990. *The Sociology of Agriculture*, Greenwood Press, New York.
- Dercon, S. 2009. "Risk, Poverty, and Insurance." Brief 3 in *Innovations in Insuring the Poor*, edited by R. Vargas Hill and M. Torero. 2020 Vision Focus 17. Washington, DC: International Food Policy Research Institute.
- Dorosh, P. and Shahabuddin Q. 2002. Rice Price Stabilization in Bangladesh: An Analysis of Policy Options. *International Food Policy Research Institute*. October, 2002. Washington D.C.
- Edelman, M. 2013. What is peasant? What are peasants? *A briefing paper on issues of definitions, Prepared for the first session of the Intergovernmental Working Group on a United Nations Declaration on the Rights of Peasants and Other People Working in Rural Areas*. Geneva, 15-19 July 2013. <http://www.ohchr.org/Documents/HRBodies/HRCouncil/WGPeasants/Edelman.pdf>
- Ellis, F. 2000. *Rural Livelihoods and Diversity in Developing Countries*, Oxford University Press Inc., New York.
- Erickson, N.J., Ahmad, Q.K. and Chowdhury, A.R. 1997. *Socio-economic Implications of Climate Change for Bangladesh*. Dhaka, Bangladesh: Bangladesh Unnayan Parishad (BUP). ISBN: 984-8126-03-1.
- FAO (Food and Agriculture Organization of the United Nations). 2001. *Production Yearbook 2000*. Rome: Author.
- Freedman, P. 1999. *Images of the Medieval Peasant*, Stanford University Press, Stanford, California
- Gill, G.J. 1991. *Seasonality and Agriculture in the Developing World: A Problem of the Poor and Powerless*, Cambridge University Press, New York.
- Hayami, Y., Kkuchi, M., Moya, P. F., Bambo, L. M. and Marciano, E. B. 1978. *Anatomy of Peasant Economy: A Rice Village in Phillipines*. Los Baños, Laguna, Philippines: IRR
- Holahan, C.J., and Moos, R.H. 1987. Risk, resistance, and psychological distress: A longitudinal analysis with adults and children. *Journal of Abnormal Psychology*, 96, 3-13.1
- Khatun D. and Roy, B.C. 2012. Rural Livelihood Diversification in West Bengal: Determinants and Constraints, *Agricultural Economics Research Review*, Vol. 25(No.1), pp. 115-124.

- Makita, R. 2005. Livelihood Diversification and Landlessness in Rural Bangladesh. The University Press Limited, Dhaka. ISSN 984-05-1783-X
- Madalgi, S. S. 1969. Small Farmers: Problems of Identification. *Economic and Political Weekly*, 4(13), A37-A40. <http://www.jstor.org/stable/40739496>
- Orr, A., Magor, N., and Islam, A.S.M.N. 1995. Targeting Vulnerable Small Farm Households in Bangladesh. *The Bangladesh Development Studies*, Vol. XXIII, March-June, 1995. Nos. 1&2.
- Rapsomanikis, G. 2015. The economic lives of smallholder farmers: An analysis based on household data from nine countries, Food and Agriculture Organization of the United Nations, Rome.
- Reardon et al. 1992
- Salam, S., Alam, S., and Moniruzzaman, M. 2012. Price Behaviour of Major Cereal Crops in Bangladesh, *Journal of Biology, Agriculture and Healthcare*, Vol 2, No.2, PP 57-70.
- Salinger, J., Sivakumar, M.V.K. and Motha, R.P. (eds). 2005. *Increasing Climate Variability and Change: Reducing the Vulnerability of Agriculture and Forestry*. Climatic Change Volume 70, Nos. 1-2. AA Dordrecht, The Netherlands: Springer.
- Schüren, U. 2003. Reconceptualizing the Post-peasantry: Household Strategies in Mexican Ejidos. *Revista Europea de Estudios Latinoamericanos y del Caribe* 75, PP 47-63. http://www.cedla.uva.nl/50_publications/pdf
- Shanin, T. (ed.). 1971. Peasants and Peasant Societies. Penguin Books Ltd, Harmondsworth, Middlesex, England.
- Singharoy, D.K. 2004. Peasant Movement in Post-colonial India: Dynamics of Mobilization and Identity. Panchsheel Enclave, Sage Publications India Pvt Ltd. New Delhi, India.
- Sivakumar, M.V.K., and Hansen, J. (eds). 2007. Climate Prediction and Agriculture: Advances and Challenges. Ver-lag Berlin Heidelberg: Springer.
- Taslim, M.A. (1995). Agricultural Land Tenancy in Bangladesh: a review', in Rashid, S.(ed.) (1995) *Bangladesh Economy: Evaluation and Research Agenda*, University Press, Dhaka.
- Webster, H. 1926. Readings in Early European History, Boston, New York, Heath and Co. Wolf, E.R. 1966. Peasants. Prentice Hall Inc., Englewood Cliffs, New Jersey
- Wreford, A., Moran, D. and Adger, N. 2010. Climate Change and Agriculture: Impacts, Adaptation and Mitigation. OECD. <http://www.oecd.org/publishing/corrigenda>
- Yizengaw, Y.S., Okoyo, E.N. and Beyene, F. 2015. Determinants of livelihood diversification strategies: The case of smallholder rural farm households in Debre Elias Woreda, East Gojjam Zone, Ethiopia, *African Journal of Agricultural Research*, Vol. 10(19), pp. 1998-2013. <http://www.academicjournals.org/AJAR>

1095 REDESIGNING RURAL DEVELOPMENT STRATEGIES: INNOVATION DYNAMICS RECONSIDERED

ABSTRACT

There is now a considerable set of theoretical approaches concerning the need rural world faces in the global knowledge economy. In particular, there is a rich academic production of territorial innovation models from which we can learn, extending the concept of regional learning to the field of developing predominantly rural areas. The first part of this article examines the challenges rural territories are facing against the background of modern theories of innovation and regional policies. It is argued that the role of localized learning is of strategic importance in the promotion of endogenous rural and regional development. Then, departing either from the handicaps either from the assets of rural areas, this paper argues that development in rural regions is made up of a complex set of interactions between different actors and processes. We question whether current rural policies are adequate to guarantee the competitiveness and sustainability of rural territories. Studying and intervening on the rural dynamics requires a shift from focusing on forms of knowledge and innovation outputs towards focusing on learning and innovation dynamics, exploring the diverse dimensions of knowledge building and promoting social capital.

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1156 STUDY ON THE RELATIONSHIPS BETWEEN RURAL AND AGRICULTURAL DEVELOPMENT AND HUMAN RESOURCE DEVELOPMENT IN RUSSIAN FEDERATION SINCE 2000S

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ABSTRACT

The main purpose of the study is to clarify the relationship between Rural and Agricultural Development and Human Resource Development in Russian Federation since 2000s. In order to achieve our purpose, we set two hypotheses for verification by using the methodologies of Data Envelopment Analysis (DEA) and Structural Equation Modeling (SEM).

Analytical results from the research clarified that there have been a positive relationship between agriculture and human resource development in Russia since 2010, which has given impact on rural development as well (Hypothesis 1). It also clarified that structural changes in agricultural sector have impacts not only on agriculture but also on rural development (Hypothesis 2). Although agricultural enterprises (AEs) remain important role in the agriculture performance among three agricultural producers, its importance is changing along with the country's social-economic situation and is uneven across region. Additionally, among the agriculture enterprises, the role of agricultural holdings in the country's agricultural performance is extremely important but its development is uneven across regions and even within some regions such as in the Siberian FD.

Policy implications drawn from the research for both central and regional government indicated that agriculture development in Russia should pay more attention to human resource development and rural development when considering food security in a long-term perspective, especially the impacts of structural changes in agriculture sector on the human resource development in rural areas needs careful analysis.

JEL Classification: O10, O11

Keywords: Rural and Agricultural Development, Human Resource Development, Russian Federation

1. INTRODUCTION⁴⁵⁸

The government of Russian Federation has implemented various kinds of policy to improve the productivity in agriculture, such as the current agricultural policy of 'State program for the development of agriculture and relation of markets for agricultural products, raw materials and food during 2013-2020'. However, the survey on the 'Current Status and Trends in Russian Agribusiness' undertaken by Deloitte in 2015, clarified that the key constraints on the Russian agricultural industry are the shortcomings of government regulation, insufficient government support and financing, and lack of skilled personnel etc.

On the other hand, Russia's agricultural revival has been leading by the South district, where producers appear to have exploited climatic, infrastructural, and institutional comparative advantages over other districts. Modern agricultural practices (e.g., hybrid corn combined with specially tailored fertilizer application) and new processes (e.g., vertically integrated poultry operations) have also likely contributed to boosting output in the region. Despite the South's early rebound, the rest of the country has lagged. As for Siberian Federal District (SFD), although the higher share of the district in Russia's agricultural production in comparison with its ratio in the population size owing to its better land endowment, the productivity of agriculture is declining in the period of 2001-2005 and 2011-2015.

Therefore, the main purpose of the study is to clarify the relationship between Rural and Agricultural Development and Human Resource Development in Russian Federation since 2000s. The remaining parts of the paper are designated as follows. In Section 2, we will make a brief literature review on the rural and agricultural development and human resource developments, some related issues in Russia will be referred. In Section 3, we will present our analytical framework, hypotheses and methodologies for the research. In Section 4, we will verify our hypotheses by describing the changes in rural and agricultural development and clarifying the relationships between agricultural development, human resource development and rural development at regional level in Russian Federation since 2001-2015. Finally, in Section 5, policy implications draw from the analytical results will be suggested for the government to set their strategies for rural and agricultural development.

2. REVIEW OF LITERATURES

2.1 Rural and Agricultural development

According to Kiminami and Kiminami [9], rural and agricultural development concerns both the issues of development within a geographical region of an "agricultural community", and the issues of developing "agriculture" as an industry. First of all, there is the dimension of "quantity and quality" in economic development, in which the quantitative aspect includes the increase in wealth, income level, and availability of assets or services, and the qualitative aspect includes the realization of social welfare, creation of employment opportunities, sustainable development, and improvement in

⁴⁵⁸ The earlier version of this paper was presented at the 54th Annual Meeting of the Japan Section of the RSAI (6-8 Oct. 2017, Ritsumeikan University, Kyoto, JAPAN)

quality of life (QOL). Furthermore, in terms of rural and agriculture development today, geographical spatial links are strengthening as well as widening in the issues covered.

However, despite convincing successes, agriculture has not been used to its full potential in many countries because of anti-agriculture policy biases and underinvestment, often compounded by misinvestment and donor neglect, with high costs in human suffering. New opportunities for realizing this potential are present today, but also coming are new challenges, particularly in pursuing a smallholder-driven approach to agricultural growth that reconciles the economic, social, and environmental functions of agriculture (World Bank [22]).

During the transformation of Russia's economy in the 1990s, agriculture became one of the most unattractive areas for investments because of its longer capital turnover, low return, outdated infrastructure and specific natural conditions of production. That, in turn, decreased the level of income of rural people, created unemployment and forced migration to urban centers. Consequently, rural regions of Russia lacked not only capital, but also labour, leading to the degradation of agricultural production and rural infrastructure, and giving rise to social tensions.

Recently, the Russian Government has begun to pay special attention to ensuring sustainable rural development. General programs and concepts accepted at the federal level ⁴⁵⁹ defined the main state approaches to rural issues, but concrete rural areas need real and effective mechanisms of social and economic revival (Erokhin et al., [5]).

According to Kurtsev [10], in the Siberian economy, agricultural production plays more significant role than the average for Russia. The agrarian aspect of the social and economic development of Siberia in its concrete expression due to the multifunctionality of agriculture encompasses a number of directions. Quantitative and qualitative characteristics of nutrition are the most important criteria for the level of social development of the territory, since it is about satisfying the most important everyday life needs of people. The creation of a food base that meets the quantitative and qualitative parameters of a full-value nutrition of people at prices for food products that are acceptable in terms of incomes of the population is one of the prerequisites for the further development of the Siberian region.

In the long term, the main functions of the rural sector should not be limited to agricultural production, which is, of course, important for the country's food security, but include other production activities. For instance, the reanimation of the social and production infrastructure of rural areas, the development of agricultural product processing, the revival of vernacular arts, the involvement of various recreational resources into the rural economy, and the development of industrial production sites based on the use of local natural resources and raw materials etc. In other words, the idea is to diversify the rural economy.

2.2 Human Resource Development

Human development is a process of enlarging people's choices. Human development is also the objective, so it is both a process and an outcome. Human development implies that people must influence the processes that shape their lives. In all this, economic growth is an important means to human development, but not the end. Human development is the development of the people through building human capabilities, by the people through active participation in the processes that shape their lives and for the people by improving their lives (UNDP[17]).

The composite of Human Development Index (HDI) integrates three basic dimensions of human development. Life expectancy at birth reflects the ability to lead a long and healthy life. Mean years of schooling and expected years of schooling reflect the ability to acquire knowledge, and gross national income per capita reflects the ability to achieve a decent standard of living.

According to the calculation of UNDP [17], HDI of the Russian Federation in 2015 ranked No.49 among 188 countries with a very high level of index (0.804) for Human Development⁴⁶⁰, key indicators of life expectancy, particularly child and maternal mortality had improved, and rates of major infectious diseases had stabilized. Nevertheless, some studies showed that huge inequalities in human resource development such as three distinct dimensions of inequality affect access to health care: household-level, regional-level and rural-urban differences within region exist in Russia (Cook [4]).

In general, development of human resources such as educational investment and health improvement in rural areas contribute to the promotion of modernization of agriculture (Mellor [12]). However, empirical researches on the relationship between the development of the agricultural sector and human resource development in Russian since the 2000s are insufficient so far.

On the other hand, human capital, a key for the development of human resources is the main engine and the foundation of the industrial economy (Schultz [16]). Since public policy prioritizes food production in Russia's agricultural sector, there are insufficient resources allocated to support human capital in the sector. As a result, the serious problems of human capital such as a shortage of qualified specialists and an outflow of rural residents continue to deteriorate, and it will damage the aspirations of Russia's leadership and competitiveness in the world food market (Wegren [20][21]).

2.3 Economic transition in Russia

The sharp decline in Russia's agricultural output and use of inputs (land, labor, materials, and capital) as the sector transitioned to a market economy affected all Russian districts rather equally. A higher level of specialization in output across districts has been a common feature of Russia's subsequent agricultural recovery. Since 2000, the South district

459 For example, Agricultural Development Program of Russian Federation for 2013-2020

460 See also UNDP Russia [18] for the regional difference in the country.

has increased production of wheat, corn, and sunflower seed while decreasing production of potatoes and eggs. The Central district has traditionally been the country’s biggest producer of sugar beets and is now the largest meat producer. A high level of specialization for some districts are not by increasing output of particular commodities but rather by decreasing production (Rada et al. [15]). However, the extreme specialization on a specific type of activity may carry high risks in some regions with the possibility of economic instability.

There have been three major kinds of agricultural producers in Russia since the collapse of the Soviet Union: former state and collective farms (called as agricultural enterprises by the Russian statistical authorities), household plots and private family farms. Agricultural enterprises have been the dominant producer in the post-Soviet period, at least in terms of institutional structure and influence. In the early 1990s, the former state and collective farms reorganized from the Soviet period. Households working on agricultural enterprises have retained the Soviet-era practice of maintaining small plots, with the right to consume or sell their products. The total amount of agricultural land used by these plots increased from 3 percent in 1990 to 16-20 percent by 2013. The third type of agricultural producer in Russia is the private family farm. In the Soviet planned economy, farms did not have decision making power over their input use and output mix; rather, farms received from central planners a specific allocation of inputs tied to mandated output targets. Farms faced no competitive market pressure to be efficient, reduce waste, and economize on inputs. In Russia’s market economy, however, farms not only have the potential to earn profit but also to be largely self-financing. They have the freedom of decision making, including the choice of output and input mix, and stronger managerial control to improve labor incentives (Rada et al., [15]).

3. RESEARCH FRAMEWORK, HYPOTHESES AND METHODS

Based on the review of the existing literatures and achieve our purpose to clarify the relationships between rural and agricultural development and human resource development in Russian Federation, we set the following conceptual framework as shown by Figure 1 and two hypotheses to explain the relationships. Furthermore, Table 1 showed the methodologies and variables for verifying each hypothesis in the research.

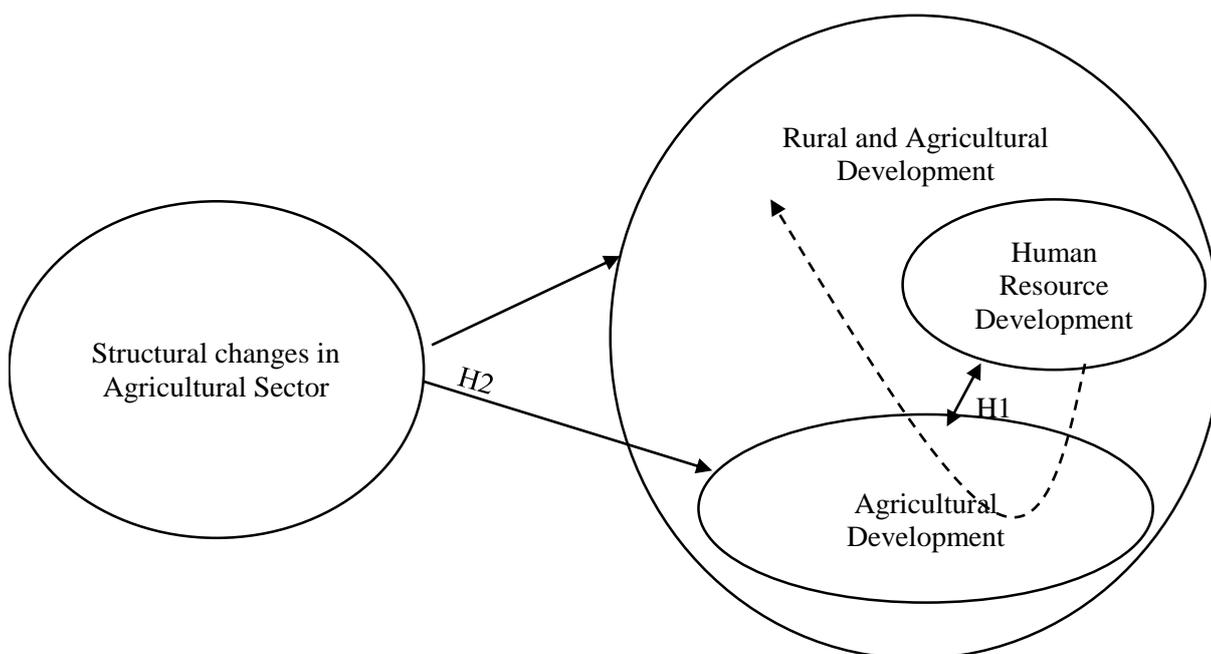


Figure 1 Conceptual framework

Hypotheses

H1: There is strong relationship between agricultural development and human resource development in Russia since 2000s.

H2: Structural changes in Agricultural Sector have impacts on the Rural and Agricultural Development in Russian Federation since 2000s

Table 1 Analytical methods and variables

Hypotheses	Main Methods
H1: There is strong relationship between agricultural development and human resource development in Russia since 2000s.	-Data Envelopment Analysis(DEA) -Structural Equation Modeling(SEM)
H2: Structural changes in Agricultural Sector have impacts on the Rural and Agricultural Development and Human Resource Development in Russian Federation since 2000s	

4. ANALYTICAL RESULTS

4.1 Human Resource Development and Rural and Agricultural Development in Russia

4.1.1 Human Resource Development in the Regions of Russian Federation

Table 2, Table 3 and Table 4 showed the situation of human resource development in the regions of Russian Federation during the period of 2001-2015. As for the life expectancy in Russian Federation, it has expanded 6.1 years from 65.29 years in 2001 to 71.39 in 2015. However, uneven improvement of life expectancy across regions, such as a big gap between Central, North-West, Southern and Siberian, Far East FD. Although, the average income in Russian Federation has been increased more than 10 times in 2015 comparing to that in 2001, there is a big gap between the highest region (Central FD with 38,776 rubles) and the lowest region (Siberian FD with 23,584 rubles). Furtherly, the level of education especially in the number of graduates of university has increased in all regions of Russian Federation during the period but its distribution is still extremely uneven across regions. Although Russian government has implemented reforms to improve the quality of high education since 2011, the reason for the decrease in the number of graduates of university from 2010-2015 might be explained as due to the sharp decline in the fertility rate in the first several years of 1990s because of the economic stagnation (Filatova et al. [7]).

Table 2 Life expectancy in the Federal Districts of Russian Federation

	Life Expectancy (years)				Rate Changes 2001-15(%)
	2001	2005	2011	2015	
Russian Federation	65.29	65.3	69.83	71.39	6.10
Central FD	65.26	66.29	71.19	72.72	7.46
North-West FD	64.42	64.02	70.07	71.70	7.28
Southern FD	67.24	68.06	70.65	72.13	4.89
Volga FD	65.75	65.26	69.24	70.71	4.96
Ural FD	65.28	65.22	69.42	70.38	5.10
Siberian FD	64.00	62.75	67.72	69.31	5.31
Far East FD	63.49	62.24	66.36	68.68	5.19

Source: Russian Statistic Yearbook (2002, 2006, 2012, 2016)

Table 3 Average Income in the Federal Districts of Russian Federation

	Average income (rubles)				
	2001	2005	2011	2015	Changes 2001-15
Russian Federation	3,060	8,112	20,780	30,474	27,414
Central FD	4,446	11,084	27,089	38,776	34,330
North-West FD	3,017	9,045	21,184	32,388	29,371
Southern FD	1,930	5,333	16,584	27,004	25,074
Volga FD	2,285	6,220	17,282	26,300	24,015
Ural FD	3,790	9,507	23,908	32,794	29,004
Siberian FD	2,508	6,680	16,568	23,584	21,076
Far East FD	3,130	8,892	22,870	36,320	33,190

Source: Russian Statistic Yearbook (2002, 2006, 2012, 2016)

Table 4 Number of Graduates of University (High Education) in the Federal Districts of Russian Federation

	Graduated specialists (th.person)				
	2001	2005	2010	2015	Rate Changes 2001-15(%)
Russian Federation	720.2	1151.7	1467.9	1300.5	580.3
Central FD	239.3	343.5	483.2	417.8	178.5
North-West FD	80.4	120.0	147.0	124.7	44.3
Southern FD	87.9	151.4	121.7	127.7	39.8
Volga FD	135.8	233.8	291.0	255.2	119.4
Ural FD	53.0	97.5	113.7	101.7	48.7
Siberian FD	94.3	156.5	180.2	150.8	56.5
Far East FD	29.5	49.0	56.3	49.2	19.7

Source: Russian Statistic Yearbook (2002, 2006, 2012, 2016)

4.1.2 Agricultural Development in the Federal Districts of Russian Federation

In this section, we will firstly analyze the performance of Russian agricultural sector at regional level since 2000s in order to understand the situation of utilizing human resource. The productivity of labor, land and capital of 7 federal districts are calculated from the statistical database (*Regions of Russia*) in order to analyze the performance of Russian agricultural sector at regional level (See Table 5). They showed the differences across districts by average. For Siberian FD, labor productivity and capital productivity were higher than the average in Period 1, but the growth rates of them were lower than that of the average in period 2.

Table 5. Agricultural Productivity of Federal Districts in Russian Federation

	Productivity					
	Period1 (2001-2005)			Period 2 (2011-2015)		
	Labor	Land	Capital	Labor	Land	Capital
Central FD (17)	98.0	5.3	0.9	184.7	7.4	1.3
North-West FD (9)	91.1	11.8	0.8	109.9	9.8	0.9

Southern FD (12)	85.9	5.8	1.0	131.8	7.1	1.8
Volga FD (14)	92.3	4.4	1.0	138.3	4.8	1.5
Ural FD (4)	99.1	3.8	1.0	169.2	4.1	1.4
Siberian FD (12)	98.5	2.5	1.0	139.3	2.4	1.4
Far East FD (9)	99.0	10.1	0.9	110.4	6.7	1.5
Average	94.5	6.0	0.9	142.7	6.1	1.4

Notes: The value in parentheses is the number of regions in simple average. The units of productivity are as follows: Labor Productivity (1,000 rubles/person); Land Productivity (1,000/ha); Capital productivity (rubles/rubles). Data of the agricultural outputs and capital (Fixed Asset) deflated by using the agricultural producer price index and agricultural price index respectively.

In order to understand the efficiency of agricultural sector in each region, we use Data Envelopment Analysis (Charnes et al. [3]; Bankers et al. [1]) to calculate the efficiency of 77 regions in Russian Federation from 2001-2005 to 2011-2015 as shown in Table 6 (See Appendix). It is clear that the efficiency of agriculture in Far East FD is the highest and the main reason for this is due to a high technical efficiency, but the efficiency of agriculture in the Siberian FD is moderate in period 1. However, in period 2, the ranking of Far East FD as the highest efficiency replaced by Central Federal District and dropped to 6th place. Efficiency in the Siberian FD declined from number 3 to number 5 in period 2.

Table 6. Results of DEA (Output-oriented, VRS model) analysis (Federal District)

	Efficiency					
	Period1 (2001-2005)			Period 2 (2011-2015)		
	CRSTE	VRSTE	SCALE	CRSTE	VRSTE	SCALE
Central FD	0.687(7)	0.729(6)	0.946(5)	0.678(1)	0.697(3)	0.975(2)
North-West FD	0.695(6)	0.708(7)	0.982(1)	0.523(7)	0.527(7)	0.991(1)
Southern FD	0.699(5)	0.767(5)	0.919(7)	0.639(3)	0.785(1)	0.825 (7)
Volga FD	0.722(4)	0.788(2)	0.920(6)	0.603(4)	0.706(2)	0.865(6)
Ural FD	0.745(2)	0.772(4)	0.963(3)	0.671(2)	0.691(4)	0.972(3)
Siberian FD	0.744(3)	0.772(3)	0.964(2)	0.595(5)	0.641(6)	0.926(4)
Far East FD	0.773(1)	0.813(1)	0.952(4)	0.585(6)	0.673(5)	0.894(5)
Average	0.718	0.762	0.946	0.616	0.681	0.916

Notes: The rank of the score of each district indicated in the form of parentheses. Simple average scores calculated in each federal district used the results of regions (77 regions in total). The input variables of data for the analysis are agricultural labor, agricultural land and agricultural capital. The output variable of data is agricultural output.

4.1.3 Share of output by type of agricultural producers

Table 7 shows the share of output by type of agricultural producers in federal districts. The ratio of Agricultural Enterprises (hereafter, AEs) and Family farms (hereafter, FFs) rises while the ratio of Household Plots (hereafter HPs) declines from the period 1 to the period 2. With regard to HPs, although the share of output is highest in all areas except Northwest FD in the period 1, it has declined in all federal districts, and the ratio of AEs in the Central FD and Volga FD have become highest in the periods 2.

However, the ratio of AEs in Siberian FD is second lowest in the period 1 and period 2, and the ratio has not changed during these periods. This means that the importance of AEs for Russian agriculture has increased from the period 1 to period 2 as a whole. Furthermore, around year 2000, a different type of AEs so called “new operators” (a particular class of these new operators is the very large agroholdings) emerged (Rada et al. [15]), and it has given great impact on the agricultural sector.

Table 7 Share of output by type of agricultural producers (%)

	Period1 (2001-2005)			Period 2 (2011-2015)		
	Agricultural Enterprises (AEs)	Household Plots (HPs)	Family Farms (FFs)	Agricultural Enterprises (AEs)	Household Plots (HPs)	Family Farms (FFs)
Central FD	45.7	51.7	2.6	56.6	37.7	5.7
North-West FD	50.5	46.8	2.6	59.9	36.3	3.8
Southern FD	30.8	59.1	10.1	30.1	49.2	20.7
Volga FD	43.0	53.5	3.5	46.5	46.0	7.5
Ural FD	42.9	53.4	3.7	46.2	46.6	7.2
Siberian FD	33.3	61.8	4.9	33.8	56.8	9.3
Far East FD	35.6	56.1	8.4	36.4	48.5	15.1
Average	40.2	54.8	5.0	44.6	45.5	9.9

Source: Calculated from the EMISS (<https://www.fedstat.ru/>)

Figure 2 shows that AEs are concentrated in the Southern FD, the Ural FD, and some regions of Central FD. The regions (500 or more companies) with the largest number of AHs (500 and more firms) is located in three regions (Krasnodar, Rostov and Stravropol) within the Southern FD and one region (Moscow) in the Central FD. The regions with the second

large number of AEs (260 to 499 firms) located in the eight regions (Chuvash, Kirov, Nizhny Novgorod, Orenburg, Samara, Saratov, Tatarstan and Udmurt).



Note: Red color (less than 20), Pink color (21-49 firms), Orange color (50-139 firms), Yellow color (140-259 firms), Light green color (260-499 firms), Green color (500 and more firms)

Source: Russian Agriculture Census, 2016

Figure 2 The Number of Agricultural Enterprises (including Agroholdings) in the Russian Federation (2016)

4.2 Role of Agroholdings (AHs) in the country agricultural performance

There are three major types of agricultural organizations (agricultural enterprises, households plots, family farms)⁴⁶¹ in Russian agricultural production. According to Russian Agriculture Census (2016), the category of “**agricultural enterprises**” includes economic partnerships, societies, limited liability companies, state and non-state, joint-stock companies, production cooperatives, unitary enterprises, subsidiary farms of non-agricultural organizations and institutions. Among the agricultural enterprises, a new type of organization called agricultural holdings have emerged dramatically since 2000s. **Agroholding** is a group of legally independent farming, processing and service organizations, reference (highest) statutory capital packets which belong to the same person (the parent company, the owner), the manager (organized by the Office) Group (Uzun [19]).

As regarding to the differences in the location of agricultural holdings (AHs), Table 8 showed the concentrated location of AHs in Federal Districts of Russia. Furthermore, Table 9 summarizes the profitability and productivity by the types of agricultural enterprises. First, non-state agricultural holdings have higher profitability and productivity than that of state. However, among the state agricultural holdings, the profitability of each type is in the order of Federal >Regional>Municipal; the productivity of labor is in the order of Non-State>Regional>Federal>Municipal; and the productivity of land is in the order of Non State>Regional>Federal>Municipal. This means that non-state agricultural holdings generally have higher profitability and productivity than state holdings, while federal holdings have lower productivity but a higher profitability than regional holdings. The reason that municipal holdings have the lowest productivity and profitability among state agricultural holdings due to its inefficient management.

Table 8 Number of Agroholdings in Russian Federation

	State AHs		Non-State AHs		Club Agro-300 ⁴⁶²	
	Regional State	Municipal State	Number	(%)	Number	(%)
	Number	(%)				
Central FD	1	7	32	(33.7)	56	(22.0)
North-west FD	1	1	9	(9.5)	17	(6.7)
Southern FD	6	4	18	(18.9)	96	(37.8)
Volga FD	6	8	20	(21.1)	39	(15.4)
Ural FD	1	0	4	(4.2)	17	(6.7)

461 The other two types of agricultural production are household plots and family farms. Household plots include personal subsidiary and other individual farms of citizens in rural and urban settlements, as well as farms of citizens who have land plots in horticultural, gardening and dacha non-profit associations. Personal subsidiary plots are a form of non-entrepreneurial activity for the production and processing of agricultural products carried out by the individual labor of a citizen and members of his family in order to meet personal needs on the land plot granted or acquired for the maintenance of a personal subsidiary farm. Land use of farms can consist of personal and field sites. The Family farms is an association of citizens related to relatives and (or) property having common property and jointly carrying out production and other economic activities (production, processing, storage, transportation and sale of agricultural products) on the basis of their personal participation. An individual entrepreneur for agricultural activities is a citizen (an individual) engaged in entrepreneurial activity without the formation of a legal entity from the moment of its state registration.

462 The Agro-300 club has farms from 56 regions of the Russian Federation. Regions with the most favorable conditions for agriculture are represented in the Club by the largest number of agricultural organizations

Siberian FD	3	(15.0)	8	(28.6)	12	(12.6)	29	(11.4)
Far East FD	2	(10.0)	0	(0.0)	0	(0.0)	0	(0.0)
Total	20	(100.0)	28	(100.0)	95	(100.0)	254	(100.0)

Note: Agricultural enterprises that agricultural land is 0(zero) are excluded from the calculation.

Table 9 Agricultural Production and Profitability by Type of the Agricultural Holdings (2004-06)

		Agricultural Holdings (AHs)				Non-State AHs
		State AHs				
		Federal AHs	State	Regional State AHs	Municipal State AHs	
Profitability	(%: profit/sales)	4.1		-5.2	-15.4	18.0
Labor Productivity	(1,000 rubles/person)	192.8		244.3	63.5	391.1
Land Productivity	(thousand rubles/ha)	6.1		22.0	3.0	38.3

Note: Agricultural enterprises that agricultural land is 0 (zero) are excluded from the calculation.

Source: Calculation based on Nikonova [13]

Furthermore, looking at the profitability of agricultural holdings at regional level as shown by Table 10, non-state holdings have a higher profitability and a higher productivity than state agricultural holdings almost in all regions. On the other hand, profitability of municipal holdings in all regions have a minus number, especially the situation is bad in Siberian FD.

Table 10 Regional Difference of Profitability by Type of the Agricultural Holdings (2004-06)

	State AHs		Non-State AHs
	Regional State AHs	Municipal State AHs	
Central FD	18.4	-12.5	17.0
North-west FD	10.4	-4.0	20.8
Southern FD	-17.8	-4.5	24.7
Volga FD	11.5	-2.6	14.0
Ural FD	16.9	-	19.4
Siberian FD	2.1	-37.6	15.3
Far Eastern FD	-58.8	-	-
Average of FDs	-2.5	-12.2	18.5

Note: Agricultural enterprises that agricultural land is 0 (zero) are excluded from the calculation.

Source: Calculation based on Nikonova [13]

The agroholdings acquire existing corporate farms and vertically integrate them, combining primary production, processing, distribution, and sometimes retail which have some similarity as the dragon-head agro-food enterprises in China (Kiminami and Kiminami [8]). However, the lack of empirical evidence from nationally representative farm-level or farm-type data raise the question whether agroholdings represent the best production practice in Russian agriculture.

4.3 Hypotheses verification: Structural Equation Model (SEM)

After having examined the situation about rural and agriculture development and human resource development in Russian Federation since 2000s, we introduce the Structural Equation Model (SEM) to verify our two hypotheses. Figure 3 shows the analytical framework for the verification and the method of Maximum likelihood is applied. The number of sample is 77 (regions).

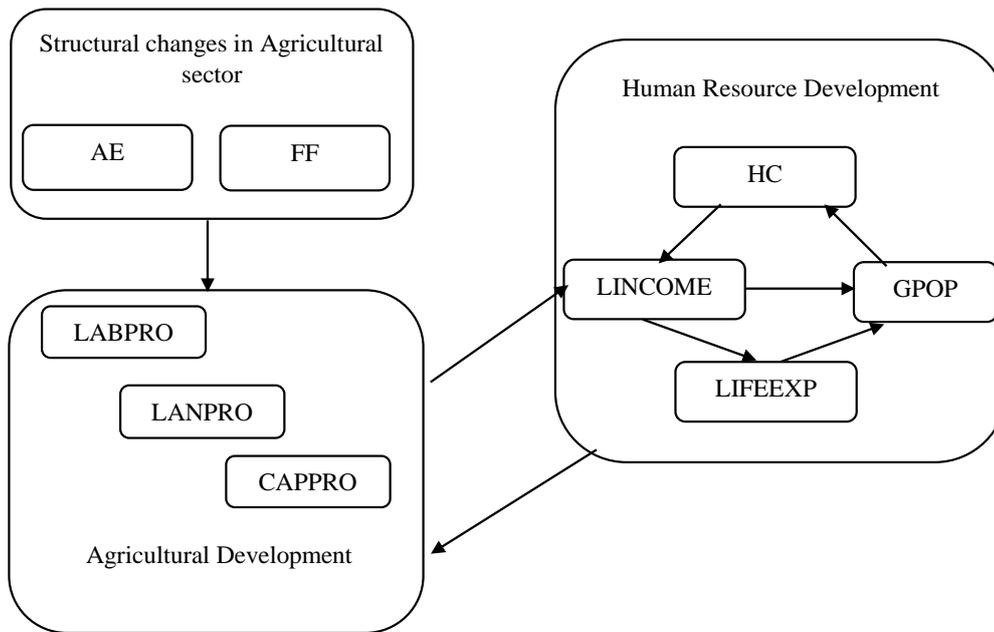


Figure 3. Analytical framework for hypothesis verification

We use the indicators for Agricultural Productivity (labor, land, capital) in each region calculated in the section 4.1. As for the structure of agriculture, we will use the ratio of production value by agricultural enterprise (AE) and family farms (FF). Therefore, the benchmark of path coefficient about AE and FF is the ratio of household plots. Finally, as for the variables of human resource development, we use the number of graduation specialists in higher education divided by number of population (HC), life expectancy (years), and natural logarithm of average income (LINCOME). In addition, we use annual growth rate of population (GPOP) as one of the indicators for sustainability. Table 11 showed the explanation of variables used for the SEM analysis.

Table 11 Explanation of Variables

Variables		Explanation	Period 1		Period 2	
			Mean	S.D.	Mean	S.D.
Agricultural Development (Productivity)	LABPRO	Labor productivity	94.539	24.432	142.725	61.170
	LANPRO	Land productivity	6.022	5.490	6.128	5.625
	CAPPRO	Capital productivity	0.936	0.264	1.401	0.624
Structure of Agriculture	AE	Ratio of production value by agricultural enterprises (%)	40.182	14.706	44.568	18.400
	FF	Ratio of production value by family farms (%)	5.036	4.395	9.898	8.501
Human Resource Development	HC	Graduation specialists in higher education divided by number of population	0.502	0.161	0.795	0.234
	LIFEXP	Life expectancy (years)	64.594	2.790	69.602	2.388
	LINCOME	Natural logarithm of average income (rubles)	8.307	0.360	9.930	0.266
GPOP		Annual growth rate of population (%)	-0.011	0.017	-0.001	0.005

Table 12 summarized the path coefficient among these indicators from SEM analysis both for the period 1 and period 2, although the sample size (77 regions) is relatively small (RMSEA >0.150, CFI <0.750). Figure 4 and Figure 5 are the path diagram obtained from the results of each period.

First, land productivity (LANPRO) had a positive impact on income (LINCOME) in both periods and started to have a positive impact on life expectancy (LIFEXP) in the period 2010-2015. However, graduation specialists in higher education divided by number of population (HC) had a negative relationship with land productivity in the two periods but a weak positive impact on capital productivity in period 1.

Secondly, as for the relationships among the indicators of human resource development, no relationships could be found between human capital (HC) and other indicators such as income (LINCOME), life expectancy (LIFEEXP) and number of population (GPOP), however life expectancy (LIFEEXP) had been positive to the number of population (GPOP) in the two periods.

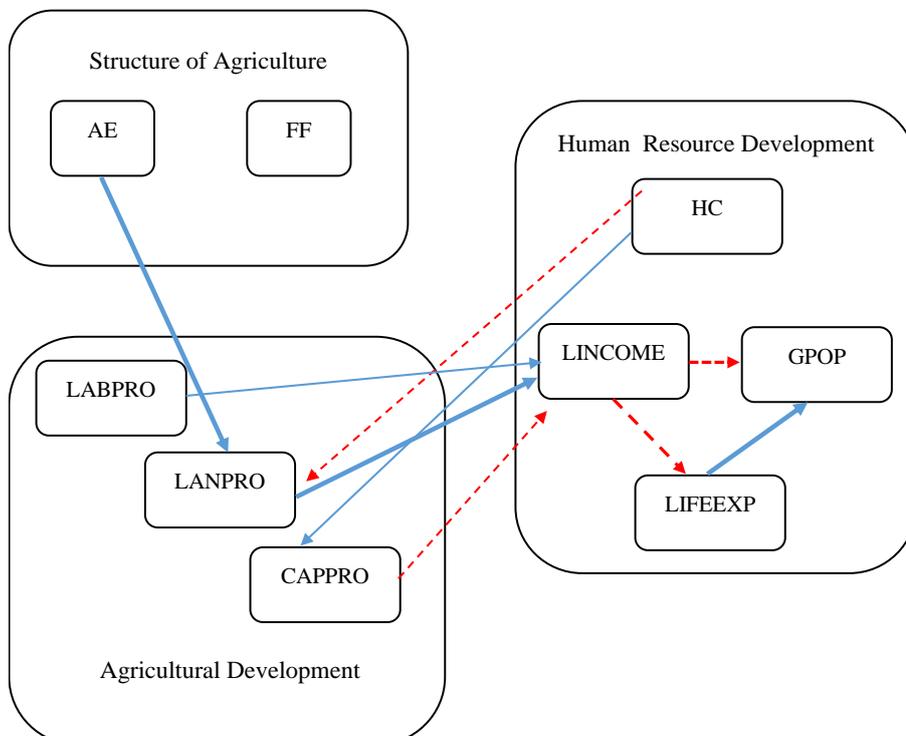
On the other hand, income had negative impact not only on life expectancy in periods 1 and 2, but also on population in period 1. Therefore, our hypothesis H1 is limitedly verified that “There is strong relationship between agricultural development and human resource development in Russia since 2000s” because the lack of skilled personnel in agricultural sector and a high level of alcoholism in rural areas had negative impacts not only on agricultural development but also on rural development.

Thirdly, there was a strong positive relationship between agriculture enterprises (AE) and land productivity (LANPRO) in both periods. AE had positive impact on land productivity that contributed to the increase in income in period 1 and started to have positive impact on labor productivity in period 2 as well. Furthermore, a positive relationship between family farm (FF) and capital productivity (CAPPRO) was found in the period 2010-2015. This means that agricultural development in Russia since 2010 has been contributed not only by agriculture enterprises through the improvements both in land and labor productivity but also by family farm through the improvement in capital productivity under the structural changes in agricultural sector. Therefore, we verified our hypothesis (H2) as “Structural changes in agricultural sector have impacts on agricultural development”.

Table 12 Results of SEM Analysis

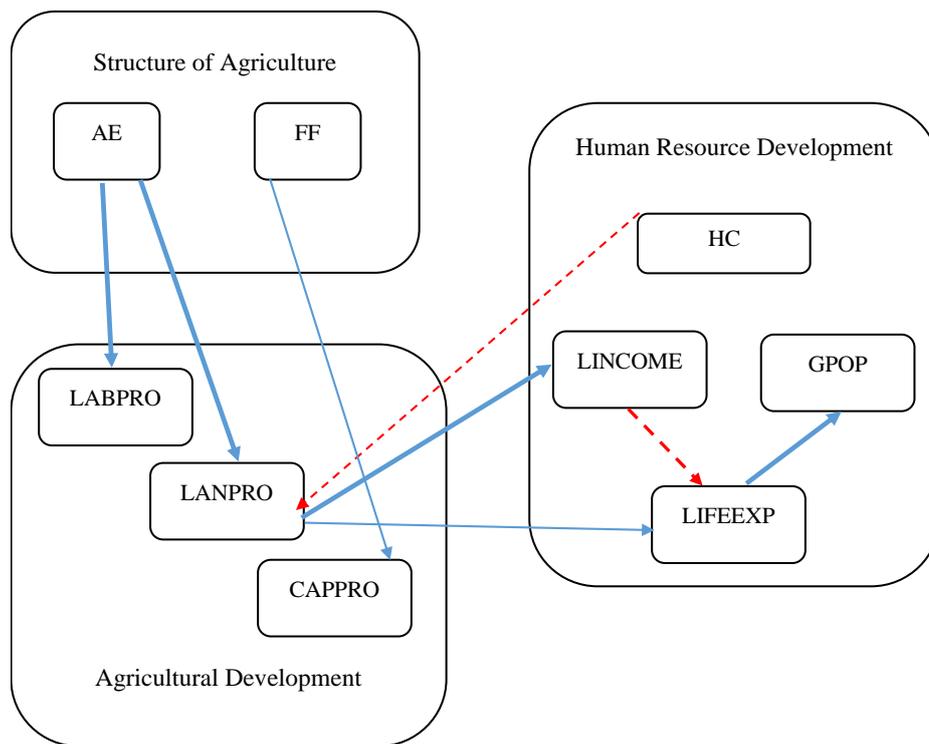
			Hypothesis (predicted sign)	Period 1(2001-2005)		Period 2 (2010/11 – 2015)	
				Standardized coefficient	P>|z|	Standardized coefficient	P>|z|
LABPRO	<	AE	2(+)	0.204	0.112	0.441	0.001 ***
	<	FF	2(+)	0.076	0.553	0.156	0.249
	<	HR	1(+)	0.090	0.426	0.105	0.317
LANPRO	<	AE	2(+)	0.465	0.000 ***	0.605	0.000 ***
	<	FF	2(+)	0.033	0.762	0.143	0.232
	<	HR	2(+)	-0.229	0.019 **	-0.217	0.020 **
CAPPRO	<	AE	2(+)	-0.082	0.519	-0.097	0.476
	<	FF	2(+)	0.097	0.442	0.249	0.067 *
	<	HR	1(+)	0.192	0.084 *	0.162	0.127
LINCOME	<	LABPRO	1(+)	0.245	0.015 **	-0.103	0.345
	<	LANPRO	1(+)	0.366	0.000 ***	0.389	0.000 ***
	<	CAPPRO	1(+)	-0.201	0.048 **	-0.149	0.169
	<	HR	1(+)	0.143	0.178	0.037	0.738
LIFEEXP	<	LABPRO	1(+)	0.093	0.400	0.149	0.155
	<	LANPRO	1(+)	0.134	0.242	0.230	0.043 **
	<	CAPPRO	1(+)	0.034	0.757	-0.047	0.652
	<	LINCOME	1(+)	-0.382	0.002 ***	-0.391	0.000 ***
GPOP	<	LINCOME	1&2(+)	-0.289	0.002 ***	0.059	0.579
	<	LIFEEXP	1&2(+)	0.448	0.000 ***	0.423	0.000 ***
Goodness of Fit		RMSEA		0.194		0.192	
		AIC		1887.104		1874.804	
		CFI		0.665		0.655	

Note: “*” (10%), “**” (5%) and “***” (1%) indicate the statistically significance.



Notes:
 ———> Solid thick blue line expresses a Strong Positive effect (***, 1% statistically significant);
 ———> Thick blue line expresses a Positive effect (** and *, 5% and 10% statistically significant);
 - - - -> Dashed thick red line expresses a Strong Negative effect (***, 1% statistically significant);
 - - - -> Dashed red line expresses a Negative effect (** and *, 5% and 10% statistically significant);

Figure 4 Relations between variables in Period 1



Notes: — Solid thick blue line expresses a Strong Positive effect (***, 1% statistically significant);
 — Thick blue line expresses a Positive effect (** and *, 5% and 10% statistically significant);
 - - Dashed thick red line expresses a Strong Negative effect (***, 1% statistically significant);
 - - - Dashed red line expresses a Negative effect (** and *, 5% and 10% statistically significant);

Figure 5 Relations between variables in Period 2

5. CONCLUSIONS

Based on the above-mentioned analytical results, we obtained the following conclusions:

First, agricultural development in Russia has made a significant progress since 2000s, it has not only improved the nation's food security but also improved rural development, especially since 2010, a positive relationship between agricultural development and human resource development has increased which have positive impact on rural development as well (Hypothesis 1). However, rural and agricultural development in Russia has been uneven across regions; some regions such as Siberian FD has left behind dynamic changes.

Secondly, structural changes in agricultural sector have impacts not only on the agricultural development but also on rural development (Hypothesis 2). Agricultural Enterprises (AEs) remain important role in the country's agriculture performance among three agricultural producers but is changing along with the country's social-economic situation and is uneven across region. For instance, the ratio of AEs in Siberian Federal District is second lowest in the period 2001-2005 and period 2011-2015, and the ratio has not changed during these periods. Additionally, among the agriculture enterprises, the role of agricultural holdings in the country's agricultural performance is extremely important but its development is uneven across regions and even within some regions such as in the Siberian FD. Furthermore, non-state holdings are more profitable and more productive than state holdings and municipal holdings are least profitable and unproductive among agroholdings.

Policy implications drawn from the research for both central and regional government indicated human resource development should be paid more attention in Russia when considering food security in a long-term perspective, especially the impacts of structural changes in agriculture sector on the human resource development and rural development needs careful analysis. This will be our next research agenda.

REFERENCES

- Bankers, R.D., Charnes, A. and Cooper, W.W. (1984) "Some Models for Estimating Technical Efficiencies in Data Envelopment Analysis" *Management Science*, 30(9):1078-1092.
- Brainerd, E. and Culter D.M. (2005) "Autopsy on an Empire: Understanding Mortality in Russia and the Former Soviet Union" *Journal of Economic Perspectives*, 19(1):107-130.
- Charnes, A., Cooper, W.W. and Rhode, E. (1978) "Measuring the efficiency of decision making units" *European Journal of Operational Research*, 2(6):429-444.
- Cook, L. (2015) *Constraints on Universal Health Care in the Russian Federation: Inequality, Informality and the Failures of mandatory Health Insurance Reforms*, UNRISD Working Paper 2015-5.
- Erokhin V., Heijman W. and Ivolga A. (2014) "Sustainable Rural Development in Russia through Diversification: The Case of the Stavropol region" *Visegrad Journal on Bioeconomy and Sustainable Development*, 3(1):20-25.
- FAO (2014) *The State of Food and Agriculture: Innovation in Family Farming*, FAO (<http://www.fao.org/3/a-i4040e.pdf>)

- Filatova, L. Abankina, I., Abakina, T. and Nikolayenko, E. (2012) "Education Development Trend in Russia" *Journal of US-China Public Administration*, Vol.9(10), pp.1198-1214.
- Kiminami, L. and Kiminami, A. (2016) "Agricultural Industry Clusters in China" In Kiminami, L. and Nakamura, T. (eds) *Food Security and Industrial Clustering in Northeast Asia (New Frontier in Regional Science: Asian Perspectives 6)*, Springer, pp.129-139.
- Kiminami, L. and Kiminami, A. (2017) "Rural and Agriculture Development in Regional Science" In Shibusawa, H., Sakurai, K., Mizunoya, T. and Uchida, S. et al. (eds.), *Socioeconomic Environmental Policies and Evaluations in Regional Science (New Frontiers in Regional Science: Asian Perspectives 24)*, Springer, pp.537-555.
- Kurtsev, I. V. (2013) "Agricultural Aspect of Siberia's Socioeconomic Development" *Regional Research of Russia*, 3(3):258-264
- Mellor, J.W. (2017) "Ch.6 The Farm, the Farmer, and Labor Supply" *Agricultural Development and Economic Transformation: Promoting Growth with Poverty Reduction*, Palgrave Macmillan, pp.75-99.
- Mellor, J.W. (2017) "Ch.10 Rural Education and Health" *Agricultural Development and Economic Transformation: Promoting Growth with Poverty Reduction*, Palgrave Macmillan, pp.123-133.
- Nikonova, A.A. (2008) Ratings of large and medium-sized agricultural organizations of Russia for 2004-2006 (10th ed.).
- Perlman F. and Bobak, M. (2008) "Socioeconomic and Behavioural Determinants of Mortality in Posttransition Russia: A Prospective Population Study" *Applied Epidemiology*, 18(2): 92-100.
- Rada, N., Liefert, W. and Liefert, O. (2017) "Productivity Growth and the Revival of Russian Agriculture", ERR-228, USDA-ERS, April 2017.
- Shultz T.W. (1961) "Investment in Human Capital" *The American Economic Review*, 51:1-17
- UNDP (2016) *Human Development Report 2016*, UNDP.
- UNDP Russia (2007) *National Human Development Report, Russian Federation 2006/2007 Russia's Regions: Goals, Challenges, Achievements*, UNDP.
- Uzun, V.Y., Shagaida, N.I. and Saraykin V.A. (2012) *Agroholdings of Russia and Their Role in the Production of Grain*. FAO Regional Office for Europe and Central Asia. *Studies on the Policy of Transition of Agriculture*. 2012-2
- Wegren, S.K. (2014) "Human Capital and Russia's Agricultural Future" *Post-Communist Economies* 26(4):537-554.
- Wegren S.K., Nikulin M.A., Trotsuk, I. (2017) "The Russian Variant of Food Security", *Problems of Post-Communism*, 64(1):47-62.
- World Bank (2008) *World Development Report 2008: agriculture for development*, The World Bank, Washington.

APPENDIX. EXPLANATION OF DATA FOR DEA ANALYSIS

The data used for the DEA analysis is collected from the official statistics "Regions of Russia" (each year version). Coverage years for the analysis is from 2001 to 2005 and 2011 to 2015. If there is a change in the regional classification due to merger etc. during these period, Data of the past year are also revised according to the regional classification after the merger. In addition, we analyzed 77 regions where all variables are available excluding regions with missing data.

Production activity of Russian agriculture fluctuates year by year, and the production level can change greatly due to factors such as weather conditions every year. In this analysis, in order to grasp structural differences and changes in the relative efficiency of the agricultural sector at the regional level, the five-year average from 2001 to 2005, and from 2011 to 2015 will be used.

Labor, land and capital were used for input factors of the agricultural sector. In order to eliminate the influence of price fluctuation, the fixed asset value is deflated using the agricultural input price index as a proxy variable of the capital of the input factor. Also, the agricultural output value is also deflated using the agricultural producer price index.

Output-oriented model with VRS (Various Return to Scale) was applied to the analysis. The relationship of three efficiency can be expressed as follows: $CRSTE = VRSTE \times SCALE$ where CRSTE indicates the overall technical efficiency, VRSTE indicates pure-technical efficiency and SCALE indicates scale efficiency (Banker et al. [1]). Here, the value of each efficiency takes 0 to 1.

Efficiency calculated here should be utilized for the analysis with reservation hence technical efficiency depends on the production structures of agriculture.

Labor: The definition of labor is the annual average number of employee in agriculture, forestry and fishery industries (1,000 people).

Land: The definition of agricultural land here is "Agricultural land - land that is systematically used to produce agricultural products." These include arable land, fallow land, perennial plantations, hayfields and pastures. (Regions of Russia, 2016, p. 567)". Data of four years from 2006 to 2009 are not reported in the statistics.

Capital: The definitions of fixed assets (million rubles) owned by profit organization in agriculture, hunting and forestry, here refer to production assets that are used repeatedly or permanently over a period of one year or more and are assets for leasing to other organizations. It includes buildings, structures, agricultural machinery, transport machines, livestock, perennial plantations and others (Region of Russia, 2016, p. 567). It is calculated by full accounting value.

Output: For output factors, we will use agricultural output (million rubles). Agricultural output is the total value of crop and livestock by all types of agricultural producers (Region of Russia, 2016, p. 802).

<Descriptive Statistics>

Table A1 summarizes descriptive statistics of the data. As the overall mean average, Inputs of Capital and Land, and Output increase from the period 1 to period 2. Looking at the coefficient of variation (average / standard deviation), the variation in the size of the Land between the regions decreased in the same period, while the variation in Output, and Input of Labor and Capital has become large.

Table A1. Descriptive Statistics

Units: Million Rubles, 1,000 people, 1,000ha

	Period1 (2001-2005)				Period2 (2011-2015)			
	Output	Labor	Land	Capital	Output	Labor	Land	Capital
Mean	9,482	99	2,509	9,937	12,405	83	2,847	9,496
S.D.	8,554	82	2,455	8,343	11,721	71	2,584	9,254
Coef. of Var.	0.90	0.83	0.98	0.84	0.94	0.85	0.91	0.97
Min.	159	3	8	282	211	2	9	209
Max.	43,922	445	10,517	49,725	50,143	381	11,007	48,624

SS10.2. Rural Transformation

1231 DYNAMICS OF INDIAN RURAL TRANSFORMATION – A CASE OF WEST BENGAL

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1 INTRODUCTION

India had 5.94 lakh inhabited rural areas (villages) in 2001 and it was supposed to be figured out to 6.02 lakh in 2011, out of these a number of 2,691 rural inhabited villages were transformed to urban areas in 2011 which had a population of 30.84 million. In 2001 only 145 villages were upgraded or merged with statutory towns. National level only 3.57 percent of rural population has been transformed to urban, however, state and union territory level it varies too much. State level West Bengal stands first with 498 new census towns have been added in 2011. For the first time since Independence of India an absolute increase of 10 million people in urban areas than rural areas has been seen in the year 2011 (Census of India, 2011).

The evidence of India's rural transformation was based largely on the official data on employment released by the National Sample Survey Office (NSSO). The employment survey conducted by the NSSO showed that between 2004-05 and 2011-12, a huge section of India's workforce, 33.3 million to be precise, left farm jobs to take up non-farm occupations, primarily in the construction sector (Bhattacharya, 2016). In India several profound transformations in the nature of social relations in rural areas took place in the post-Independence period, especially in those regions that underwent the Green Revolution. These included an increase in the use of agricultural labour as cultivation became more demanding; a shift from payment in kind (grain) to payment in cash; a loosening of traditional bonds or hereditary relationships between farmers or landowners and agricultural workers (known as bonded labour); and the rise of a class of free wage laborers took place (Majumdar, 2016).

Rural India is going through or passing through a widespread transformation or change. The transformation ranges or the extent of the transformation varies from the growth rate of population (1.7% during 1991-2001 to 1.2% during 2001-2011), agrarian distress and huge number of farmers' suicide, increasing rural to urban migration, declining growth rate of agricultural out-put, social insecurity and many more as the negative indicators of transformation (Majumdar, 2016).

A brief study national level rural transformation has been carried out with the factors of percentage of rural population transformed, share of non-farm sector in GDP (Gross Domestic Product) and growth of agriculture sector state level. The analysis draws three observations that the proximity of large cities, good accessibility or location along highways and low production of agriculture have positive impact on the transformation of rural areas. The issue therefore ultimately converges towards finding the transformational path of a rural settlement and examines how far the above impetus has been responsible for this transformation. The present study is an endeavour to investigate the extent of such transformation in India and particularly in two districts of the state of West Bengal.

2 RESEARCH QUESTIONS

The study has been attempted to find out the answers of the following research questions: - a) which factors are responsible for changes in occupational structure and economic diversification, which in turn led to rural transformation in India?, and b) whether proximity of large city has an impact on the socio-economic transformation of the rural settlements?

3. CONCEPT

3.1 Rural Transformation

Rural transformation (RT) involves rising agricultural productivity, increasing commercialization and marketable surpluses, and diversification of production patterns and livelihoods. It also involves expanded decent off-farm employment and entrepreneurial opportunities, better rural coverage and access to services and infrastructure (IFAD, 2016).

Rural transformation is a process of comprehensive societal change whereby rural societies diversify their economies and reduce their reliance on agriculture and become dependent on distant places to trade and acquire goods, services, and ideas and become culturally more similar to large urban agglomerations. Rural transformation is the reorganization of society in a given space, rather than about a space that empties as people and economic activity move away. It is embedded within a wider process of structural change that involves the whole of a country and that sees a decline in the relative weight of agriculture in the overall economy, a corresponding increase in industry and services, migration of rural people to nearby urban areas. While regional and global forces drive this transformation, they are mediated by localized social structures and institutional frameworks. However, rural transformation has different outcomes in terms of economic growth, social inclusion, and environmental sustainability both at inter country and intra country level (Berdegue et al., 2013).

Kumar et al. (2014) find that there are multiple dimensions of rural transformation. The diversity of production and economic activities of the people results into income flows from diverse sources. The agrarian economy could not satisfy

their aspirations for social and cultural mobility. The surplus they generated from agriculture thus goes into education, urban trade and other non-agricultural activities.

Majumdar (2016) described rural transformation as a proactive, positive as well as dynamic process of changes and development among the rural areas in the context of national social and economic changes. The rural transformation involves the introduction of urban facilities in rural areas, which generates a favorable environment that have a significant proper affect over standard of living condition in terms of qualitative and quantitative characteristic of rural. Rural transformation is usually characterised by changes in civic amenities, female literacy, gender ratio, employment structure, agricultural intensity, crop selection pattern, farm income, labour productivity and major improvements in housing, economy and social conditions resulting from industrialisation and urbanization (Ohlan, 2016).

The Rural Development Report of International Federation of Agriculture Development (2016) aims to shed light on the transformation of rural areas and the wider economy, yielding the following main messages:

- 1) Rural transformation does not happen in isolation, but as part of a broader process of structural transformation shaped by the interlinkages between agriculture, the rural non-farm economy, manufacturing and services.
- 2) While rural transformation may generate both positive and negative effects for rural people, inclusive rural transformation must be made to happen; it will not happen automatically.
- 3) Rapid rural or structural transformation, while necessary, does not automatically lead to a minimization of rural poverty level.
- 4) Rural development strategies for rural transformation are context-specific, but have a similar direction, with high-priority policy reforms, institutional innovations and investments dependent on the speed and inclusiveness of the transformation.

World Bank (2007) categorized the developing countries in three categories i) agriculture based, ii) transforming, and iii) urbanized in the context of contemporary issues such as rural, rural transformation and rural development. It has been found in the World Development Report, 2008 that amongst the developing countries fourteen percent of rural population are dependent on agriculture, seventy seven percent are in the stage of transforming countries including India and nine percent are in urbanized developing countries stage.

3.2 New Towns

In this study 'New Towns' refer to the urban centres which are emerged first time in 2011 census due to transformation of rural areas (villages). These new towns also termed as 'census towns' by Census of India which came into existence as they have fulfilled the census criteria, such as population at least 5,000; density of population 400 per square kilometre and at least 75 percent of male workers engaged in non-agriculture activities.

4. FACTORS RESPONSIBLE FOR CHANGES IN OCCUPATIONAL STRUCTURE AND ECONOMIC DIVERSIFICATION

Berdegue et al. (2013) identified three factors behind rural transformation as - i) diversification of rural economies, ii) progressive globalization of agri-food systems, and iii) urbanization of rural regions. Nathan et al. (2010) list the drivers of rural transformation - as i) infrastructure: roads, electricity, irrigation; ii) technology: green revolution; iii) government policy: support to cereal production; iv) entrepreneurial farmers, v) mobilization for social and gender equality: influencing government allocations through electoral system, vi) migration: commuting, circular, permanent and vii) telecommunications. Gupta (2013) listed 30 indicators under the sub categories of i) demography, ii) social, iii) economic, iv) spatial, v) infrastructure: physical, social, vi) connectivity with town, vii) banking, viii) household assets, ix) administrative/governance.

Mazumdar (2016) observed that the extent of rural transformation can be portrayed in its 'technology', 'economy', 'social institution', 'ideology', 'art' and 'religion' even it may result from one kind of rural society into another depending on the extent of change. He also argued that there are two principle factors behind the rural transformation that are: i) 'Natural factors' like earthquake, floods, famines; and ii) 'Technological factors' like the scientific inventions, new means of communications and transportation, governmental measures, etc.

Based on literature review the following indicators have been used in the present study: a) Contribution of non-farm activities in district gross domestic product (GDP); b) Demographic: literacy rate, sex ratio, household size; c) Economy: change in percentage of non-farm workers; d) Infrastructural: percentage of house electrified, percentage of households with LPG as fuel for cooking, percentage of households having latrine facilities, percentage of households having two wheelers; and e) Behavioural: mobile phone.

5. MATERIALS AND METHODS

This study is based on secondary data collected from Census of India, National Sample Survey Office (NSSO), Agriculture Survey Reports, etc. Two levels of data analysis have been done, firstly state level of India to see the spatial concentration and distribution of rural transformation and secondly, district level of the state of West Bengal.

The evidence of India's rural transformation was based largely on the official data on employment released by the (NSSO). The employment survey conducted by the NSSO showed that between 2004-05 and 2011-12, a huge section of India's

workforce, 33.3 million to be precise, left farm jobs to take up non-farm occupations, primarily in the construction sector (Bhattacharya, 2016).

To understand the dynamics of Indian rural transformation, the following data have been considered: a) Workers employed in farm and non-farm sectors in India; b) Percentage of rural population transformed; c) Share of non-farm sectors in GDP (State/UT level); d) Percentage of rural workers in non-farm activities; and e) Share and growth of agriculture and allied sector in the state GSDP. To find out the rural transformation in case study area of West Bengal, and further detail study of its two districts, the following data have been used: a) Share of non-farm sectors in GDP (district level); b) Change in occupation pattern; c) Demographic data; and d) Household assets

6. ANALYSIS AND FINDINGS

Data from NSSO and Census of India (Table 1) reveal that the share of workers employed in farm sector declined during 2000 - 2011 and it has been increased in non-farm sector, though this change in maximum in NSSO data. This is one of the evidences that change of occupancy has taken place from farm to non-farm sectors. On the other hand the share of rural population to total population has declined from 72.19 percent to 68.84 percent during 2001-2011 (Figure 1).

Table 1: Workers employed in Farm and Non-Farm sectors, India

Categories	NSSO (%)		Census (%)	
	1999-2000	2011-2012	2001	2011
Employed in farm sector	60.30	47.58	58.25	54.60
Employed in non-farm sector	39.70	52.42	41.75	45.40

Source: Estimates based on NSSO (2001 & 2014) and Census of India (2001 & 2011).

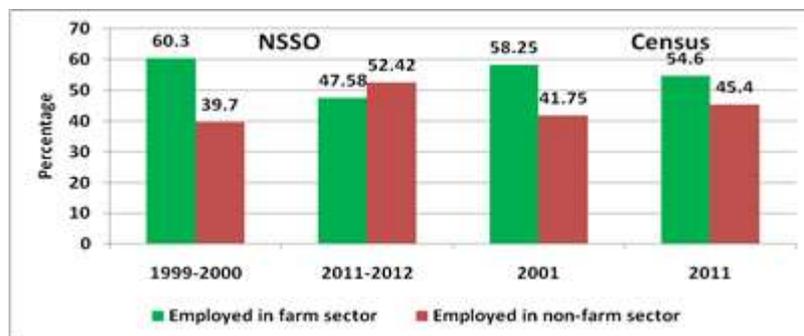
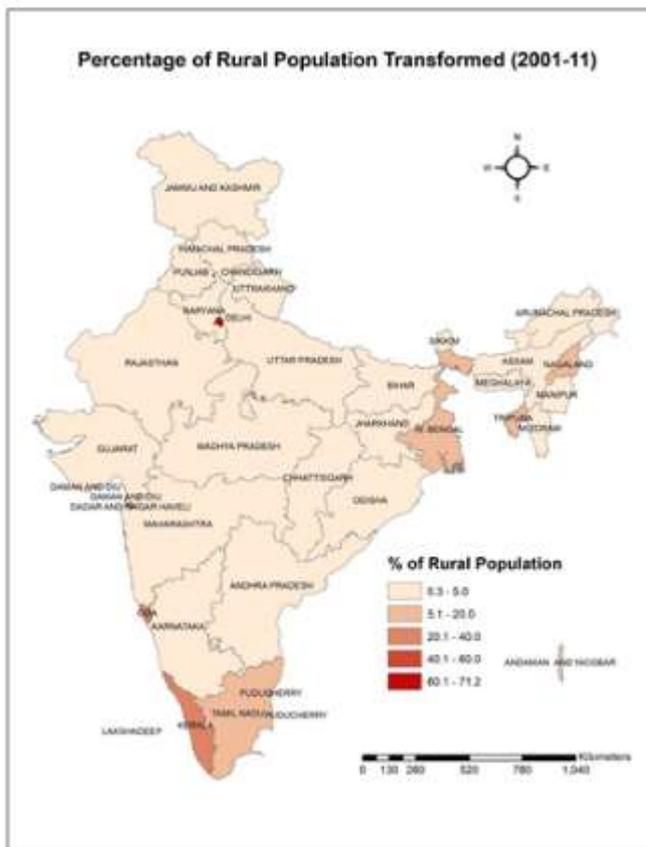


Figure 1: Workers employed in Farm and Non-Farm Sectors (NSSO and Census data)

In rural areas there are two sources of income, namely farm and non-farm activities for the households. Income of the household from non-farm activities may be one of the pull factors that are responsible for shift in occupation from farm to non-farm sector. The developmental factors like modernization of agriculture and its commercialization, increased demand for non-agricultural goods and services, growing literacy, urbanisation, have tried to pull the labour force away from farm sector to well-paid non-farm sector. At the same time, distress factors like poverty; unemployment, underemployment and natural calamities like drought have tried to push the rural workforce away from the farm sector to various nonfarm activities to supplement their income (Sinha, 2007).



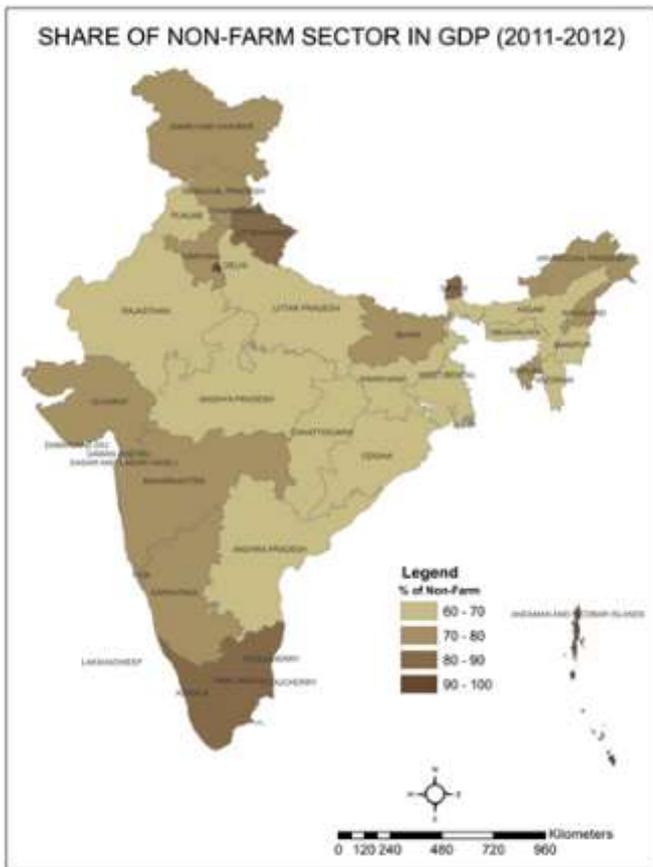
Map 1: Percentage of Rural Population Transformed during 2001-11 (state level)

6.1 Rural Transformation

An attempt has been made to find out State/UT level the percentage of rural population transformed to urban. National level 3.57 percent of rural population has been transformed to urban in character during 2001-2011. State/UT level data analysis has shown that this transformation was a maximum in case of NCT of Delhi (71.17%), Chandigarh (65.83%), Daman and Diu (65.48%), Lakshadweep (59.78%), Kerala (28.09%), Dadra and Nagar Haveli (25.39%) and Goa (22.77%). In 2011 a number of 2,691 new towns have been added in Indian urban system due to rural transformation. Amongst these 498 new towns (18.51% of 2,691) were added in West Bengal, followed by 320 in Kerala, 247 in Tamil Nadu, 214 in Uttar Pradesh, 157 in Maharashtra, 121 in Andhra Pradesh, and 104 in Gujarat (Annex I). A graphical presentation of these data has been presented in Map 1.

6.2 Non-farm Sector in GDP

The share of non-farm (secondary and tertiary sector) sectors in GDP of 2011-12 was a maximum in case of Chandigarh and NCT of Delhi 99 percent each, followed by Puducherry (93%), Andaman and Nicobar Islands (90.50%), Sikkim (85%), Uttarakhand (82.30%), Kerala (82.29%), Tamil Nadu (81.28%), Himachal Pradesh (77.08%), Maharashtra (76.75%), Nagaland (76.63%), Bihar (76.17%), Haryana (75.21%), Jammu and Kashmir (73.93%), Goa (73.50%), West Bengal (68.61%), Uttar Pradesh (67.86%) and Andhra Pradesh (66.96%) (Annex - II and Map 2).

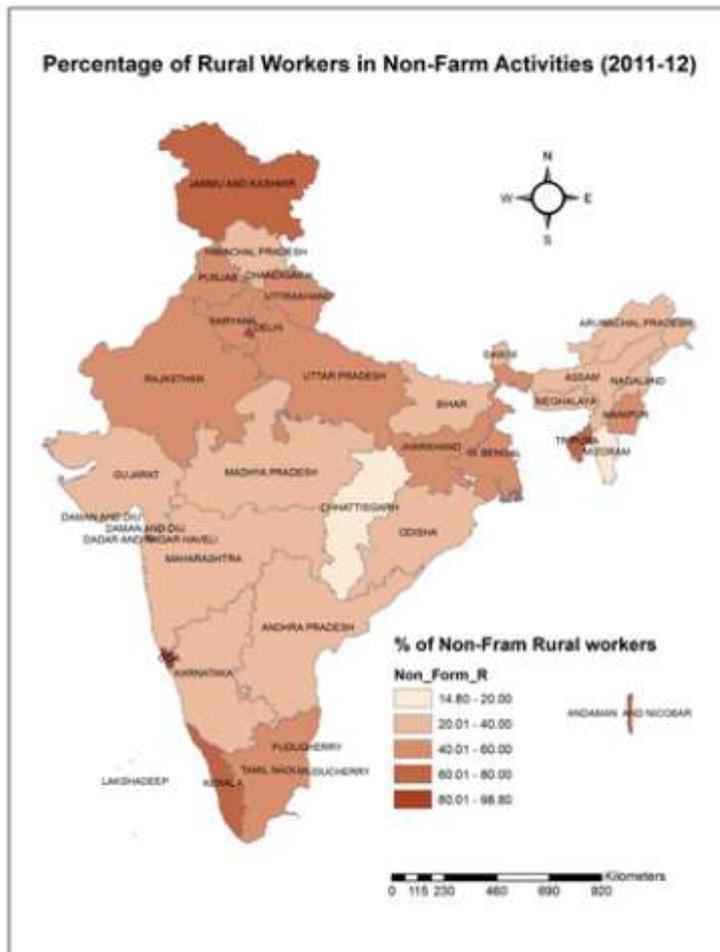


Map 2: Share of Non-Farm Sectors in GDP (2011-12)

There is a positive correlation between the state level number/percentage of rural transformation and the share of non-farm sectors in state GDP (Gross Domestic Product) as well as with percentage of rural non-farm workers.

6.3 Rural Workers in Non-farm Activities

National level the percentage of rural workers in non-farm activities was increased from 25.10 percent to 37.20 percent from 1999-2000 to 2011-2012. The percentage of rural workers engaged in non-farm activities was found maximum in the year 2011-2012 in Chandigarh (98.80%), NCT of Delhi (98%), Goa (95.40%), Lakshwadeep (90.90%), Daman and Diu (90.80%), Kerala (72.10%), Puducherry (69.60%), Dadra and Nagar Haveli (65.40%), Tamil Nadu (46.40%), West Bengal (44.80%), and Uttar Pradesh (40.80%) (Annex – III and Map 3).



Map 3: Percentage of Rural Workers in Non-Farm Activities (2011-12)

6.4 Agriculture in state GSDP

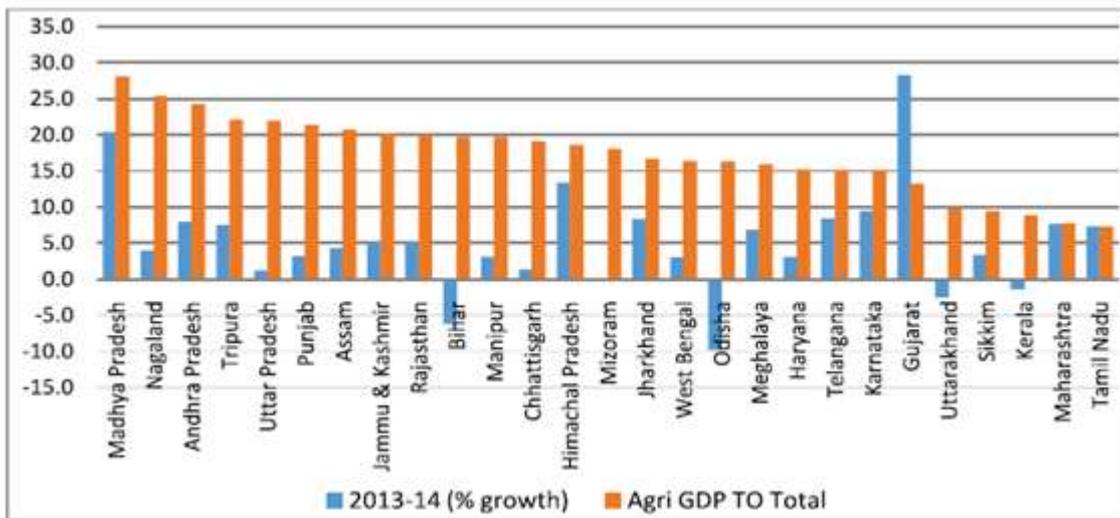
The share and growth of the agriculture and allied sector at the state level presents a very different picture from that at the national level. While at the national level, the agriculture and allied sectors contributed about 14 per cent to the GDP in 2013-14 (at constant 2004-05 prices), a number of states showed a much larger share of agriculture in GSDP. As shown in Table 2, about 13 states earn over 20 percent of their GSDP from agriculture, and only 7 states earn less than 15 per cent of their GSDP ((GoI, 2016).

Inter-state and inter-temporal variability in agricultural growth rate has also been observed. The share of agriculture in GDP was high in case of the state of Madhya Pradesh, Nagaland, Andhra Pradesh, Tripura, Punjab, Assam, Jammu and Kashmir, Rajasthan, Bihar, Manipur, Chhattisgarh and Himachal Pradesh (Figure 2). On the other hand it was low in case of the state of West Bengal, Kerala and Tamil Nadu where the share of non-farm workers was more in GDP during 2011-12 (GoI, 2016). Further it has been observed from Figure 2 that the states where the percentage of growth of agriculture during 2013-14 was more has less transformation of rural population to urban.

Table 2: Share of Agriculture and Allied Activities in State GSDP at constant 2004-05 prices

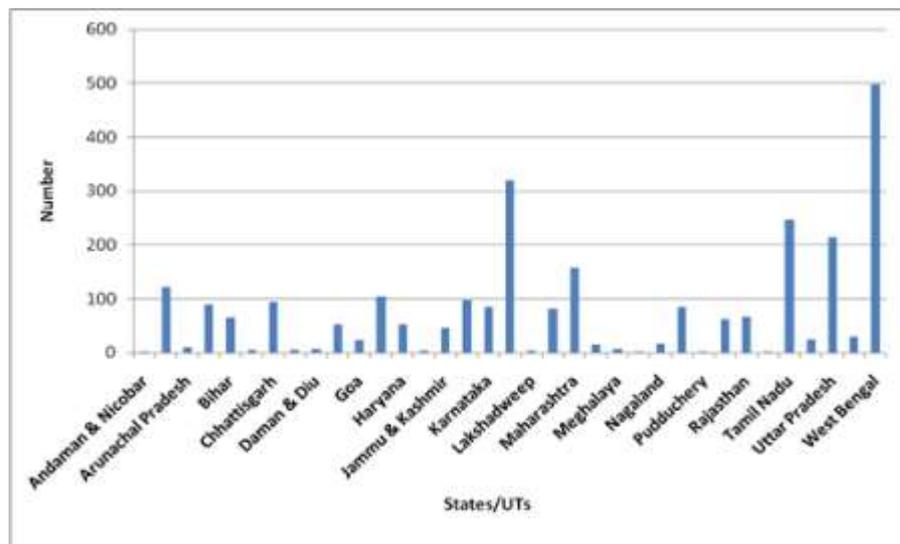
Share of agriculture and allied sector in GSDP	States
30% and above	Arunachal Pradesh
20 - 29 %	Andhra Pradesh, Assam, Bihar, Chhattisgarh, Jammu and Kashmir, Madhya Pradesh, Manipur, Nagaland, Punjab, Rajasthan, Tripura, Uttar Pradesh
15-19%	Haryana, Himachal Pradesh, Jharkhand, Karnataka, Meghalaya, Mizoram, Odisha, Telangana, West Bengal
Less than 15%	Goa, Gujarat, Kerala, Maharashtra, Sikkim, Uttarakhand, Tamil Nadu

Source: Central Statistical Office



Source: Government of India (2016): State of Indian Agriculture 2015-16, Ministry of Agriculture & Farmers Welfare, Department of Agriculture, Cooperation & Farmers Welfare, Directorate of Economics & Statistics, Delhi
 Figure 2: State-wise Growth and Share in Agriculture-GDP (2013-14)

From the above discussion based on percentage of rural population transformation, share of GDP of non-farm sector, percentage of rural workers in non-farm activities, share of agriculture in state GSDP and decline of average growth rate of agriculture reveal that the states where rural transformation is more, the share of agriculture and allied sector is less and vice-versa relationship with tertiary sector and increase in non-farm activities. The analysis also reflects that the proximity of mega or metropolitan city playing a significant role in rural transformation. Beside this the dominance of secondary and tertiary sector and decrease in primary sector workers has also an important role in this transformation. The concentration of newly emerged towns have been seen particularly around, Delhi, Chandigarh, Kolkata, Chennai and Hyderabad.

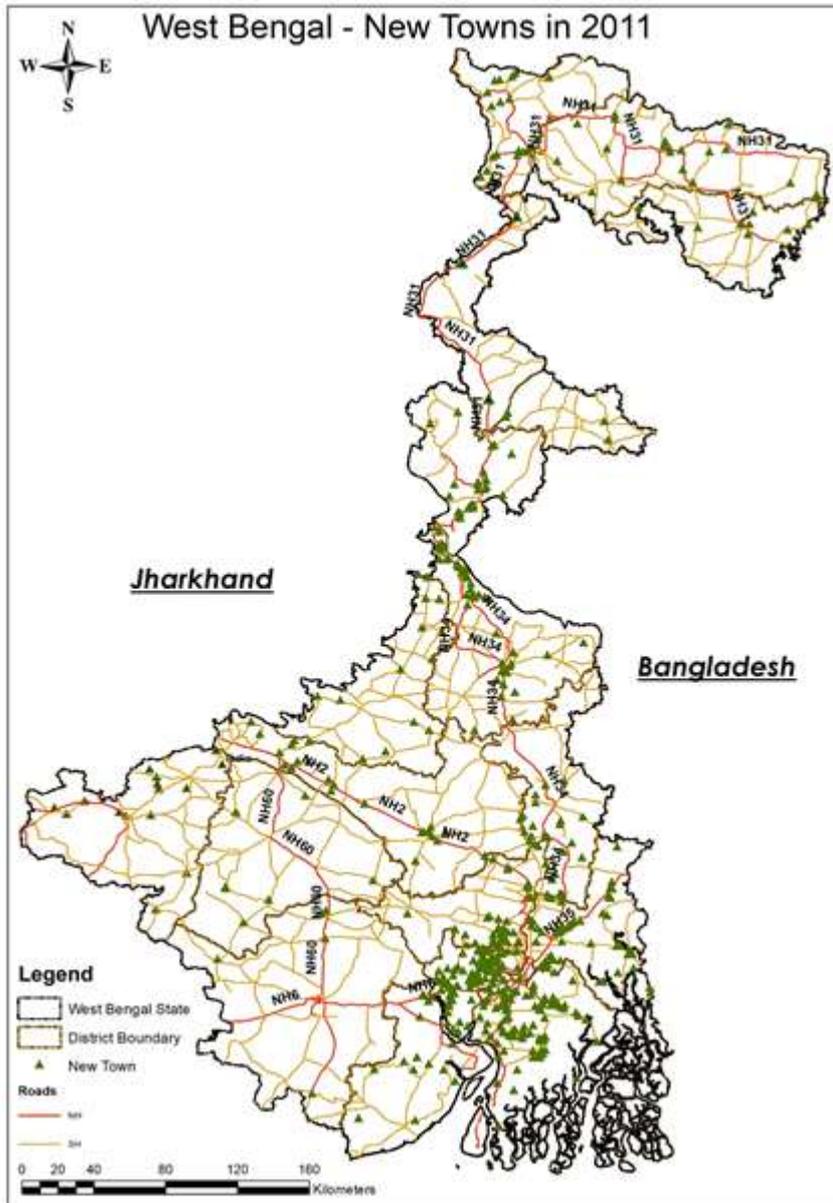


Source: www.censusindia.gov.in/2011census/population_enumeration.html accessed on 8 December, 2017
 Figure 3: Newly added Towns in 2011 (State/UT level)

It has been observed from the Figure 3 that West Bengal state has the maximum number of towns added in 2011 Census year. The detail study on rural transformation has been taken care for the state of West Bengal since it has the highest number of new towns emerged in 2011 census.

7. RURAL TRANSFORMATION IN WEST BENGAL

In 2011 a number of 498 (out of 2,691) rural areas have been transformed to urban areas. This number was the highest amongst the States/UTs of India. All these 498 new towns were rural (village) in character in 2001 (Map 4) (Table 3). This study is mainly focusing on the determinants and characters of newly emerged towns from villages.



Map 4: Location of New Towns added in 2011 in West Bengal

Table 3 reveals that a total 261 rural areas in the surrounding four districts of the megacity Kolkata, namely Hoara, Hugli, North and South Twenty Four Parganas, counts to 52.41 percent of total of the state. The proximity of megacity and increase share of rural workers in non-farm activities have resulted this transformation. Beside these a significant number of rural areas transformed in the districts of Murshidabad (42), Nadia (34), Bardhaman (29), Maldah (22) and Jalpaiguri (22).

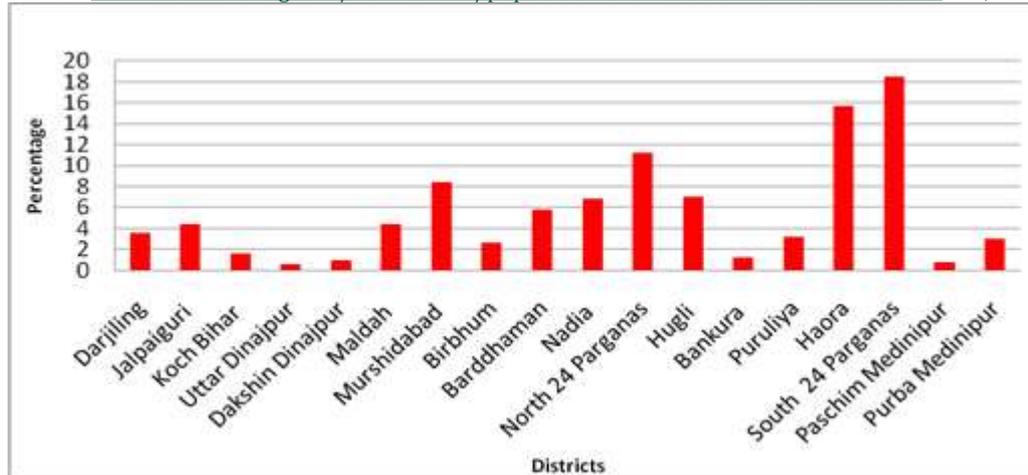
Table 3: New Towns added in West Bengal (district level) - 2011

SL. No.	Districts	Newly emerged towns in 2011	% of new towns to total of 498
1	Darjiling	18	3.61
2	Jalpaiguri	22	4.42
3	Koch Bihar	8	1.61
4	Uttar Dinajpur	3	0.60
5	Dakshin Dinajpur	5	1.00
6	Maldah	22	4.42
7	Murshidabad	42	8.43
8	Birbhum	13	2.61
9	Barddhaman	29	5.82
10	Nadia	34	6.83
11	North 24 Parganas	56	11.24
12	Hugli	35	7.03
13	Bankura	6	1.20
14	Puruliya	16	3.21
15	Haora	78	15.66
16	South 24 Parganas	92	18.47
17	Paschim Medinipur	4	0.80

18	Purba Medinipur	15	3.01
Total		498	100.00

Note: In the surrounding four districts of Kolkata 52.41 percent of new towns added in 2011

Source: www.censusindia.gov.in/2011census/population_enumeration.html accessed on 8 Dec, 2017



Source: www.censusindia.gov.in/2011census/population_enumeration.html accessed on 8 Dec, 2017

Figure 4: District level Percentage of New Towns in West Bengal (2011)

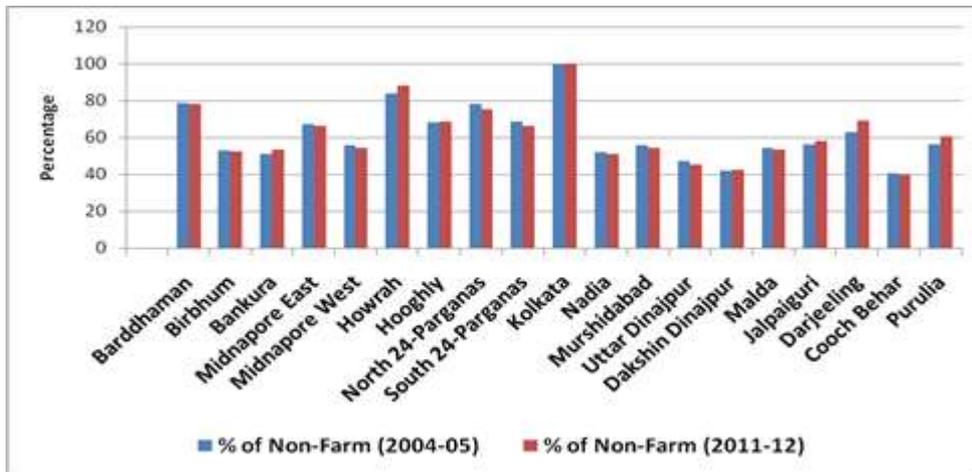
It has been seen that the districts far from Kolkata megacity have also a good number of new towns added in 2011. This is due to high growth rate of urban population during the decade 2001 – 2011. The urban growth rate (2001-11) was 85.52 percent in the districts of Maldah followed by South Twenty Four Parganas 62.62 percent, Murshidabad 57.89 percent, Jalpaiguri 53.48 percent, and Nadia 30.89 percent.

Table 4: Contribution of different Districts in GSDP, West Bengal

Sl. No.	District	2004-05			2011-12		
		Agriculture & Allied	Industry	Service	Agriculture & Allied	Industry	Service
1	Barddhaman	7.53	18.41	9.05	7.57	16.96	9.87
2	Birbhum	4.15	2.07	2.57	4.27	2.15	2.52
3	Bankura	4.80	2.14	2.87	4.88	2.66	2.92
4	Midnapore East	8.29	9.99	7.11	8.02	8.59	7.03
5	Midnapore West	7.12	4.08	4.84	7.23	4.13	4.55
6	Howrah	2.51	6.77	6.43	2.02	8.40	6.63
7	Hooghly	6.31	6.90	6.47	6.16	6.71	6.63
8	North 24-Parganas	6.83	11.70	12.96	8.63	12.40	14.04
9	South 24-Parganas	7.86	9.31	7.71	8.15	7.97	7.88
10	Kolkata	0.08	5.51	15.15	0.01	5.24	13.28
11	Nadia	7.67	3.80	4.48	7.82	3.81	4.29
12	Murshidabad	8.67	6.41	4.50	9.25	6.77	4.26
13	Uttar Dinajpur	3.06	1.07	1.65	3.43	1.19	1.63
14	Dakshin Dinajpur	2.67	0.69	1.23	2.64	0.75	1.21
15	Malda	5.05	3.28	2.78	5.18	3.38	2.61
16	Jalpaiguri	5.15	3.12	3.50	4.97	3.50	3.47
17	Darjeeling	2.51	1.67	2.60	2.32	1.94	3.24
18	Cooch Behar	4.62	1.23	1.94	4.58	1.24	1.77
19	Purulia	3.10	1.85	2.16	2.87	2.21	2.17

Source: Govt. of West Bengal (2015): State Domestic Product and District Domestic Product of West Bengal, 2013-14

The district level contribution in state gross domestic product is showing that the district around Kolkata megacity has maximum share from industry and service sectors which reflect more non-farm activities in these districts. Ultimately it has transformed the scenario of rural areas in these districts. District level the contribution of agriculture and allied sector in the state GSDP, Murshidabad, Midnapur East, North and South 24 Parganas, Midnapur West, are important. However, it is difficult to draw a conclusion that the districts which have low share in agriculture and allied sector are more urbanized. For example, in Howrah this share was 2.02 percent in 2011-12, but this district has a maximum of 78 newly added towns due to rural transformation. Detail study of two districts have been carried out, one based on highest number of new towns added in 2011 and another based on the highest percentage of rural population transformed to urban. In this method one district near mega city (South 24 Parganas) and another far from megacity (Murshidabad) are taken to capture the rural transformation process across these two districts over inter censal periods.



Source: State Domestic Product and District Domestic Product of West Bengal, 2013-14
 Figure 5: West Bengal: Contribution of Non-Farm in GSDP in 2004-05 and 2011-12

Analysis reveals that increasing contribution of non-farm activities have led to the transformation of rural areas in West Bengal

7.1 Selection Criteria of Case Study Districts of West Bengal

To find out two districts from nineteen districts of the state of West Bengal the following two criteria have been identified based the these two criteria – a) Maximum number of New Towns added in 2011 due to rural transformation, and b) One district near mega city Kolkata and the other far from mega city along national highways (NH). Therefore, based on above criteria the following two districts has been selected for detail study – i) South 24 Parganas (92 New Towns added in 2011), and ii) Murshidabad (far from mega city Kolkata and having located along NH)

7.2 Rural Transformation of Two Districts of West Bengal

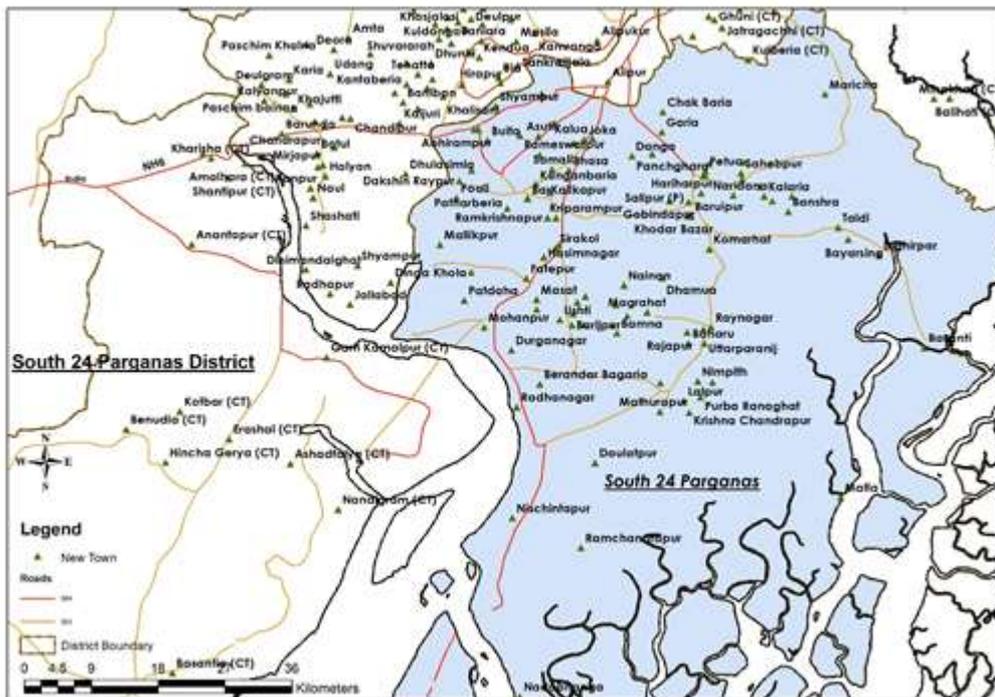
An attempt has been made to capture the rural transformation process across the newly added towns of two districts of West Bengal namely South Twenty Four Parganas with 92 new towns (Map 5) and Murshidabad with 46 new towns and located along NH 34 (Map 6) (Tables 5 and 6). The newly transformed urban centres have observed a positive change in demographic characters. The household size of the newly added towns of South Twenty Four Parganas has decreased from 5.10 to 4.46 and the sex ratio has increased from 943 to 964, these are the positive sign of urbanization. In case of the new towns of Murshidabad the household size has decreased and sex ratio has increased (Table 5) due to rural transformation.

Table 5: Demographic change in Case study New Towns of two Districts, 2001 and 2011

Sl. No.	District	Household Size		Sex Ratio		Literate		Non-Farm workers	
		2001 (Rural)	2011 (New Town)	2001 (Rural)	2011 (New Town)	2001 (Rural)	2011 (New Town)	2001 (Rural)	2011 (New Town)
1.	South 24 Parganas	5.10	4.46	943	964	75.68	78.29	70.59	87.93
2.	Murshidabad	5.54	5.05	976	970	58.43	65.03	73.23	88.31

Source: Census of India 2001 and 2011

The literacy rate of the new towns of both the districts has increased during the period of transformation. The literacy rate of the new towns has increased in South Twenty Four Parganas district but it is less than the urban average of 82.67 percent as of 2011. However, the literacy rate of the newly added towns of Murshidabad district is also less than the district urban average of 71.85 percent (Census 2011).



Map 5: Location of New Towns in South 24 Parganas District

Table 5 reveals that the percentage of non-farm workers has been increased in case of the newly added towns in 2011 for both the districts. However, the overall percentage of urban areas of South Twenty Four Parganas was 94.55 percent in 2011 as compared to 87.93 percent. However, in case of the new towns of Murshidabad district the percentage of non-farm workers is much more than district urban average of 40.59 percent (Census, 2011). This district is very well connected by national highways. This shows a positive impact of national highways on rural transformation.



Map 6: Location of New Towns in Murshidabad District

An attempt has been made to observe the impact of change of occupation pattern and provision of amenities, mainly percentage of households having - electricity, LPG (liquid petroleum gas) as fuel for cooking, latrine facilities, two wheelers and mobile phone. It has been observed from Table 6 that the above mentioned household assets are still less than the district urban average in the newly transformed settlements of both the districts (Table 6).

Tables 5 and 6 also address that there is a role of large city in the socio-economic transformation of the rural areas of South Twenty Four Parganas as compared to Murshidabad. The purpose behind the rank correlation is to establish the verity that improvement in one aspect of life and livelihood positively impacts other aspects and thus a cascading effect generates whereby each aspect mutually impacts one another. The Spearman rank correlation coefficient has been found to be 0.95 at 5 percent level of significance. It validates the argument that the demographic, economic and infrastructural

factors in case of the new towns of South Twenty Four Parganas have not only vastly transformed positively, each one of the factors (and sub factors) have impacted the others and in turn got impacted by other factors.

Table 6: New Towns having Household Assets, 2011

Sl. No.	District	Percentage of Households having				
		Electricity	LPG as fuel for cooking	Latrine facilities	Two Wheelers	Mobile Phone
1.	South 24 Parganas	59.37	15.66	63.19	6.03	50.05
2.	South 24 Parganas (District's urban average 2011)	90.30	37.20	83.10	8.90	61.10
3.	Murshidabad	47.61	11.73	48.06	7.06	37.69
4.	Murshidabad (District's urban average 2011)	59.50	22.60	61.80	10.30	45.40

Source: Census of India, 2011

Spearman rank correlation coefficient, $\rho = 1 - 6\sum d^2 / n(n^2 - 1)$ where d is the difference between the pair of ranks for each pair of observations and n is the number of paired observations.

8. CONCLUSION

The rural transformation has been much more in the state of West Bengal in India as compared to other states and union territories. It has been observed that the states and union territories where agriculture and allied sector is declining the agricultural labourer forced to change their occupation. There is a fact that mega/metro cities and alignment of national highways also played a significant role in this massive transformation during 2001-2011. A detail study of West Bengal reveals that the socio-economic transformation of rural South 24 Parganas ostensibly due to its proximity to mega city, Kolkata. Demographic, economic and infrastructural factors in case of South 24 Parganas have not only vastly transformed positively, but each factor has impacted the others and in turn got impacted by other factors. On the other hand in Murshidabad, well connectivity with National Highways 34 (NH) and proximity of large city Malda has impacted the transformation. The occupational pattern of the newly added urban settlements largely non-farm (secondary and tertiary) since 2001, the transforming is also a fulfilment of census criteria. While doing analysis it has been observed that few villages are of above two case study districts are not fulfilling one of the criteria of census that 75 percent of male workers will be engaged in non-agricultural activities. A question arise here whether all these newly added towns in 2011 census are census towns or some of them are statutory towns also. This needs further research.

REFERENCES:

- Berdegué Julio A., Tomás Rosada, and Anthony J. Bebbington (2013): The Rural Transformation
Bhattacharya, Primit (2016) India's rural transformation: A myth or reality? The transformation of the Indian countryside has been slow and messy. <http://www.livemint.com/Politics/xwxM6w3YAuBPCQlkabU1N/Indias-rural-transformation-A-myth-or-reality.html> accessed on 16 December, 2017.
 Government of India (2016): State of Indian Agriculture 2015-16, Ministry of Agriculture & Farmers Welfare, Department of Agriculture, Cooperation & Farmers Welfare, Directorate of Economics and Statistics, New Delhi, 5-7
 Government of India (2001 and 2011), Registrar General of India, Census of India, 2001 and 2011.
 Government of West Bengal (2014): State Domestic Product and District Domestic product of West Bengal 2013-14.
 Gupta, Anima (2013): Measuring Urbanization around a Regional Capital a case Bhopal
 IFAD (2016): Rural Development Report 2016 - Fostering inclusive rural transformation, Rome, Italy, September 2016
 Kumar, Ranjit, Uttam Deb, Cynthia Bantilan, N Nagaraj and M Bhattarai (2014): Economic growth and rural transformation in Eastern India: Strategies for Inclusive Growth
 Majumdar, Koustab (2016): Agrarian Transition and Dynamics of Rural Transformation in Contemporary India, Research Proposal, April, 2016 <https://www.researchgate.net/publication/301820076> accessed on 5 January, 2018
 Nathan, D, Reddy, D.N., Sharma, A.N. (2014):: A Halfway House: An Overview of Rural Transformation in India.
 Ohlan, Ramphul (2016): Rural Transformation in India in the decade of Miraculous Economic Growth <https://www.researchgate.net/publication/291185321> accessed on 2 January, 2018
 Sinha, Archana (2007): Farm sector, non-farm employment and rural livelihood: A study, Social Change, March 2007, Vol. 37, No.1, 50-76

ANNEX - I

Newly Added Towns and their Percentages (State/UT level) - 2011

Sl. No.	States/UTs	Newly added Towns	% to total 2691
1	Andaman And Nicobar Islands	2	0.07
2	Andhra Pradesh	121	4.50
3	Arunanchal Pradesh	10	0.37
4	Assam	90	3.34
5	Bihar	65	2.42
6	Chandigarh	5	0.19
7	Chhattisgarh	94	3.49
8	Dadra And Nagar Haveli	5	0.19

9	Daman And Diu	6	0.22
10	Delhi	52	1.93
11	Goa	23	0.85
12	Gujarat	104	3.86
13	Haryana	52	1.93
14	Himachal Pradesh	3	0.11
15	Jammu And Kashmir	46	1.71
16	Jharkhand	98	3.64
17	Karnataka	85	3.16
18	Kerala	320	11.89
19	Lakshadweep	3	0.11
20	Madhya Pradesh	81	3.01
21	Maharashtra	157	5.83
22	Manipur	15	0.56
23	Meghalaya	6	0.22
24	Mizoram	1	0.04
25	Nagaland	17	0.63
26	Odisha	85	3.16
27	Puducherry	2	0.07
28	Punjab	62	2.30
29	Rajasthan	67	2.49
30	Sikkim	1	0.04
31	Tamil Nadu	247	9.18
32	Tripura	24	0.89
33	Uttar Pradesh	214	7.95
34	Uttrakhand	30	1.11
35	West Bengal	498	18.51
	India	2691	100.00

Source: www.censusindia.gov.in/2011census/population_enumeration.html accessed on 8 December, 2017

ANNEX - II

Share of Different Economic Sectors in GDP 2011-12

States/UTs	Primary	Secondary	Tertiary	Non-Farm
Andaman And Nicobar Islands	9.5	38.5	52.00	90.50
Andhra Pradesh	33.04	18	48.96	66.96
Arunanchal Pradesh	29.31	29.69	41.00	70.69
Assam	37.74	11.39	50.87	62.26
Bihar	23.83	15.91	60.26	76.17
Chandigarh	1	13	86.00	99.00
Chhattisgarh	35.2	26.58	38.22	64.80
Delhi	1	17	82.00	99.00
Goa	26.5	33	40.50	73.50
Gujarat	27.62	30.11	42.27	72.38
Haryana	24.79	22.32	52.89	75.21
Himachal Pradesh	22.92	39.25	37.83	77.08
Jammu And Kashmir	26.07	23.8	50.13	73.93
Jharkhand	33.28	19.22	47.5	66.72
Karnataka	29	17.85	53.15	71.00
Kerala	17.71	20.36	61.93	82.29
Madhya Pradesh	38.8	18.2	43.00	61.20
Maharashtra	23.25	19.81	56.94	76.75
Manipur	32.89	25.89	41.22	67.11
Meghalaya	30	24	46.00	70.00
Mizoram	36.57	14.86	48.57	63.43
Nagaland	23.37	14.38	62.25	76.63
Odisha	34.3	20.27	45.43	65.70
Puducherry	7	45.25	47.75	93.00
Punjab	36.59	23.47	39.94	63.41
Rajasthan	34.43	19.86	45.71	65.57
Sikkim	15	39.63	45.37	85.00
Tamil Nadu	18.72	21.23	60.05	81.28
Tripura	24.44	17.7	57.86	75.56
Uttar Pradesh	32.14	16.73	51.13	67.86
Uttrakhand	17.7	21.92	60.38	82.30
West Bengal	31.39	12.78	55.83	68.61

Source: Central Statistical Organisation

ANNEX - III

Percentage of rural workers in non-farm activities

Sl. No.	States/UTs	1999-2000	2011-12
1	Andhra Pradesh	21.90	29.90
2	Arunachal Pradesh	18.20	22.10
3	Assam	34.50	39.70
4	Bihar	19.90	33.00
5	Chhattisgarh		14.80
6	Delhi	93.40	98.00
7	Goa	74.40	95.40
8	Gujarat	22.10	26.60
9	Haryana	40.00	48.00
10	Himachal Pradesh	34.00	38.20
11	Jammu and Kashmir	33.50	67.30
12	Jharkhand		45.10
13	Karnataka	18.30	30.10
14	Kerala	57.70	72.10
15	Madhya Pradesh	13.20	28.70
16	Maharashtra	18.10	24.40
17	Manipur	25.70	49.80
18	Meghalaya	13.60	32.80
19	Mizoram	16.00	19.80
20	Nagaland	25.60	27.70
21	Odisha	21.90	39.50
22	Punjab	37.60	57.70
23	Rajasthan	26.20	41.30
24	Sikkim	39.70	26.80
25	Tamil Nadu	32.50	46.40
26	Tripura	54.60	65.20
27	Uttarakhand		43.50
28	Uttar Pradesh	26.10	40.80
29	West Bengal	34.70	44.80
30	A and N Islands	36.40	65.00
31	Chandigarh	34.00	98.80
32	Dadra and Nagar Haveli	44.70	65.40
33	Daman and Diu	68.20	90.80
34	Lakshadweep	49.60	90.90
35	Puducherry	40.10	69.60
	All-India	25.10	37.20

Source: Central Statistical Organisation

1400 CHANGING NATURE OF TRADITIONAL TRIBAL WEAVING IN TRIPURA, INDIA: A STUDY ON CHAKMA COMMUNITY

ABSTRACT

Tripura, a small state in the North-Eastern region of India is the homeland to 19 tribal communities with an area of 10,486 km². The communities have their own fine cultural and proud heritage. The Chakma is one such rich cultured tribe among them. According to the Census of India, 2011 the total population Chakma population in Tripura is about 79,813 which is the fourth largest tribal community of the State after Tripuri, Reang and Jamatia. They are mainly concentrated in Belonia and Sabroom sub-divisions of South Tripura District, Kanchanpur sub-division of North Tripura and Amarpur sub-division of Gomati District respectively. Weaving is the primitive self sustainable economic activity as well as cultural symbol of this tribal community. Now a day, the Chakma men have given up their traditional clothes for western-style shirts and trousers but the Chakma women maintain the traditional style of dresses. Globalised market, impact of westernisation, mechanised product and others socio-economic factors cumulatively make a negative impact on traditional handloom weaving among the Chakma Community of the state. This research work attempted to understand the changing nature of traditional tribal weaving in Tripura. About 200 samples have been collected from Chakma concentrated clusters of Tripura through Stratified Random Sampling technique by Systematic Schedule Survey. Secondary data also has been collected from the Census of India and Rural Development Blocks, Gram Panchayat Offices of different districts of Tripura. The finding reveals that the traditional handloom weaving culture is annihilate from the state due to social upliftment of Chakma Community both in terms of educational as well as economical. Keyword: Tribal, Chakma, Handloom, Weaving

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1419 RUBBER PLANTATION PLAYING A MAJOR ROLE AS THE ECONOMIC BACKBONE AMONG THE TRIBAL GROUPS TOWARDS THEIR SOCIO-ECONOMIC DEVELOPMENT: A STUDY ON THE WEST GOALPARA DISTRICT, ASSAM

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ABSTRACT:

Goalpara District is one of the leading producers of Rubber in the entire state of Assam, and also in North-East India. The major production of Rubber came from the West Goalpara District. However, since 1980s, small growers have been switching to rubber with some help from the Rubber Board. Out of the total rubber plantations in Assam, Goalpara alone has 8460ha under Rubber Plantation. The district is having 47 RPS (Rubber Producer's Societies) covering more than 2068 rubber growers. In Goalpara District, the indigenous tribes have realized the benefits of rubber cultivation and are shifting their occupation towards the prospective venture. Over 7,000 families are dependent on rubber cultivation for their livelihood. Rubber cultivation provides them a golden opportunity to become self-employed. The analysis has been done with the help of Extensive field survey with suitable sampling technique and addition with some secondary data collected from Rubber Board Regional Office, Census data and NGO. This paper focuses on the role of natural rubber (*Hevea brasiliensis*) cultivation as a source of income for rural tribal communities. The cultivation and establishment of rubber plantations have a very positive socio-economic impact in the study area.

Keywords: Rubber Plantation, Tribal, Socio-Economy, Livelihood

INTRODUCTION

Rubber Cultivation is undertaken as a plantation crop mostly in the hills and plains of tribal dominated areas of the entire North Eastern region. This region comprising of eight states has tremendous potential for production of Rubber Cultivation. Nine percent of the country's rubber production comes from the North-East India and Tripura is considered as the "Second rubber capital of India" by the rubber broad. There are six rubber nurseries in the North Eastern Region: Three in Assam (Cachar, Goalpara and Karbi Anglong District), Two in Meghalaya (East Garo Hills and West Garo Hills) and one in West Tripura.

Goalpara district exhibits a remarkable diversity as the hills of Meghalaya forms its southern boundary and major part of the district is constituted by the plains of the Brahmaputra. The landform of the district, especially in the entire western part and southern part, along the foothills of Meghalaya has much upland. These uplands along with the favorable climatic condition have supported rubber plantation in many parts of the district. Replacement of natural vegetation with various plantation crops is a global phenomenon. Rubber was introduced in Goalpara as one of the plantation crops in 1980s. Attracted by the economic benefits and incentives to convert traditional farming areas into high value commercial crops many farmers switched to rubber cultivation in the District. Government policy and incentives have also given a shift towards rubber plantation. The ability to store and transport rubber easily as well as overall return on investment make rubber superior to other cash crops. Assam, where Rubber Plantation was launched even before in Tripura, has a potential for about two lakh hectares, where only 42,097.01(Statistical Handbook of Assam 2015) hectares have been brought for rubber cultivation. The rubber Board has identified Assam as a "Potential State" for rubber cultivation. Rubber is cultivated in almost all the districts of Assam.

Farmers of the district are taking up the highly lucrative rubber cultivation on a large scale and as future prospects of the rubber industry grow brighter, the Government has come up with various schemes for the entire region. The first plantations, mostly confined to large estates, trial plantations were taken up by the forest and soil conservation department. However, since 1980s, small growers have been switching to rubber with some help from the Rubber Board. In fact, Goalpara district of Assam has been one of the Rubber Board's success stories. The Rubber Board had in fact implemented a project called Accelerated Development of Rubber Plantation in the Northeastern region during the six-year period, from 1984-90. While the target under the project was to bring 24,000 hectares under rubber plantation, around 23,155 hectares was achieved.

STUDY AREA

Goalpara district of Assam is located between 25°33' and 26°12' North latitude and 90°07' and 91° 15' east longitude. The district covers an area of 1,832 sq.km. It is bounded by West and East Garo Hill districts of Meghalaya on the South, Kamrup district on the East, Dhubri district on the west and the river Brahmaputra on the North. The district is in the south-western part of the state bordering national boundary between Assam and Meghalaya and adjacent to international boundary between India and Bangladesh in the west.

The district is situated entirely on the south bank of the river Brahmaputra. The district has 5 Revenue Circles. These are 1) Lakhipur Revenue Circle 2) Balijana Revenue Circle 3) Dudhnoi Revenue Circle 4) Matia Revenue Circle and 5) Rangjuli Revenue Circle. There are 81 Gaon Panchayats and 837 revenue villages in the district.

LOCATION MAP

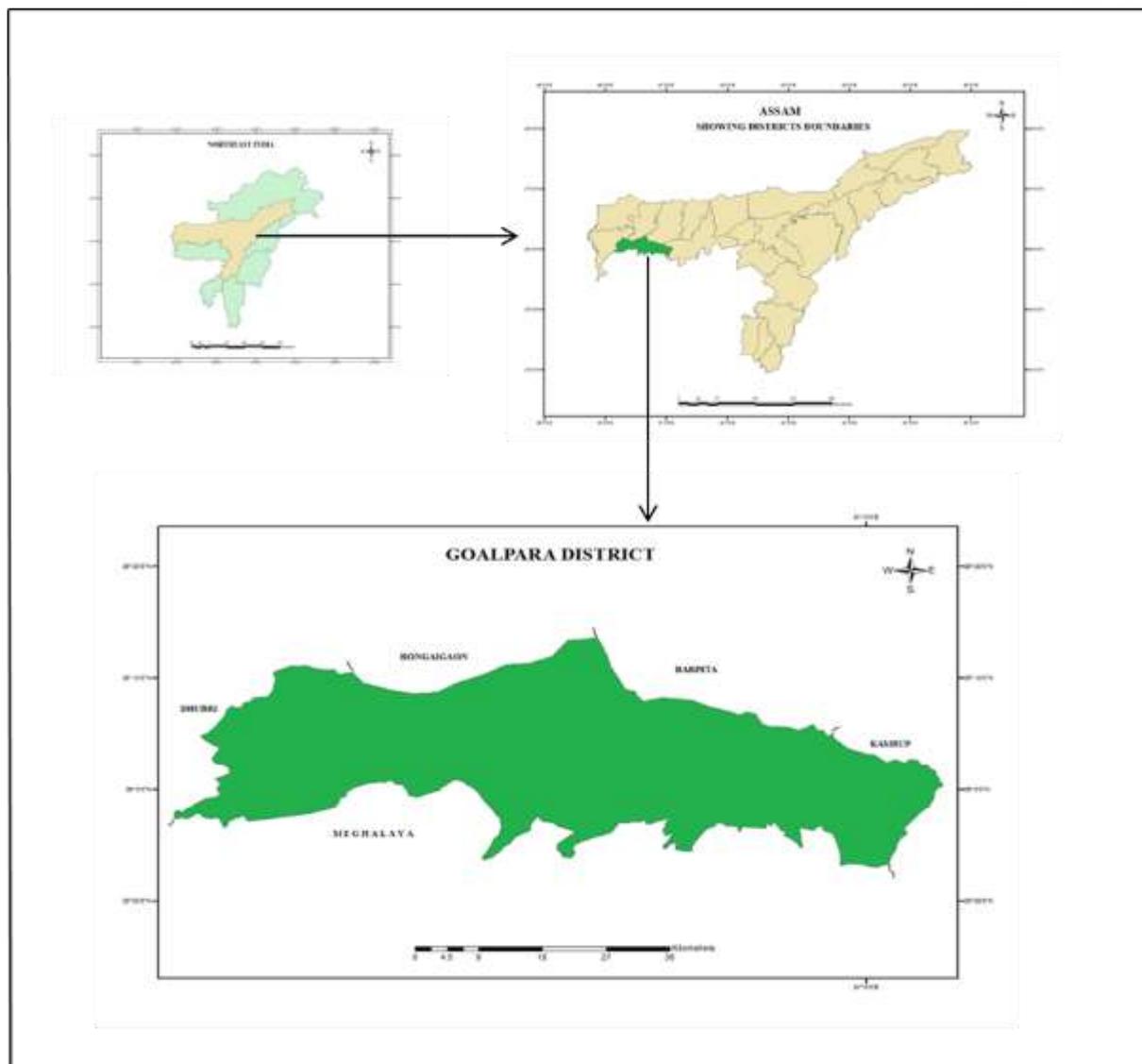


Fig-1) Map of the study area

OBJECTIVES

The main objectives of the study are:

- i) to analyse the trend of development of rubber plantation;
- ii) to study the social characteristics of the people associated with rubber plantation, and to examine the economic change among the rubber growers; and
- iii) to discuss the positive aspects of rubber plantation in relation to the society.

DATABASE AND METHODOLOGY

The study has been carried out with the help of primary and secondary data. The relevant secondary data has been collected from the sources like-(i) Directorate of Economics and Statistics (ii) Rubber Board Regional Office (iii) Office of the Circle Officer (iv) Satellite imageries of the study area.

Firstly, by using some GIS techniques, the relief has been represented (using DEM), and the satellite imageries of three different years i.e. 1990, 2004 and 2017 were used to show the development of rubber plantation and also the land use change in the areas.

Secondly, the primary data has been collected based on the objectives with the help of a well-designed survey schedule. The survey was conducted using suitable sampling technique. As the area is a larger one, the Stratified Random Sampling was followed for collecting primary data.

RESULTS AND DISCUSSION

Rubber is one of the important cash crops among the rural tribal in Goalpara. It was introduced in 1985-1986. The first plantations were started in two villages i.e., Ghengamari and Pandoba in the Western part of the district by the indigenous tribes. The district is the leading producer of rubber and the indigenous have realized the benefits of rubber cultivation and are shifting their occupation towards the prospective venture. The fact that small and marginal landholders, especially from tribal communities (Rabha, Garo, Bodo, and Hajong), are the majority participants in the rubber

plantation in the district implies that this new form of economic activity has contributed significantly to economic empowerment at the grassroots.

AREA UNDER RUBBER PLANTATION

Out of the total area of the district, i.e., 182400 hectares, the area under rubber plantation seems to be increasing year after year. Over 7,000 families are dependent directly or indirectly on rubber plantation for their livelihood. As per the data of 2017-2018, the total matured area under this plantation is 4812 hectares; immature area is 3783 hectares (Rubber Board Data). **Table 1** shows the area and the production of Rubber in the district. **Table 2** shows the employment generation in rubber plantation activities in Goalpara District from 2003-2004 to 2015-2016.

Table 1: Year wise extension in the area of rubber plantation

Year	Area (in hectare)	Production (in metric tons)
2012-2013	8045.6	1745
2013-2014	7640.14	2625.8
2014-2015	8595.72	6937.2
2015-2016	9595.75	6699.65

Source: Statistical Handbook of Assam 2013, 2014, 2015 and 2016

Table 2: Employment generation (in man-days) in rubber plantation activities In Goalpara District from 2003-2004 to 2015-2016.

Years	Employment Generation
2003-2004	130200
2004-2005	136200
2005-2006	140200
2006-2007	150200
2007-2008	156200
2008-2009	160200
2009-2010	164200
2010-2011	211600
2011-2012	241368
2013-2014	21441
2014-2015	20268
2015-2016	30515
Total	1562592

Source: Statistical Handbook of Assam 2010, 2011, 2012, 2015 and 2016

Rubber has already started influencing the socioeconomic profile of rural tribes. The Rubber Grower's Association was formed in 1994-1995 which supported the indigenous towards the rubber plantation and the rubber nursery came up in the area in 1998 and it has helped the farmers in saving their time and money from purchasing the rubber saplings from Kerala. From the beginning the Rubber Board has been giving great importance to rubber and implementing a variety of programmes for the development of tribal people through rubber plantation along with subsidy of 30,000 per hectare to the farmers. The government agencies and NGO's like *Ajagar Social Circle*, *NABARD*, *Pradhan Mantri Kaushal Vikas Yojana (PMKVY)* have contributed significantly for the development of rubber plantation in the rural areas by giving loans, Tapping Skill Training and some awareness programmes.

AREAS CONTRIBUTING MAXIMUM PRODUCTION

The major areas of the district which are contributing towards the growth of rubber plantation are mostly from the villages of Balijana, Dudhnoi and Lakhipur Revenue Circle. The villages engaged in Rubber Plantation are, *Ghengamari, Tilapara, Rangapara, Bardamal, Rampur, Bairang, Chotadamal, Bamungdanga, Hadlapara, Salpara, Maladhara, Lemakona, Pandoba, Mojaipara, Lengpara, Darani, Kuruwabasha, Goroimari, Dariduri, Bhalukdubi, Majpara, Gendra, Baida, Borjhora, Rangasai, Satabari, Borjuli, Balasari, Thakurbila, Derek*, and some parts of *Darangiri*. These villages have adopted rubber plantation and are developing it at a large scale, where some trees are at the growing stage and most of them are yielding latex at good amount. The plantations are mostly of individual type, and some are cooperative. Rubber production has steadily emerged as an important economic activity among the people in the study area, especially among the youths. The people in the study area are shifting themselves from multiple cropping to monocropping. Earlier there was large number of people engaged in paddy, banana, arecanut and such other type of cultivations. But after knowing about the profit and income from rubber, most of them have shifted or adopted the plantation of rubber, and empowered themselves. Sensing the pulse of the rising demand for rubber products in markets across the country, farmers in the Goalpara district of Assam are taking up rubber cultivation on a grand scale.

FIELD SURVEY

The household survey was conducted via face-to-face interviews using a well-designed questionnaire. Information was collected in the interview about the changes in the livelihoods of people in the villages before and after the establishment of rubber plantations. The information gathered includes the income generated from natural forests and rubber, the contribution of rubber plantations in improving livelihoods, the direct and indirect values of rubber plantations and reasons why local people decided to plant rubber. The information collected included the history of rubber development,

costs of establishment and maintenance of rubber plantations, expected income from production of latex and timber over a production cycle, location of rubber plantations in relation to preferred soil type, or originality of land use type (e.g., forest or barren land).

The people engaged in this plantation are earning income through various ways, like as:

IMMATURE PLANTATION:

Intercropping:

During the initial years of a plantation when the interspaces receive plenty of sunlight, a variety of intercrops (i.e. banana, medical plant, pineapple, ginger, turmeric etc.) can be cultivated.

Casual worker:

In immature plantation casual workers are needed for cutting the unnecessary small plants, forming the boundary of garden and also looking the drainage facilities. In many cases watchman were also employed by authority for providing the security of the garden.

MATURE PLANTATION:

Tapping:

It is method of collecting latex from rubber plants and the workers who involve in this work are known as rubber tapper. This work is generally done in the early morning.

Rubber agency:

Some private garden owners produce large amount of latex/sheet and when they are unable to sell those directly in the rubber factory, the rubber agencies collect those and this way the unemployed youths can engage themselves in those agencies or can also start new agency.

Rubber honey:

Rubber tree is a rich source of nectar. About 15 hives can be placed in a hectare of rubber. About 10 kg of honey is obtained from one hive.

Casual worker:

In rubber processing centre additional workers are needed for various activities i.e. accounting, security, water collection etc.

LIVELIHOOD BEFORE AND AFTER THE INTRODUCTION OF PLANTATION

Before the growth of rubber plantations, surveyed households depended mainly on forest products collection, paddy, banana, arecanut and such other type of cultivations. Nearly 33% of respondents put wet season rice production as the main source of income. The percentage of respondents and their main source of income are shown in the Figure 3 below. They were engaged in hunting, vegetable farming, collected fuel woods, wild fruits and veggies and sell their domesticated animals for their subsistence. Some people were dependent on small business, livestock and wage earner at daily basis.

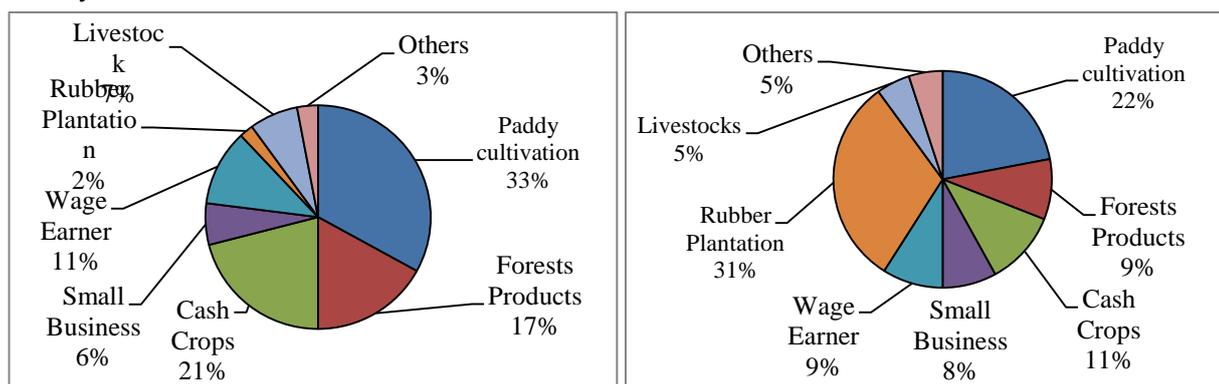


Figure 3: Sources of income before (left) and after (right) Rubber Plantation

After the establishment of rubber plantations, people’s livelihoods in the area have changed rapidly. As the forest area has been converted into rubber plantations only 9% of respondents relied on forest products as the main source of income compared to 17% before. Only 22% relied on paddy cultivation, and 31% have shifted to rubber plantation. The economy of the people grew more after adopting the plantation. Now the people can send their children to schools and colleges for further studies, they are also connected to the world after buying television. After introducing the plantation the rural tribal villages have been developed, and it is clearly reflected in their houses, education, dressing sense, food habits etc. As stated by the farmers, the youths in those backward areas started to join the terrorists groups before the adoption of rubber plantation, because they couldn’t do anything due of poverty. But after the plantations the youths realized its benefits and started to work on it either individually or collectively.

At the initial stage, the growers need to spend a sum of 20000/25000 per hectare for the plantation and its maintenance. As rubber starts to give latex from the 7th year of its plantation, so till that period it is very crucial time for the growers to take care of the trees and to protect it from animals, natural calamities etc. Once the latex is extracted, it has to go through many processes to form the rubber sheets, and the sheets need to smoke before selling. Thus a smoke house is required near the plantation area. The farmers having large plantation areas have smoke house in their compound, while the small growers have to go to other place for the same. The modern smoke house made of iron and steel having the capacity of nearly 100 rubber sheets cost around 80,000 to 1 lakh including the construction of the house.

The farmers got 20,000 to 25,000 per quintal of rubber during 2000-2010, but the price has decreased later and presently the growers are getting 11000-12000 per quintal.

DEVELOPMENT OF RUBBER PLANTATION

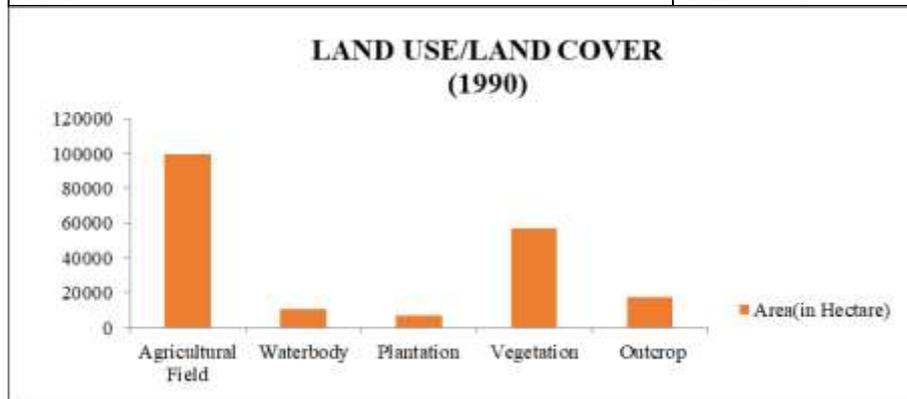
The first plantations were started in 1980s but there was much struggle in the area to make the indigenous understood about the production and benefits of rubber. During 1994-1995 the Rubber Growers Association was formed and started the plantation programs in some areas, preferably the slopes. Later the Rubber nursery was also came up in the district which helped in manifold. One NGO *Ajagar Social Circle* and the *Rubber Board Regional Office* supported the farmers for their growth and development by giving different skill development training related to plantation for better quality of latex extraction and productivity, and also helped financially. The land use/land cover maps (Figure 4, 5 & 6) of three different years i.e. 1990, 2004 and 2017 of the months between October to December shows the growth of plantation in the district along with the related tables (3, 4 & 5) and graphs. It has been found that the area under plantation has been increasing rapidly.



Figure 4: Land Use/ Land Cover (1990)

Table 3: Land Use/ Land Cover of 1990

Categories	Area(in Hectare)
Agricultural Field	99823.72
Waterbody	11047.03
Plantation	7154.098
Vegetation	57307.43
Outcrop	17367.7
Total	192699.978



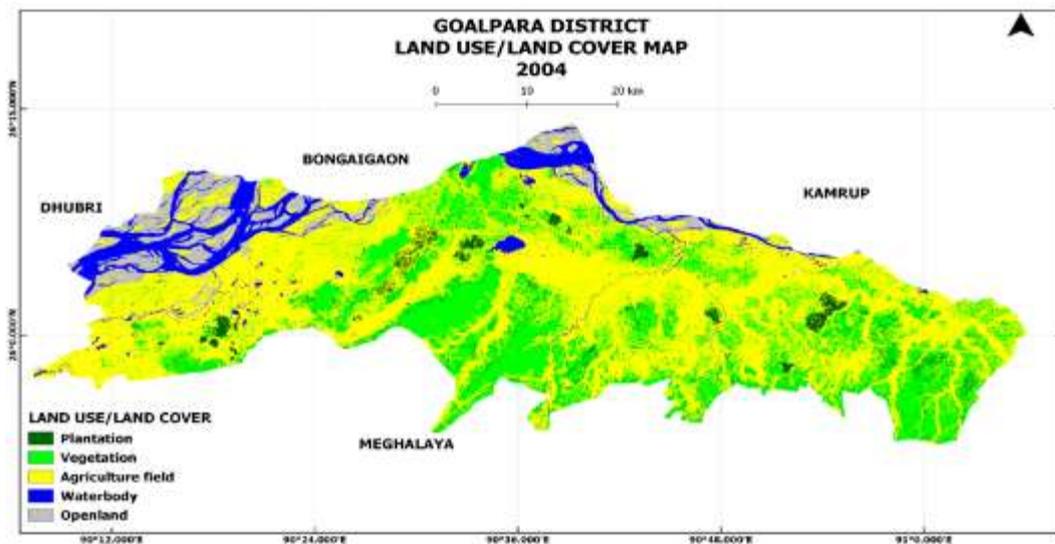


Figure 5: Land Use/ Land Cover (2004)

Table 4: Land Use/ Land Cover of 2004

Categories	Area(in Hectare)
Agricultural Field	107707
Waterbody	13511.81
Plantation	6505.087
Vegetation	53102.03
Outcrop	11874.1
Total	192700.027

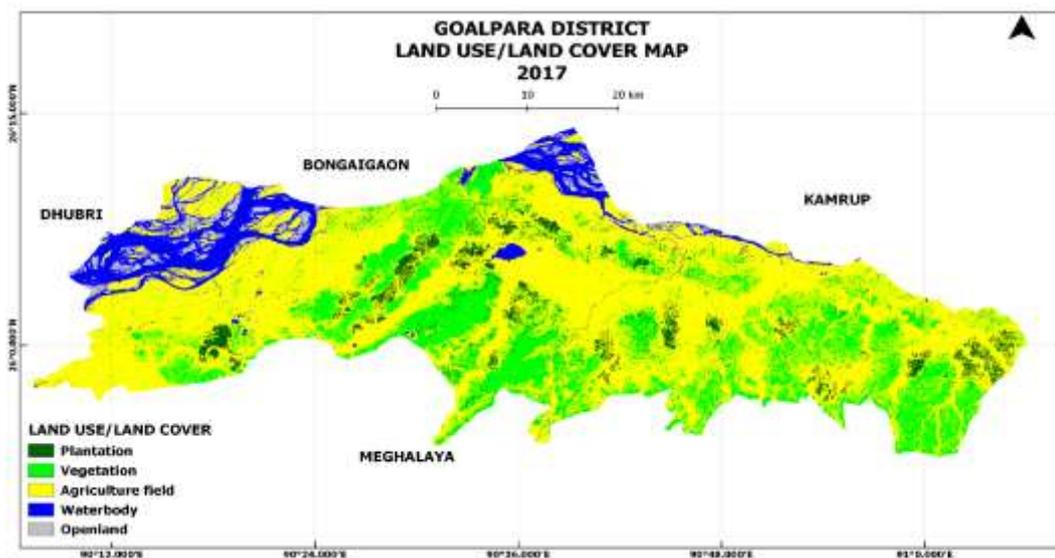
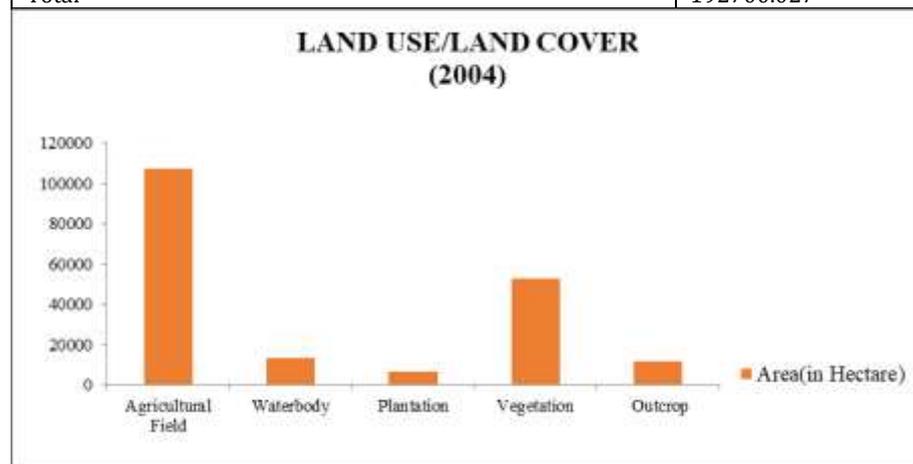
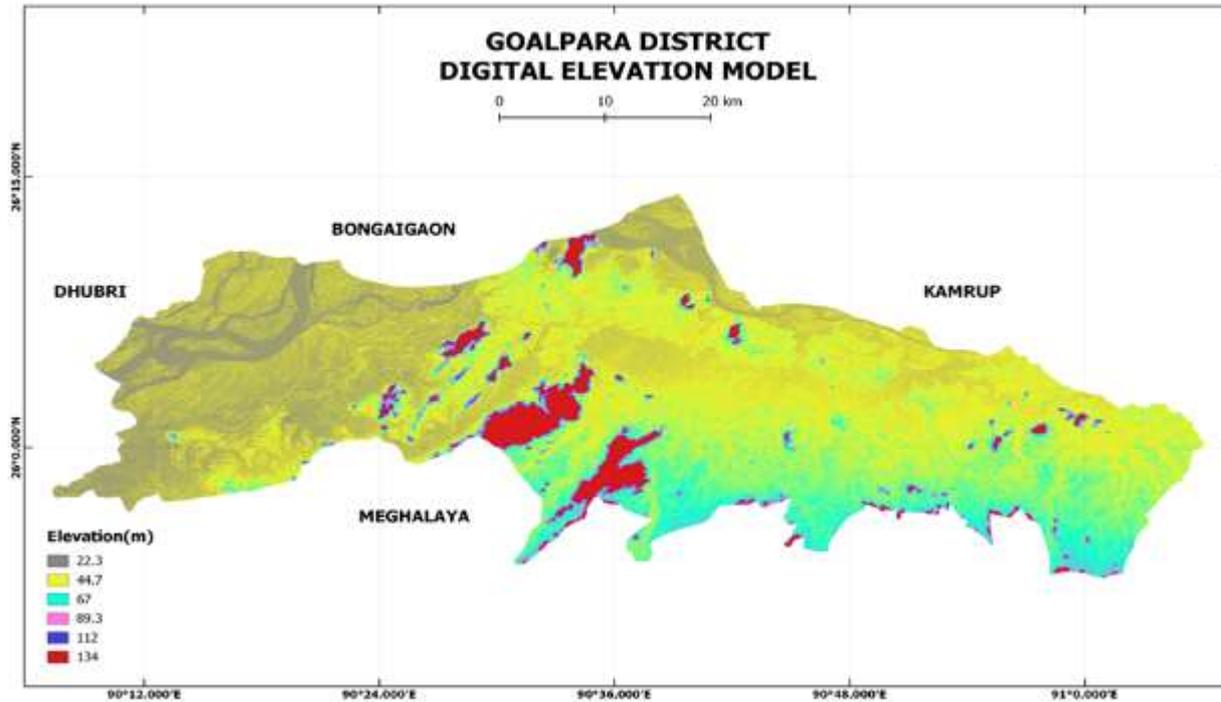


Figure 6: Land Use/ Land Cover (2017)

Table 5: Land Use/ Land Cover of 2017

Categories	Area(in Hectare)
Agricultural Field	118696.5
Waterbody	15898.63
Plantation	8307.241
Vegetation	44452.45
Outcrop	5345.178
Total	192699.999

DIGITAL ELEVATION MODEL



CONCLUSION

The landform pattern of an area plays a vital role on the type of agriculture practiced in that area. Goalpara district exhibits a remarkable diversity as the hills of Meghalaya forms its southern boundary and major part of the district is constituted by the plains of the Brahmaputra. The landform of the district, especially in the southern part, along the foothills of Meghalaya has much upland. These uplands along with the favorable climatic condition have supported rubber plantation in many parts of the district. But looking at the economic benefit of rubber, the farmers are doing the plantation near or in the agricultural land which is not much favorable for rubber plantation.

It is a more popular plantation crop in the district. Contribution of rubber production is higher mostly from the western part of the district. The district has many government and private agencies (*i.e.* , Rubber Board, NABARD, Ajagar Social Circle, Rubber Growers Association etc.) which are working for the expansion of rubber plantation in hilly areas where maximum peoples are tribal. In Goalpara (entire western part) large numbers of rural tribal live below the poverty line and rate of unemployment is also very high. This poverty and unemployment are the major reasons for violence, clashes, robbery, terrorism etc. Extension of rubber plantation in rural areas has solved all those kinds of problems to a great extent and it also helping the tribes to overcome poverty and unemployment.

Rural people can earn income from rubber plantation in various ways. In immature plantation people can earn income through intercropping in rubber plantation and also as casual worker. Mature plantation is the main source of income because of latex collection. Therefore, rubber plantation benefits the rural tribal people in many ways.

REFERENCES

Husain, M. (1996). *Systematic Agricultural Geography*. Rawat Publications, Darya Ganj, New Delhi

Singh, J., & Dhillon, S. S. (2004). *Agricultural Geography*. Tata McGraw-Hill, New Delhi.

Majumder, A., Datta, S., Choudhary, B. K., & Majumdar, K. (2014). Do Extensive Rubber Plantation Influences Local Environment? A Case Study From Tripura, Northeast India. *Current World Environment*, 9(3), 768.

Zhang, L., Kono, Y., Kobayashi, S., Hu, H., Zhou, R., & Qin, Y. (2015). The expansion of smallholder rubber farming in Xishuangbanna, China: A case study of two Dai villages. *Land Use Policy*, 42, 628-634.

Tokbi, M. (2017). A Study on the Trend of Area, Production and Tapping area of Rubber Cultivation in Karbi Anglong district of Assam. *International Journal of Research in Economics and Social Sciences*, Vol. 7, Issue 8, 119-125

He, H., Lai, Z., & Mischke, S. (2016). Meteorological impacts on landform changes. *Advances in Meteorology*, 2016.

Mongkolsawat, C., & Putklang, W. (2010, November). An approach for estimating area of rubber plantation: Integrating satellite and physical data over the Northeast Thailand. In *Proceedings of the 31th Asian Conference on Remote Sensing Vietnam* (pp. 1-5).

Sarkar, S. (2011). Rubber plantation: A new hope for rural tribals in Tripura, *International Journal of Plant Sciences*, Vol 6, Issue 2, 274-

- Fu, Y., Brookfield, H., Guo, H., Chen, J., Chen, A., & Cui, J. (2009). Smallholder rubber plantation expansion and its impact on local livelihoods, land use and agrobiodiversity, a case study from Daka, Xishuangbanna, southwestern China. *International Journal of Sustainable Development & World Ecology*, 16(1), 22-29.
- Nath, D., & Bezbaruah, M. P. (2011). Economics of rubber production in the nontraditional area of Goalpara District in north-east India. *IUP Journal of Agricultural Economics*, 8(2), 36.
- Chattopadhyay, S. (2015). Environmental consequences of rubber plantations in Kerala. (*Discussion Paper No. 44*).
- Fox, J., Castella, J. C., Ziegler, A. D., & Westley, S. B. (2014). Rubber plantations expand in mountainous Southeast Asia: what are the consequences for the environment?. *East West Center, Asia Pacific*, Issue No. 114, 1-8.
- Du, J., Yang, X. D., Zhang, H., & Yu, G. B. (2008). Quantitative distribution of earthworms and its relationships with environmental factors in tropical secondary forest and rubber plantation in Xishuangbanna. *Chinese Journal of Ecology*, 11, 1941-1947.
- Liu, X., Feng, Z., Jiang, L., Li, P., Liao, C., Yang, Y., & You, Z. (2013). Rubber plantation and its relationship with topographical factors in the border region of China, Laos and Myanmar. *Journal of Geographical Sciences*, 23(6), 1019-1040.
- Guardiola-Caramonte, M., Troch, P. A., Ziegler, A. D., Giambelluca, T. W., Durcik, M., Vogler, J. B., & Nullet, M. A. (2010). Hydrologic effects of the expansion of rubber (*Hevea brasiliensis*) in a tropical catchment. *Ecohydrology*, 3(3), 306-314.
- Werner, C., Zheng, X., Tang, J., Xie, B., Liu, C., Kiese, R., & Butterbach-Bahl, K. (2006). N₂O, CH₄ and CO₂ emissions from seasonal tropical rainforests and a rubber plantation in Southwest China. *Plant and Soil*, 289(1-2), 335-353.
- Xu, J., Grumbine, R. E., & Beckschäfer, P. (2014). Landscape transformation through the use of ecological and socioeconomic indicators in Xishuangbanna, Southwest China, Mekong Region. *Ecological Indicators*, 36, 749-756.
- Dove, M. R. (1993). Smallholder rubber and swidden agriculture in Borneo: a sustainable adaptation to the ecology and economy of the tropical forest. *Economic Botany*, 47(2), 136-147.
- Vongkhamheng, C., Zhou, J. H., Beckline, M., & Phimmachanh, S. (2016). Socioeconomic and Ecological Impact Analysis of Rubber Cultivation in Southeast Asia. *Open Access Lib. J*, 3.

SS10.3. Rural Transformation

1422 SUSTAINABILITY OF RURBAN SETTLEMENTS IN AN URBANIZING MILIEU: A PROBE INTO SELECTED PARTS OF HAORA DISTRICT, WEST BENGAL

ABSTRACT

Rurban settlements are basically hybrid settlements symbolizing a blend of rural and urban characteristics. Between the dualism of two dichotomous but interactive components of human settlement, viz. urban and rural, a concept pertaining to their hybridization has been emerging significantly. The present study focuses on the issues of sustainability of rurban settlements in selected parts (Domjur and Panchla Blocks) of Haora — the smallest but the most urbanized district (excluding Kolkata) in West Bengal, India. The urban landscape of the district is dominated by a large number of census towns and only three statutory towns with 63.38% urban population as against 36.62 % rural population. The prime objectives of this research are: i) to observe the process of rurbanisation in Haora District, ii) to identify the rurban centres (ii) to analyse the potentials of these identified settlements in terms of their infrastructure and (iii) to suggest the necessities to be introduced in these settlements. The methodology applied here includes rurban index, gravity model, and functional classification of rurban centres, correlation and regression analysis and cartographic representation of data collected through primary and secondary sources. It has been observed that the block of Panchla has witnessed larger areas to be designated as rurban settlements than that in Domjur block where settlements are more urban rather than rurban. The Shyama Prasad Mukherji Rurban Mission (SPMRM) has declared two rurban clusters in these two blocks with an ambitious bid to transform these clusters in near future. This area with its traditional site for jewellery and zari work has a huge growth potentials supported by its transport network (made under the scheme of Golden Triangle) and other infrastructure. Among a number of problems identified by the people of the surveyed areas, a major one is the problem of governance of these rurban or quasi-urban settlements. The scattered picture of urbanization emerged from these types of hybrid settlements could boost the pace and quality of urbanization if statutory status is accorded to these towns. The sustainability of these quasi-urban settlements depends largely on strengthening the intrinsic services which simultaneously de burden the urban areas; it may ultimately lead to balanced regional development.

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1475 RURAL LAND TRANSFORMATION AROUND A PLANNED CITY: SOME ISSUES AND POLICY CONCERNS (A CASE STUDY OF CHANDIGARH PERIPHERY)

ABSTRACT

In the last two decades, urban fringes have witnessed a massive rural land transformation and Chandigarh periphery is no exception. This period, in fact, coincides with radical changes effected in India’s macroeconomic policies to promote the role of private sector and attract foreign capital. Under the privatization policy, super specialization in medical, educational, banking and other professional services recorded a mushrooming growth around urban centres especially in cities like Chandigarh. Under the liberalization policy, private investment both foreign and Indian, found an added attraction in cities like Chandigarh where availability as well as quality of services was par excellent. Chandigarh thus became a great attraction for investors, service providers, job seekers and professionals. Consequently urban land prices shot up in the city. This led to the emergence of a number of residential colonies which sprung up in the villages and towns in Chandigarh periphery in the wake of exorbitant land/real estate prices in the city. Similarly, many private institutions for technical and professional education have come up in the surrounding villages. A number of malls, restaurants, resorts, marriage palaces can be seen all along the major roads. All this has come up on prime fertile agricultural land. The villages which earlier supplied vegetables, milk and grains to the city are dotted with residential complexes and institutional buildings. The villagers have sold out their land to the private land developers and are weaning away from agriculture with no alternate livelihood options. This paper in similar vein tries to capture these land use changes in rural areas through remotely sensed satellite data and primary data collected during field work. Further, an attempt has also been made to bring forth the socio-spatial implications and policy concerns for Chandigarh city as well as its periphery.

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1480 AN EXPERT SYSTEM FRAMEWORK FOR HOLISTIC DEVELOPMENT OF RURBAN CLUSTERS IN INDIA: CASE OF TRIBAL ORISSA**Ahana Sarkar, Ronita Bardhan**

Centre for Urban Science and Engineering, IIT Bombay

ABSTRACT

In this study, a novel step wise conceptual framework for rural development in an Indian Rurban cluster was developed, to make it a self-sustaining growth centre. This methodology encompasses a people participatory model with a blend of sustainability into it. This study critically appraises the newly formed Indian rural development scheme (SPMRM) and intends to bridge the gap in rural development policies in relation to social interaction models and bottom up approaches. The need of the villagers and deficiency of the rural cluster was assessed through household surveys and resource mapping of the village. A mixed mode research method was adopted through participatory rural appraisal activities for involving local people and their requirements in designing the framework model. While the rural urban disparity analysis (RUDA) estimated the gap between the village cluster and urban areas, problem identification and infrastructure prioritization that was performed through personal and collective interviews of the villagers formed the core basis for sustainability assessment. This step helped in personalizing the individualistic linkages for sustainable rurban development. The efficiency of the proposed methodology over existing strategy was validated through employment of social benefit analysis and rurban ecosystem health assessment (REHA). Results show that current methodology could improve the ecosystem condition of the rural cluster to 71.6% within ten years period (FY 2017-FY 2027) while the improved methodology could improve it to 87% within the same time frame.

1. INTRODUCTION

Although rapid urbanization has led to deep transformation in urban quality of life in India, rural communities are benefitting on a *trickle down* basis[1]. According to Planning Commission 2017, India has recorded an annual growth rate of 6.8% in 2016. However, rural poverty still remains a significant policy concern[2]. Rural development has seldom attracted the awareness of planners and has turned to be a rarely intervened field from planning perspective. Rural areas in India lack essential services like clean water supply, education and health centers, all weather roads, clean energy and sanitation provisions. The search for an improved quality of life has exaggerated the influx of rural urban migration, creating resource constrained stress on urban areas like lack of affordable housing and employment opportunities[3]. This phenomenon has led to the development of slums in the cities, which are portrayed by UN Habitat as 'dwellings unfit for human habitation'[4]. This widespread poverty and deprivation of rural population amidst the shining metropolitan cities has captured the planners' attention by indicating an urgent need for bottom-up approach for rural communities to curb large scale migration.

There is a critical shortage of empirical studies about the effectiveness of rural development policies and this study seeks to make an initial exploratory step in this direction. Rural sector development has been identified as one of the major drivers in accomplishing the UN Habitat Sustainable Development Goal (SDG) of inclusive development[5]. World Bank defines rural development in terms of improvement of quality of life of low-income group of people residing in rural areas and making the process of this development self-sustaining. India has witnessed policies regarding rural development since pre-independence era where rural policies were described majorly as experiments of various individuals. The post independence era however linked rural development with five year plans (FYP) thereby incorporating strategies like rural reconstruction through enactment of three tier Panchayati raj administrative system, rural poverty alleviation by increasing employment in agricultural systems etc. The major flagship programmes in India for rural development, some of which have been revamped envisaging wider outreach and acceptability, include Indira Awas Yojana (IAY), Mahatma Gandhi National Rural Employment Guarantee Act (MNREGA), Pradhan Mantri Gram Sadak Yojana (PMGSY) and Provision of Urban Amenities to Rural Areas (PURA). Despite prolonged attempt by the Government of India (GoI) to improve the policy strategies, the rural development schemes have failed to achieve the desired goals. Most of these schemes were found incompetent in accomplishing the structured objectives mainly due to the loopholes in implementation such as lack of a proper institutional structure or dedicated professional support, and lack of awareness among people[6]. In a recent initiative by GoI to bridge the gap between the urban and rural circumstances, the government metamorphosed PURA 2.0 into Shyama Prasad Mukharjee Rurban Mission (SPMRM) in 2015[7]. The SPMRM mission acts as an impetus to stimulate local economic development, enhance basic services, and create well-planned Rurban clusters. Ministry of Rural development (MoRD), GoI elucidated Rurban clusters as large parts of rural areas often in close proximity to each other which typically illustrate potential for growth, have economic drivers and derive locational and competitive advantages. This mission aimed to create 300 'Rurban Clusters' within next five years, across the country with about 100 Rurban clusters approved every year[7].

However, the SPMRM policy like other foregoing schemes does not take into consideration the bottom-up strategies like peoples' participation and contextual factors into the planning process. This study applies a dissection strategy to assess the substructure followed by the existing Rurban policy and has intended to propose a revised conceptual framework for sustainable Rurban development taking Rurban mission identified tribal cluster of Mayurbhanj, Orissa as the case scenario[8].

The objective of this study is to provide a holistic methodology for enacting rural development scheme in India through consolidation of social, technical, economic and environmental factors. This study enables in deciphering major socio-

technical and context-based parameters which when incorporated in existing rural development policies will promote holistic Rurban clusters leading to enrichment of quality of life of rural population. The novelty of this study lies in the development of transverse approach for efficient and sustainable Rurban development and rural policy efficiency in Indian context. It intends to fill the blind spot in methodological intervention in the field of existing rural development policies by applying mixed mode approach and adding a scientific value to it. This study can pave a path towards the direction of enhancement of rural development policies that is comprehensible with the current social issues.

2. STUDY AREA

The Rurban mission identified tribal cluster, located in the Mayurbhanj district of Orissa (state of India), comprises of three adjacent gram panchayats namely Digdhar, Thakurmunda and Bharandia (see Figure 1). The cluster includes twenty eight villages and covers an area of 9838 hectares with 31% area covered with dense sal forests. Apart from spatial inequality, the lack of basic infrastructure was observed to be the main reason behind the poverty and seclusion of the study area. Out of 4430 households, only 557 households are exposed to individual level water supply connection with a distribution capacity of only 27 lpcd (much below than ICAP prescribed required level i.e. 70 lpcd). 87.73% households lack individual household level sanitation facilities. The cluster is also devoid of basic amenities like drainage system, street lighting, and inter village connectivity. Thirty-nine community dustbins covering 1330 households is the main solid waste management alternative present in the rural cluster. 25% of households are exposed to LPG as cooking fuel while rest of the villagers used unclean fuels like kerosene and other solid fuel to serve their cooking needs.

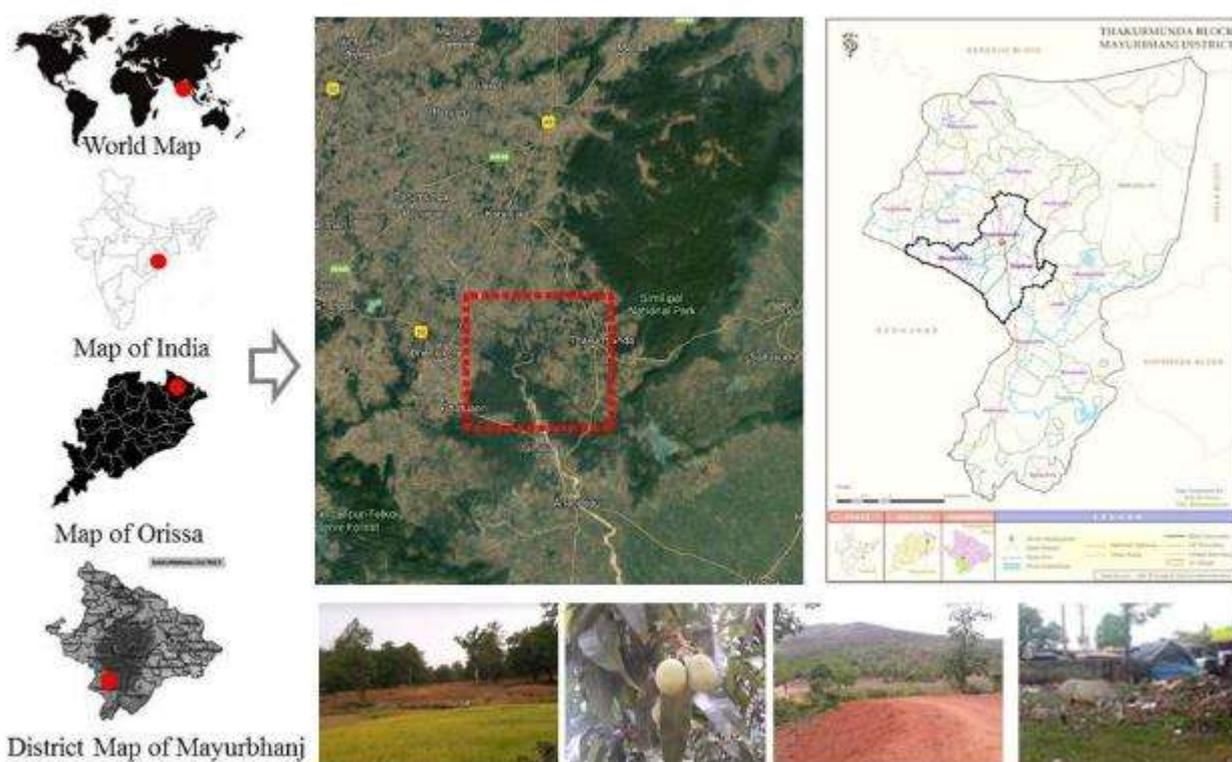


Figure 116 Thakurmunda Rurban Cluster (source: ICAP, SPMRM)

The total population of the cluster as per the 2011 records is 19757 with a decadal growth rate of 12.61%. The female population is dominating with a sex ratio of 0.93:1. During the survey tenure, the total number of households was accounted to be 4430. Table 1 presents the population statistics of the three gram panchayats which collectively constitute the rurban cluster.

Table 49 Population statistics of the cluster

Details		Thakurmunda	Digdhar	Bharandia	Total
Existing					
1	Total Population (As per census 2011)	8793	8544	2420	19757
2	Decadal Growth in Rural Population (%) (2001-2011)	12.34	13.16	11.67	12.61
3	Total Household	1928	1954	548	4430
4	Sex Ratio (M/F)	0.88	0.98	0.93	0.93

3 METHODOLOGY FOR RURAL PLANNING

The policy framework under current RURBAN mission follows the conventional top down approach, regardless of the fact that the proposals approved by the schemes may be found inconsistent with the sustainable needs of the specific

rural area. This study proposes a methodology (see Figure 2) that tries to eliminate the pitfalls of current planning methodology followed by Rurban mission (SPMRM). The broader level methodology followed in this work is presented in Figure 1.

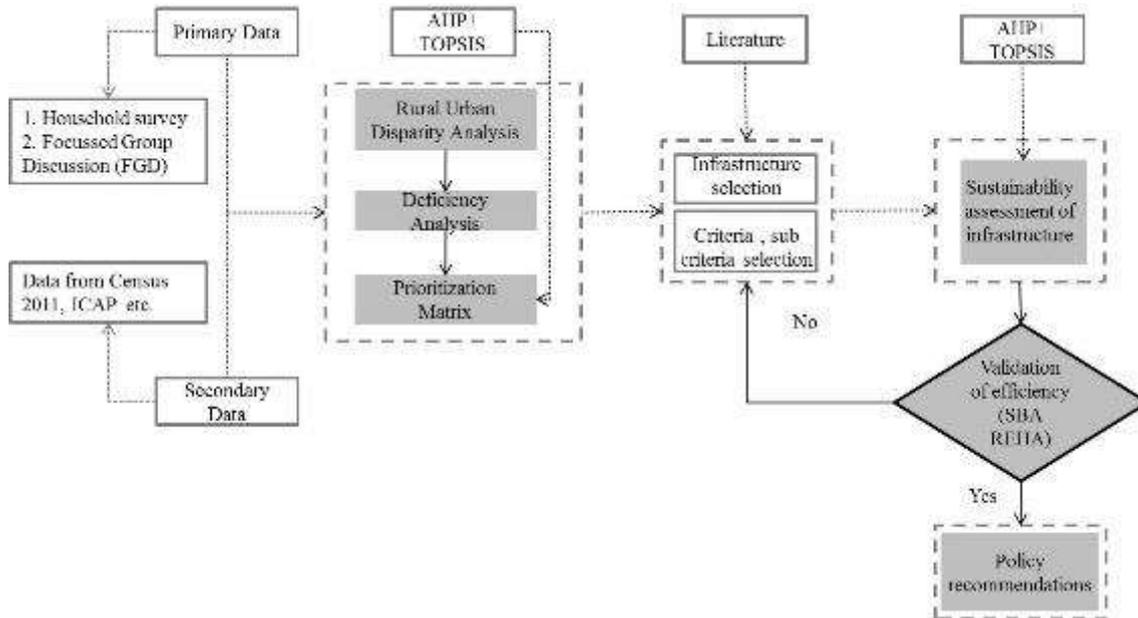


Figure 117 Proposed methodology for Rurban planning

In this study, the mixed mode research method was employed to investigate the planning strategies for holistic development of the Rurban cluster. First, field surveys were conducted in the month of September 2016, which included quantitative as well as qualitative data collections through participatory rural appraisal (PRA) methods that include household surveys, personal interviews and Focus Group Discussions (FGDs). Sixty household surveys were performed to apprehend the existing deficiency level of the village, the conditions and need of the villagers thus intensifying the bottom up approach. The data collection method included cognitive mapping of the cluster through reconnaissance survey, deficiency ranking of infrastructure levels from the villagers’ response, and accumulating local resource knowledge base from the Block Development Officers (BDOs). The framework model initiated with rural urban disparity analysis, deficiency analysis, and prioritization of infrastructure followed by sustainability assessment of infrastructure for the cluster. The efficiency of the proposed methodology over the existing one was validated using two distinct methods of Cost Benefit Analysis (CBA) and Rurban Ecosystem Health Assessment (REHA).

Rural Urban Disparity Analysis

The concept of Rurban mission (SPMRM) envisages in strengthening the rural and urban linkages in a developing nation. The Rural Urban Disparity Analysis (RUDA) approach [9] was employed to recognize the level of discrepancy between rural and urban areas. The selected Rurban cluster was compared with urban areas of Banpur (Non tribal cluster), Baripada (District town), Cuttack (Tier II city) and Bhubaneswar (Tier I city) in the same state of Orissa to highlight the gaps in terms of employment opportunities and infrastructure provision. A Rural Urban Disparity Index was derived to understand the current status of the rural development. A step wise methodology was applied to compute the RUDI which is elaborated in Eqs 1, 2 and 3. The major elements for comparison analysis not only included literacy rate, employment rate and life expectancy but the disparity level was also investigated in terms of accessibility to basic infrastructure like sanitation, clean water, electricity, cooking fuel, health and education facilities.

Step 1: Calculation of each component

Each of the criteria was measured using the following formula:

$$I_{ij} = \frac{\text{Actual } X_{ij} \text{ value} - \text{minimum } X_{ij} \text{ value}}{\text{Maximum } X_{ij} \text{ value} - \text{minimum } X_{ij} \text{ value}} \tag{Eq 1}$$

Step 2: Calculation of Urban and Rural Composite Index (RCI)

The weighted components were calculated by multiplying I_{ij} with weightages (W_n). Rural Composite index (RCI) and Urban Composite index (UCI) were calculated by averaging the aggregated components.

$$\text{Rural/urban Composite Index} = \frac{\sum_{n=1}^n w \cdot I_{ij}(\text{rural/urban})}{N} \tag{Eq 2}$$

Where N is the total number of components considered for measuring the disparity level.

Step 3: Calculation of Rural Urban Disparity Index (RUDI)

Lastly, Rural Urban Disparity Index (RUDI) was evaluated using the following formula.

$$RUDI = 1 - \frac{RCI}{UCI} \tag{Eq 3}$$

The value of RUDI in the above equation ranges from 0 to 1, where greater value indicates higher level of disparity between rural and urban areas.

Deficiency analysis

The major components considered for deficiency analysis included water supply, sanitation, solid and liquid waste management, street lights, drainage system, health facility and education levels. The number of households with access to the infrastructure was evaluated against the total number of households in the Rurban cluster. The existing condition of the cluster for each of the infrastructures was weighed against the desired ICAP prescribed levels and deficit level was calculated in percentage taking 100 as the maximum deficit. Deficiency analysis was performed using the following step.

$$Deficiency = 100 - \left(\frac{\text{Number of HHs with access to infrastructure}}{\text{Totl number of HHs in the cluster}} * 100 \right) \tag{Eq 4}$$

Prioritization Matrix

The deficit level values obtained from the deficiency analysis were used as a criterion for executing prioritization matrix. Higher deficit value indicated more criticality of the component and hence was given higher score. The respondents ranking presented in Likert scale (1 to 10) and capital expenditure spent by SPMRM on that particular infrastructure were added as two major criteria. This step was calculated using MCDM[10] [13] approach of Analytical hierarchy process (AHP) coupled with Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) [14]–[20].

Sustainability assessment of infrastructure

This section adopted multi criteria decision making (MCDM)[10][11][12][13]approach to select the most feasible infrastructure from a finite number of alternatives. The major sustainability criteria i.e. technical, environmental, economic and social factors and their respective key assessing indicators were chosen based on widespread literature studies. The household surveys mainly contributed to the social ranking in each case. An expert choice system i.e. Analytical Hierarchy Process (AHP) was employed to provide weight to the criteria and their respective sub criteria. (TOPSIS)[11], [14]–[20]was then applied for ranking the alternatives based on the different indicator scores. The best solution derived from MCDM could be considered as the ultimate proposal best suitable for the cluster. The major components of infrastructure used in this study are explained below in Table 2.

Table 50 Infrastructure alternatives and their key assessing indicators for sustainability assessment

Components	Alternatives	Technical Criteria	Economic Criteria	Environmental Criteria	Social Criteria
Street Lighting	Grid Electricity	Technical feasibility, Life expected	Installation cost, Operation and Maintenance Cost	CO ₂ emission, SO ₂ emission	Social acceptance
	Diesel Generator Set				
	Onsite Solar PV				
	Off-site solar PV				
Domestic Electrification	DG set (10 HH)	Coefficient of efficiency, Availability of primary energy supply, Reliability of technology	Installation cost, Operation and maintenance cost	CO ₂ emission, SO ₂ emission, NO _x emission	Creation of jobs, Citizen participation, Acceptance of power
	Biogas plant individual house				
	Solar panels individual house				
	Grid electricity				
	Compact DG set				
	Compact biogas plant				
Solid waste management	Landfill	Labour experience Land required Time required Storage required Equipment required	Installation cost Operation and maintenance cost, Economic benefit	CH ₄ emission/year, CO ₂ emission/year	Social acceptance, Persons involved in job, Participation power
	Vermi Compost Plant				
	Vermi compost per 10 HH				
Sanitation	Pit Latrine	Land required, Storage tank size, Water required	Installation cost, O&M Cost, O&Mtime,Life	BOD level, Coliform level	Social acceptance, Citizen participation, Health
	Pour flush				
	Aqua Privy				
	Septic Tank with soak pit				
	Bio digester toilets				
	Aerobic bio-tank				
	Overhung + fish pond				
	Compost Pit				
Water Supply pumping system	Solar PV	Efficiency Reliability,	Installation cost,	CO ₂ emission, Land	Local acceptance
	DG set				

	Micro hydro Solar PV with batteries	Feasibility, Working days per year	O&M cost	requirement, Vulnerable resources	
Cooking fuel	Natural Draft ICs	Efficiency, Calorific value, Life span, Availability of fuel	Fuel price, Fuel price escalation, Capital cost, O&M cost, Other costs	CO ₂ emission, Organic carbon emission, N ₂ O emission, CH ₄ emission	Social acceptance,Local trend, Convenience of cooking, Health hazards
	Forced Draft ICs				
	Biogas individual				
	Biogas community				
	LPG				
PNG					

4. RESULTS

Rural Urban Disparity Analysis

The calculated values of Rural Urban Disparity Index (RUDI) showed existence of deep incongruity between the Thakurmunda rural cluster and Bhubaneswar with a RUDI value of 0.47, followed by a medium level of disparity with Cuttack (0.30) and Banpur (0.39). However, a very low RUDI value was observed when Thakurmunda was compared with district town of Baripada. These results identify that enormous intervention is essential to bridge the gap between Thakurmunda and other nearby urban areas in Orissa and transform it into a ‘Rurban Cluster’ in real terms.

Deficiency Analysis

The RUDA step was followed by Deficiency Analysis. Out of the thirteen components for which deficiency level was evaluated, maximum gap was observed in case of provision of village street lighting with a deficit level of 100, and digital literacy (100), followed by water supply (88.83), sanitation (87.73), cooking gas connection (75) and solid waste management. The findings identified that the village lacked basic facilities, primarily because of negligence caused due to remoteness from state capital (Bhubaneswar city).

Prioritization matrix

Social respondents ranking was given utmost importance in this step followed by deficiency level and cap-ex while developing prioritization matrix. In case of existing methodology, where deficiency level was taken as the sole criteria, street lights received the maximum priority followed by drainage system, skill development, digital literacy, sanitation and water supply. However, by taking the aggregated value of three above-mentioned criteria, sanitation received maximum preference with a TOPSIS ranked value of 0.841; followed by village street lights (0.806), water supply (0.769), and domestic electrification (0.641). The results of prioritization matrix proved that attaching villagers’ ranking to the prioritization process would transform the overall policy framework and aid in investment phasing in later stages of rural development.

Most sustainable infrastructure alternative

The most feasible infrastructure alternative derived from MCDM (i.e. AHP coupled with TOPSIS) approach is elucidated in Table 2. As observed from the table, the multi criteria evaluation differentiated the behaviour of the alternatives under different viewpoints of comparison. The Consistency ratio (CRs) obtained across the process demonstrated the reliability of the method as the values of CR ranged from 0.01 to 0.20 with the final CR as 0.016 for domestic electricity and 0.19 for street electricity. For street lighting, off-site solar powered LED ranked highest with a value of 0.867 followed by onsite solar power (0.80), diesel generator (0.61) and grid electricity (0.17). On comparing the technical and economic criteria for domestic electrification, grid electricity came up as the most preferred one with value of 0.908 and 1 respectively. However, with the importance of social and environmental criteria being considered, the preference shifted to solar PV. On aggregation of the four criteria in the second tier, off-site solar power with micro grid came up to be the highest ranked with TOPSIS value of 0.633 followed by grid electricity (0.473) and compact biogas plant (0.471).

Table 51 Results of sustainability assessment of infrastructure

Proposed alternatives	Technical	Economic	Environmental	Social	Aggregated Ranking
Street Lighting	-	-	-	-	Onsite solar power (0.80)
Domestic Electricity	Grid electricity (0.90)	Grid electricity (1)	SPV batteries, micro grid (1)	SPV batteries, micro grid (1)	SPV batteries, micro grid (0.63)
Solid Waste	Landfill (0.75)	Vermin compost (group of 5 HH) (1)	Vermin compost (group of 5 HH) (0.61)	Vermin compost (group of 5 HH) (0.54)	Vermin compost (group of 5 HH) (0.83)
Sanitation	Compost Pit (0.87)	Overhung+fish pond (0.97)	Bio digester (1)	Pit latrine (1)	Compost pit (0.88)
Water supply pumping system	DG set (1)	Solar PV (0.97)	Solar PV (0.98)	Solar PV (1)	Solar PV (0.82)
Cooking fuel	Biogas IHHL (0.72)	Natural Draft ICs (0.90)	PNG (0.60)	Natural draft ICs (0.93)	Natural draft ICs (0.93)

In the case of solid waste management, landfill ranked highest when technical criteria was solely considered. When social, economic and environmental criteria were taken into consideration, vermin compost became the most sustainable alternative. Similarly, for the case of sanitation, water supply pumping system and cooking fuel cases, the compost pit latrine, solar PV supported pumping system and improved cook-stoves were evaluated as the most sustainable alternatives respectively.

5 EFFICIENCY OF THE PROPOSED METHODOLOGY

The efficiency of the proposed methodology was validated through social benefit incurred and health level of the ecosystem.

Social benefit calculation

Cost benefit analysis (CBA) was performed for both existing and proposed methodology to understand whether the social benefit of a project was worth its cost. The benefits incurred from both the methodologies reflected a major difference when it included social ranking in the process. This score, derived from respondents survey was employed to evaluate the annual social benefit gained by the cluster. Table 4 represents the overall social benefit gained from the proposed methodology.

Table 52 Social benefit from the proposed methodology

Components	No of units benefited more from proposed methodology	Total benefit incurred from proposed methodology (INR)	Social score (from HH survey)	Social benefit (INR)
Domestic electricity	375 HH	405000	0.641	259605
Street lighting	144 no.	1147500	0.806	924885
Solid waste management	1511 HH	5439600	0.625	3399750
Cooking fuel	4674 HH	26641	0.851	22672
Total				4606912 INR

Rurban Ecosystem Health Assessment (REHA)

The method of Set Pair Analysis (SPA) [21]–[26] was introduced to assess the Rurban ecosystem health. The approximate degree of Rurban ecosystem health was compared with the optimal set to describe the level of the rural ecosystem by combining multiple health indices. Set Pair analysis proposed by Zhao in 1989 is a modified uncertainty theory considering both certainties and uncertainties as an integrated certain uncertain system and depicting the certainty uncertainty systematically from three aspects as identity, discrepancy and contrary. A health assessment scale was generated to understand the condition of rural ecosystem across a given time period. The evaluation of the ecosystem health scale followed a step wise approach which is demonstrated in Eqs 5 to 9.

The identity degree and contrary degree of the set pair can be defined as Eqs 5 and 6:

$$a_{kr} = \frac{h_{kr}}{u_r + v_r} \tag{Eq 5}$$

$$c_{kr} = \frac{h_{kr}^{-1}}{u_r^{-1} + v_r^{-1}} = \frac{u_r v_r}{(u_r + v_r) h_{kr}} \tag{Eq 6}$$

Where a_{kr} is termed as identity degree that means approximate degree between h_{kr} and u_r while c_{kr} contrary degree that represents approximate degree between h_{kr} and v_r . Here u_r and v_r represents the upper and lower threshold values of the components.

AHP was used to assign weights to the components. Taking the weight of each matrix into account, the average identity degree and contrary degree can be counted through Eqs 7 and 8 in the comparative interval of $s_k [U, V]$:

$$a_k = \sum_{r=1}^n w_r a_{kr} \tag{Eq 7}$$

$$c_k = \sum_{r=1}^n w_r c_{kr} \tag{Eq 8}$$

Where a_k stands for the average identity degree representing the close extent between s_k and U, while c_k describes the average contrary degree expressing the close extent between s_k and V. Then, the approximate degree between s_k and U can be expressed as the following:

$$r_k = \frac{a_k}{a_k + c_k} \tag{Eq 9}$$

With larger value of r_k the situation of s_k is better.

The matrix contained three layers, including object layer O, i.e. urban ecosystem health, criteria layer F, i.e. F1 to F5, and index layer, i.e. I1 to I12 as listed in Table 5. Analytic hierarchy process (AHP) was employed to determine the weightages of each indicator.

Table 53 Judgement matrix for Set Pair Analysis

Assessing factors (F)		Assessing indicators (I)		2017	2022	2027
Vigor	F1	Annual Per capita income	I1	50,000	86000	86,000
Structure	F2	Farm/ Total workforce	I2	42%	50%	50%
		Population density	I3	290/sq.km	326.4/sq.km	390/sq.km
Resilience	F3	% of utilization of solid waste	I4	0	60%	60%
				0	9.3%	9.3%
				Existing Rurban policy		
Ecosystem service function	F4	% HH using renewable energy	I5	0	76.4%	100%
				0	38.2%	50%
				Existing Rurban policy		
		Employment rate	I6	46.6%	52.4%	62.2%
		Productivity hours per capita per day	I7	12	18	18
				12	16	16
Existing Rurban policy						
Population health	F5	Number of sub centres/ 20000 population	I8	2	7	12
				% of access to electricity	I9	43.9%	64%	100%
		43.9%	53.95%			82%
		Existing Rurban policy				
		% of access to cooking energy	I10	29.1%	88.79%	100%
				29.1%	29.1%	29.1%
Existing Rurban policy						
% of access to safe drinking water	I11	11.17%	88.79%	100%		
% of access to sanitation	I12	13.81%	97.7%	100%		

The identity and contrary degree was calculated for each indicator with respect to upper and lower threshold values. Weightages were assigned to the values and their aggregation lead to the formulation of the ecosystem health levels. The range of the scale for evaluating health level varies from 0 to 1 where higher values indicate better health condition of the ecosystem.

Ecosystem health assessment was performed for both existing and proposed methodologies. Figure 3 highlights the differences in the Rurban ecosystem health assessment for the two methods. The final results showed that the present value of rural ecosystem health is only 0.33 which can be increased up to 84.3% in 2022 to a value of 0.61 and 0.63 in 2027 in case of proposed methodology. The same procedure was carried out for Rurban prescribed existing methodology where the value increased by only 66.2% i.e. 0.55 in 2022 and 0.57 in 2027.

Rurban Ecosystem Health Assessment

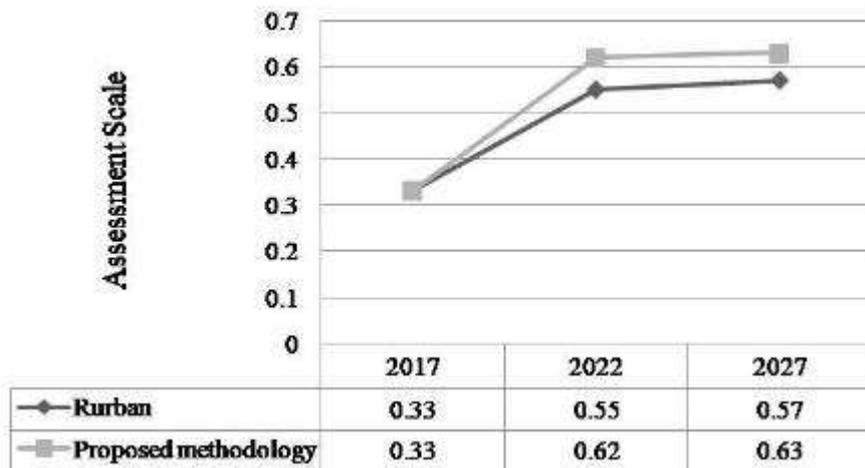


Figure 118 Rurban Ecosystem Health Assessment (REHA) results for both methodologies

6 DISCUSSION AND CONCLUSION

This paper has critically analyzed the limitations of strategies employed by current Rurban mission. A novel strategy was applied in this paper to assess the existing framework model followed by the current Rurban mission (SPMRM). The major steps in existing policy include the deficiency analysis and prioritization of infrastructure elements directly followed by implementation strategies like scheme convergence and investment phasing. The major loopholes in this planning process encompass the lack of social coherence factor and sustainability aspect. Hence, this study made an attempt to develop a holistic methodological framework which tried to overcome the faults of existing case. The proposed structure introduced additional socio-technical approaches like Rural Urban Disparity Analysis (RUDA) which describes the incongruity of rural cluster with respect to nearby urban areas. This evaluation-based step was necessary as Rurban mission aims to bridge the gap between rural and urban areas. Hence, the selected Rurban cluster was compared with tier I, II cities and district towns of the same state to comprehend the intricacy of operations required for its development.

This was followed by deficiency analysis which is in sync with the existing methodology. The infrastructure components were prioritized based not only on deficit analysis but also on respondents ranking and cap-ex of infrastructure projects. FGD and household surveys emphasizing the need of the local people formed the core basis of the whole method. This step enhanced the concept of bottom up approach in prioritizing the components of a rural cluster. The aftermath of investment in infrastructure projects in rural areas often present economic benefits but do have negative impacts, particularly for social and environmental assessments. Thus there lies an ambiguity on the effectiveness and adequacy of the assessment of infrastructure investment. Assessment in this case was improved by incorporating attributes embodied in sustainable development principle which is widely described as a triple bottom line (economic, environmental, social and technical). In sustainability assessment of infrastructure, social criterion was given more importance for highlighting the idea of bottom up path. This study introduced a set of key assessment indicators (KAIs) for assessing the sustainability of the infrastructure which can be used in future for planning other rural clusters in India. The most sustainable infrastructure alternative was selected by applying MCDM method i.e. AHP and TOPSIS. The authors further validated the efficiency of the proposed methodology by comparing the proposed with the existing Rural Mission methodology. Social benefit was computed to show that the existing method led to a total social loss of Rs. 46 lakhs (INR) as shown in Table 4. Rural Ecosystem Health Assessment (REHA) also proved the proposed methodology to be more efficient than the existing one. The SPA generated ecosystem health levels show that the current methodology could improve the ecosystem condition of rural cluster to only 71.6% within ten years period (FY 2017- 2022-2027) while the transformed methodology could improve it to 87% within the same time frame.

Although Rural Mission (SPMRM) launched by Indian government (GoI) has set up proposals for rural areas, it can be noticed from this study that there are certain discrepancies in selection of the best fit alternative. The whole scenario changes when social choice and the concept of peoples participation is taken into consideration. Future work can include rural infrastructure benchmarking to identify any differences found between analyzed standard and ICAP prescribed benchmarks. In this study, coupled method of AHP-TOPSIS was applied for sustainability analysis which has drawbacks.

Cumulatively, the proposed methodology qualifies as a suitable and holistic methodology adopted for Rural development in India that can fill the gap in the existing Indian rural development policies. This methodology with an iota of social coherence and sustainability aspect enhances the notion of rural development from a purely top down to bottom up approach. This methodological intervention can carry forward towards the direction of growth of rural development policies that is comprehensible with the current social issues.

REFERENCES

- [1] R. Debnath and R. Bardhan, "Resource Symbiosis Model through bricolage: A livelihood generation assessment of an Indian village," *J. Rural Stud.*, vol. 60, no. March, pp. 105–121, 2018.
- [2] R. S. Adisa, "Rural Development in the Twenty-First Century as a Global Necessity," *Rural Dev. - Contemp. Issues Pract.*, 2012.
- [3] R. Bardhan, K. Kurisu, and K. Hanaki, "Does compact urban forms relate to good quality of life in high density cities of India? Case of Kolkata," *Cities*, vol. 48, pp. 55–65, 2015.
- [4] R. Bardhan, S. Sarkar, A. Jana, and N. R. Velaga, "Mumbai slums since independence : Evaluating the policy outcomes," *Habitat Int.*, vol. 50, pp. 1–11, 2015.
- [5] OECD, *A New Rural Development Paradigm for the 21st Century : a Toolkit for Developing Countries*. 2016.
- [6] K. Singh Rajput, "National Rural Mission: Hope for the Balanced Development," no. June 2016, pp. 3–24, 2278.
- [7] GoI, "National Rural Mission: Integrated action plan," *Minist. Rural Dev.*, vol. 2, 2016.
- [8] N. R. Mission, M. Of, and R. Development, "Spatial Planning Aspects of Integrated Cluster Action Plan."
- [9] I. Republic, R. Rehabilitation, and R. Development, "ترازو و ایتخارپ و ا نی و غرابید د ویلکد ناتسناغفا ی ماسا یروهم تاهد فاشکنا for Afghanistan Rural Development Report ۲۰۰۶ By : AIRD."
- [10] V. T. Lokare and P. M. Jadhav, "Using the AHP and TOPSIS methods for decision making in best course selection after HSC," *2016 Int. Conf. Comput. Commun. Informatics, ICCCI 2016*, 2016.
- [11] J. C. Rojas-Zerpa and J. M. Yusta, "Application of multicriteria decision methods for electric supply planning in rural and remote areas," *Renew. Sustain. Energy Rev.*, vol. 52, pp. 557–571, 2015.
- [12] Y. Kara and A. Ç. Köne, "the Analytic Hierarchy Process (Ahp) Approach for Assessment of Regional Environmental Sustainability."
- [13] J. G. Dolan, "Shared decision-making - transferring research into practice: The Analytic Hierarchy Process (AHP)," *Patient Educ. Couns.*, vol. 73, no. 3, pp. 418–425, 2008.
- [14] E. Roszkowska, "Multi-Criteria Decision Making Models By Applying the Topsis Method To Crisp and Interval Data," no. Mcdm, 2011.
- [15] S. Sindhu, V. Nehra, and S. Luthra, "Investigation of feasibility study of solar farms deployment using hybrid AHP-TOPSIS analysis: Case study of India," *Renew. Sustain. Energy Rev.*, vol. 73, no. January, pp. 496–511, 2017.
- [16] D. Streimikiene, T. Balezentis, I. Krisciukaitien, and A. Balezentis, "Prioritizing sustainable electricity production technologies: MCDM approach," *Renew. Sustain. Energy Rev.*, vol. 16, no. 5, pp. 3302–3311, 2012.
- [17] N. G. Gogate, P. P. Kalbar, and P. M. Raval, "Assessment of stormwater management options in urban contexts using Multiple Attribute Decision-Making," *J. Clean. Prod.*, vol. 142, pp. 2046–2059, 2017.
- [18] E. Arıkan, Z. T. Şimşit-Kalender, and Ö. Vayvay, "Solid waste disposal methodology selection using multi-criteria decision making methods and an application in Turkey," *J. Clean. Prod.*, vol. 142, pp. 403–412, 2017.
- [19] A. T. D. Perera, R. A. Attalage, K. K. C. Perera, and V. P. C. Dassanayake, "A hybrid tool to combine multi-objective optimization and multi-criterion decision making in designing standalone hybrid energy systems," *Appl. Energy*, vol. 107, no. November, pp. 412–425, 2013.
- [20] J. J. Huang, G. H. Tzeng, and H. H. Liu, "A revised vikor model for multiple criteria decision making - The perspective of regret theory," *Commun. Comput. Inf. Sci.*, vol. 35, pp. 761–768, 2009.

- [21] M. R. Su, Z. F. Yang, B. Chen, and S. Ulgiati, "Urban ecosystem health assessment based on emergy and set pair analysis-A comparative study of typical Chinese cities," *Ecol. Modell.*, vol. 220, no. 18, pp. 2341–2348, 2009.
- [22] M. Su *et al.*, "Urban Ecosystem Health Assessment and Its Application in Management: A Multi-Scale Perspective," *Entropy*, vol. 15, no. 1, pp. 1–9, 2012.
- [23] M. Su, Y. Zhang, G. Liu, L. Xu, L. Zhang, and Z. Yang, "Urban ecosystem health assessment: Perspectives and Chinese practice," *Int. J. Environ. Res. Public Health*, vol. 10, no. 11, pp. 5874–5885, 2013.
- [24] M. R. Su, Z. F. Yang, and B. Chen, "Ecosystem health assessment of urban clusters: Method and application," *Procedia Environ. Sci.*, vol. 13, no. 2011, pp. 1134–1142, 2012.
- [25] M. Su, B. D. Fath, and Z. Yang, "Urban ecosystem health assessment: A review," *Sci. Total Environ.*, vol. 408, no. 12, pp. 2425–2434, 2010.
- [26] H. Saarikoski, D. N. Barton, J. Mustajoki, K. H., E. Gomez-Baggethun, and J. Langemeyer, "Multi-criteria decision analysis (MCDA) in ecosystem service valuation," *OpenNESS Ecosyst. Serv. Ref. B.*, vol. 1, no. 17, pp. 1–5, 2015.

1569 GEOGRAPHY AND CRAFTS: GEOGRAPHICAL INDICATIONS FROM SOUTH INDIA***Soumya Vinayan, N. Lalitha***

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1. CONTEXT

Regional products often produced by small producers use geography as an important marker of quality in the realm of trade. The land based qualification conveys to the consumer that the location of the activity is in fact based in the region and is inextricably linked to the characteristics of the product. Geographical Indications (GIs) is such a form of origin labelling used by producers to capture market. Economic assets of the region form core of production and larger the share of such assets, stronger the multiplier effect on the regional economy. India has a sui generis law on GIs (since 1999) which recognises the link between the region (both the natural and human factors) and products; assumes added significance since every region of India has a unique product whether agricultural, foodstuff, textiles or handicrafts. In this paper, based on primary data, the authors focus on three crafts which are registered GIs: Swamimalai Bronze Idols (SBI), Aranmula Mirror (AM) and Pochampalli Ikat (PI).

The most commonly used form of IPR by industrial production which was organised on small scale since the times of trade guilds as early as the 13th century has been the use of marks indicating geographical origins of goods. These indicated that products from a certain region were superior in relation to goods from other regions because of their better quality. The superior quality of the goods were attributed to the natural factors such as climate or geological conditions such as the quality of the soil (Burgundy wine) or to human factors such as skills (Dacca silk), food processing techniques (Frankfurter sausages). In the present day, Geographical Indications (GI) has become a catchword not only among academicians, lawyers and policy makers but also among the general public ever since its inclusion under TRIPS Agreement. GIs have been heralded by the developing countries given its potential to boost rural development, ensure economic returns to stakeholders in the value chain and protect traditional knowledge.

2. THEORETICAL FRAMEWORK

There are several features of GIs which makes it more amenable to be a community right. Unlike other intellectual property rights which are owned by an individual or a single company, GIs are held by a group of producers who maintain the required quality and characteristics of the product within a specific geographic region which is well defined. Moreover, the right cannot be transferred and thus remains within the community of producers as long as the geography-quality link is maintained. The GI products also hold the characteristics of being excludable (if specificities of the products are not adhered to by the produced within the geographic region defined) and that of being non-rivalrous (enjoyment of GI by one does not diminish the enjoyment by the other). Thus, one can clearly discern that 'geography', 'local use of resources' are at the centre of use of GI. These coincide with the objectives of rural development. Rural development approach is a holistic agenda encompassing not only economic progress of the area but also focuses on the socio-cultural cohesiveness of the region. The growing importance of the 'rural' (Warren 1993), the 'terroir' (the French concept) (Barham 2003) and the 'local' (Bowen 2010), in promoting market access of products which are region specific has been widely recognized. In addition, in the era of mass production of commodities across the globe, there is a rising recognition to "protect, preserve, maintain and exploit culture" through legal claims (Coombe 2005). A GI certified product with the strong emphasis on the use of 'quality and local' resources in the making of the product, can reach a specific and sustainable market, which rewards with a premium price and recognition. Thus, the objectives of GI and rural development merge in realising the market potential of local resources through sustainable use. Moreover, the major concern of policy makers across the world is to mitigate out-migration from rural to urban areas especially distress migration and production and marketing of 'rural cultural distinction' has become a catchword in local development strategies (Coombe 2005).

Nonetheless, the registration of GI does not automatically guarantee rural development. The potential benefits are considerable if the following are met: "strong organizational and institutional structures to maintain, market, and monitor the GI; equitable participation among the producers and enterprises in a GI region; strong market partners committed to promote and commercialize over the long term; effective legal protection including a strong domestic GI system" (Giovannucci, D n.d.). She further opines that most often the negative effects arise out of inadequate planning and governance mechanisms. An institutional mechanism which fosters network of relationships (Giovannucci and Claudia 2008) and the level of cohesion in the collective organizing body (Bowen 2010) determine the sustainability of GIs, along with institutional and political context of GI supply chains has been well-established. Tregear et al (2007) also raises the pertinent questions as to (1) who are the actors who get involved in product qualifications and what are their motivations and (2) terms of reference of qualification (code of practice) and its evolution (consultative process, who and what determines exclusion of stakeholders).

This is also reflected in the Indian context. Studies point out that the clusters (agricultural and non-agricultural) engaged in producing regional products has the potential to become IP clusters to show case heritage and traditional knowledge and thus have tremendous scope for rural development through sustainable livelihoods (Das 2009). However, the involvement of middlemen who act as a bridge between communities and market also has the potential to exploit the artisans who may not reap the economic advantage of the GI status as is evident in the case of Pochampalli prints (Das

2009, Vinayan 2013) and the difference in the price paid to the artisans and the final market value of the product disappoints the artisans and discourages the younger generation in pursuing the craft (Gopalakrishnan et al 2007).

In other words, a certification mark like GI, can boost the livelihoods of people associated with its entire value chain, if the different stake holders of the entire value chain is appropriately identified, sensitized and are subject to rules laid out by the producer associations to realize the economic benefits out of the certification mark. Thus, the legal recognition of geographical indications is only an institutional tool through which to address these problems and consequently provide rural communities with the opportunity to valorize their local production and extract rents based on local *savoir faire* (Cerkia 2013). It is on this premise that GIs are considered as a potential tool for promoting rural livelihood.

Given this context, the next section looks at the GI Scenario in India. Following a brief introduction to the legal framework and status of registration, the section proceeds to reflect on three case studies – Swamimalai bronze, Aranmula Mirror and Pochampalli Ikat. The aim here is to delineate and compare the processes and examine how relevant the GI protection is to the producers in terms of access to market and enhancement in economic benefits.

3. GI: THE INDIAN CONTEXT

Until the enactment of the *Geographical Indications of Goods (Registration and Protection Act), 1999* (hereafter GI Act), there was no separate legislation which governed the use of GIs though there have been legal instances under passing off and/or unfair completion (Srivastava 2003). It is important that each GI application by the registered user (Part A) is meticulously followed by filing of (Part B) application for the recognition of authorised user. The Act has been in operation since 2003 and the GI Registry in Chennai has received applications from different categories of goods across India and abroad for registration. The Indian GI Act specifies that the GI tag can be used only by an authorised user in addition to the registered user. An authorized user, as per the GI Act is one who produces the goods in respect of which a GI has been registered. In addition, as per the Indian GI Act, any infringement action on a registered GI product can be initiated only by the registered users.

The number of GI applications filed every year ranges widely. Over the 13-year period 2003-04 to 2015-16, an average of 41 applications has been filed, with a peak of 148 applications in the year 2011-12.⁴⁶³ Compared to 2004, when GI registrations began, 2007-08 and 2008-09 have been the two years when there has been a spike in registration, with 31 and 43 applications filed respectively. Out of 320 registrations with the Indian GI registry as on March 31, 2018, there were 13 products of foreign origin. Of the registered products from India, handicrafts (including textiles) account for 62 per cent of the total products followed by agriculture (28 per cent). Manufactured and food stuff constitute 6 and 4 per cent respectively. Karnataka leads the rest of the states with 39 registrations. Karnataka (12 per cent), Maharashtra and Tamil Nadu (9 per cent), Kerala and Uttar Pradesh (9 per cent each), are the five states in the top three ranks. Rajasthan Marble is the only product that has been registered under the category of natural products.

4. CASE STUDIES⁴⁶⁴

4.1 Swamimalai Bronze

Product and socio-economic context

Swamimalai is located at a distance of 40 KM from Thanjavur and form one of the most famous art forms of Tamil Nadu. The history of Swamimalai bronze icon is several centuries old. The different kingdoms like the Cholas, Pallavas and Pandyas have contributed to the cultural heritage of Tamil Nadu. The art has continued uninterrupted till today, although the 20th century bronzes continue to be copies of the Pallava and Chola figures and have yet to develop an identity of their own. The makers of the SBI are known as sculptors or *sthapathis*. The process of making the SBI is elaborate. There are several processes involved – making of the wax model, wrapping the wax model with sand and clay mixture, burying the sand & clay structure in sand, casting of metal mix on this structure followed by removal of the cast and chiseling of the idol.⁴⁶⁵ A one feet idol would take about 15 to 20 days from the start to finish. Larger idols take more than a month or two. The entire process is done manually. Here, it is to be noted that the entire process is manual. Moreover, most importantly, the soil required for making the bronze idol is a very special kind of alluvial soil, which is available only in the river bed of Cauvery in a kilo meter range from Alavanthipuram to Thimmakudi. University level research undertaken by scholars indicate that the alluvial soil has special binding quality and thus, the GI feature of the Bronze idols lays both in the use of soil and the human skill involved in the making of the idol.

Production Process: Key actors

In the production process, four key actors could be identified. There are around 250-300 SSIs involved in the production of the craft. They either work in their own workshop or in the workshops of other master craftsmen or for the society. Most of them are members of the Cooperative Society, which buys and provides the metals. The large scale idol (LSI) maker is directly involved in the production, procurement as well as marketing of the idols unlike the SSI. The SSIs sell either through the middlemen or through Cooperative society. Poompuhar is the apex society of Handicrafts and Handlooms in Tamil Nadu and is a government enterprise. Poompuhar is also engaged in the teaching, production and marketing of the idols. Thus, there are three marketing channels: (1) Poompuhar (2) cooperatives (3) to individuals

⁴⁶³Based on the information available from the Annual Report 2016-17, The Office of the Controller General of Patents, Designs, Trademarks and Geographical Indications, Ministry of Commerce and Industry Department of Industrial Policy and Promotion, Government of India.

⁴⁶⁴ The case studies are drawn from Lalitha (2014) and Vinayan (2013).

⁴⁶⁵ For more details, see Lalitha (2014)

(against orders – could range from individual customers to institutions such as ISCON, hotel chains like Taj), retail show rooms, utensil shops. The profit margin is thus dependent on to whom the idol is sold. On an average, an artist makes 15 to 20% of the cost of the idol as net income.

GI qualification

The GI application regarding SBI was filed in the year 2006 as belonging to class 6 (common metals and their alloys) and the part A registration took place in the year 2008. The GI application was made by the Development Commissioner, Handicrafts (Ministry of Textiles, New Delhi) and the protection is renewed till 2026. The LSI (who participated in the interview) was involved in the providing information about the filing of the application for GI. With regard to initiatives from local government, it was pointed out that since Swamimalai was declared a heritage town, a fund of Rs. 1.5 crores was set aside for development and some funds from this was also used for the documentation of the GI. Most of the artisans were aware of the fact that SBI has the GI certification, but were clueless regarding the part B registration (authorized users). It was widely felt that the government should undertake workshops/symposium to educate the artisans about the GI certificate its potential. Some of the stakeholders such as LSI were of the opinion that the government should organize all the idol makers together and educate them about the GI certification and its usefulness. Different opinions prevail among the artists about the GI certificate. While the Poompuhar officials felt that GI certificate would increase the sales world-wide, a sculptor cum researcher, who was one of the respondents, was of the opinion that he is indifferent to the GI certificate as it has not made any difference to the artisans. The cooperative society has so far not engaged in any GI awareness spreading activity among the members. Nonetheless, it was pointed out by some artisans that GI can be used to prevent the unauthorized sales. According to the LSI, there are some craftsmen in Thanjavur who make idols and call it as Swamimalai idols. Such persons can be taken to task, if the part B part of the registration – identifying the authorized users of the GI certificate had been done. Similarly, idols made by the Swamimalai idol makers are easily copied by the idol makers elsewhere like the Moradabad idol makers who produce it on mass production basis. Though the Moradabad idol makers do not call their creation as SBI, yet they copy the style of SBI and because of the mass production, they compete with the SBI on price. Hence, though we cannot call this as GI infringement, because they are not sold as SBI yet there is IP violation of copying the designs. This kind of IP violations have not been checked so far, either by the artists or by the government. The respondents also said that there should be a logo for the idols of Swamimalai, which will distinguish it from the idols made elsewhere.

4.2 Aranmula Mirror

Product and socio-economic context

It is mentioned in GI application of the Aranmula Mirror that, about 400 years ago, the chief priest of Aranmula temple, himself a patron of art and craft, brought in a few craftsmen from Sankaran Koil, in Tamil Nadu to make bell metal vessels for the temple. In the process, they made an alloy which when polished shone and reflected like a true mirror. These craftsmen remained in Aranmula and continued making this metal mirror. This mirror is used as one of the eight auspicious items used in religious occasions even today. The combination of making the alloy was maintained as a secret and was known only to this few crafts men. The lineage continues even now. In making the Aranmula mirror, there are no chemicals used and the entire process is manual. It involves three main processes – preparation of the disk (where the clay from the paddy fields is used), preparation of the metal mix and preparation of the outer frame to hold the mirror (see Lalitha N 2014 for more details). Thus, the GI feature of the Aranmula mirror comes from the use of clay from the local paddy fields and in the skill of mixing the tin and copper for the preparation of the metal mix.

Production Process: Key actors

According to the president and secretary of the Parthasarathy Handicraft Society (which was formed to initiate the application), totally there are 17 artisans who are engaged in the making and selling of the Aranmula mirror. The number of producers remains limited since the craft of making the metal mirror is limited only to the two panchayats of Aranmula and Mannupuzhachery, where 9 and 8 producers are located. Out of this 15 are active, of which only two are women. Eight of these are members of the association. Indirect employment potential is therefore those workers who bring the clay from the paddy fields of Aranmula and those who prepare the clay mixture. These techniques are laborious. The other potential scope for employment is with those who make the outer frame and stand. The third important employment potential is with those who make the small carry jewellery case for these mirrors that are stitched in velvet and attractive boxes. The major marketing channels are (1) through individual shops located in the region (2) through Kairali, the state handicrafts emporium (3) to individuals/institutions against order. In this case the economic benefits are dependent on the volume of sales. For the society, the turnover ranged from Rs. 3 to Rs. 3.5 lakhs per month and the net income was between Rs. 25,000 to Rs. 40,000. For individual artisans it ranged from Rs. 1 lakh turnover to Rs. 30000 as net income.

GI qualification

The application for GI was filed in December 2003 and was granted in 2005. All the artisans both from and outside the society were aware of the GI application filing and the outcome. The Parthasarathy society was formed for the purpose of getting the GI certificate with 5 members at the time of application and now has 8 members. Recently, the society also renewed the part A certificate of Aranmula mirror (valid till December 2023). Membership fee for the association is Rs. 50. Apart from this, the society has not built any share capital among the members. The members themselves noted that very less activity takes place in the association in general and nothing particular on GI. The association does not involve

all the people engaged in the craft and is limited to a few individuals was the common refrain. It was also pointed out by the artisans that producers who make authentic mirrors do not reduce the price, but the retail shops near the Aranmula temple reduce the price and sell because they produce lower quality mirrors and hence, they do not agree to form a group. Also these sellers have agents who work for a commission and bring potential buyers to these shops. Interestingly, presently, all those artisans who are engaged in metal mirror making are related to each other and all belong to the vishwakarma caste. The president of the society said though the non-member, his brother and sister make the mirror in a different area, which does not fall in either of the panchayats mentioned in the GI application. But no action is taken because they also belong to the Vishwakarma community and they are all related to each other. The technique of making the mirror is in mixing the metals in the right proportion, which some of the artisans do in secrecy, while the president of the society said, that he does it before his workers. Yet, the technique is not copied by many because the work is laborious.

The secretary of the association said that the state government does not promote the art. He further added that UNDP offered Rs. 15 lakhs to the Association. Rs.5 lakh for documentation and the rest of the money for buying materials and to build common facility centres. This proposal of UNDP was left unutilized as there was no co-operation between the members of the association. One of the reasons for this deadlock was that besides the buying of the materials through the society, the members will also have to sell the mirror through the society at a price fixed by the members. The latter means that everybody will have to fix a uniform price for a mirror based on the size, whereas presently, all the artisans charge their own price. Hence, this proposal did not materialize. GI certificate is displayed and mentioned only by the president in his workshop and others said they mention to the buyers when it is sold individually. Some of the artisans have made a small pamphlet about them and about the art where the GI part is also mentioned and this is kept in the display box of the mirror.

4.3 Pochampalli Ikat

Product and socio-economic context

Ikat weaving has been in vogue in Nalgonda for more than a century, even though there exist ambiguities about the origin of tie and dye weaving in Nalgonda. It appears not to be indigenous to the region but learnt (Dharmaraju 2006). In post-Independent era, cooperative movement picked momentum among weavers and they also entered into silk weaving. This attracted consumers from across the country and Pochampalli developed as a centre of handloom silks in the entire country. However, there has been spate of suicides reported in Pochampalli since early 1990s (Krishnakumar 2001). The reasons were rising costs of raw materials (especially hank yarn), piling up of stock in cooperatives due to inefficiencies in the apex organization the APCO, mismanagement of cooperatives, lack of credit facilities and working capital. Today, there are no such untoward incidents, not because, things have changed for good, but, skilled artisans have changed their vocation (Vadlapatla 2011). There are three basic forms of Pochampalli Ikat, namely: a single ikat, where either warp or threads are tied and dyed prior to weaving; combine ikat, where warp and weft ikat may co-exist in different parts of a fabric occasionally overlapping; double ikat which is by far the most complex from: both warp and weft threads are tied and dyed with such precision that when woven thread from both axis and mesh exactly at certain points to form a complete motif or pattern.⁴⁶⁶ The main products include saris, dress materials and home furnishing. Both silk and cotton yarn are used but the latter mostly in the production of dress materials and home furnishing. The intellectual property of the product lies in the laborious tie and dye method used in the colouring of the yarn. It is the human skill which uses specific designs (though similarities exist in the process for Sambalpur Ikat in Orissa and Patola from Gujarat) that the certification tries to protect. During the Focus Group Discussion, weavers had pointed out that several decades ago, the water from Musi river was used for dyeing but with the pollution of Musi river, the water has been rendered unfit for use.

Production Process: Key actors and their interests

Quintessentially a household industry, handloom sector it has undergone transformations owing to colonial rule and the changes in policy environment during the post Independent era. Today, there are no watertight compartments with regard to organization of weavers. However, they are broadly organized under three institutions – co-operatives, master weavers and independent weavers. Under these institutions, there are two kinds of working systems (except independent weaver) – putting out system (household) and karkhana system (shed). In case of ikat weaving in Pochampalli, the karkhana system is not widespread. It is still predominantly a household level of organization. There are master weavers who employ 10-15 weavers, but basically, the weavers undertake tie and dye at home since it is a highly skilled work. Even in case of cooperative weavers, only the yarn is supplied by the cooperative, the tie and dye of colour is done at the household level by the individual weavers and their family. Moreover, there are ‘independent’ weavers who usually procure yarn at the market, undertake tie and dye, weave; but sell the finished product to the traders. The rise of weaving outside the home is a recent phenomenon and shows the crisis in the industry remarked the master weavers and cooperative officials during interaction. The main raw materials involved in production are: yarn – silk and cotton. In Pochampalli, there are three main sources of raw material for silk yarn: State Department of Sericulture (SERIFED), Karnataka Silk Board and private traders in Karnataka (Bangalore, Mysore) and Andhra Pradesh (Dharmavaram, Hindupur). KSB has sales depot in Pochampalli next to the cooperative society. The cotton hank yarn used by handlooms is procured through National Handloom Development Corporation (NHDC) in Hyderabad and also private traders in Hyderabad. NHDC is the main source of procurement of raw materials for cooperatives which provide

466 For a detailed account of the process of production refer Journal 2, Geographical Indications Registry, Chennai, pp. 3-6 (<http://ipindia.nic.in/girindia/journal/2.pdf> accessed on October 5, 2012)

it at a subsidized rate. Chemical dyes and colours are sourced from traders in Secunderabad while Zari is obtained from Surat and Pune. There are around 65 master weavers in and around Pochampalli who form the association Pochampalli Handloom Tie and Dye Manufacturers association. Within and outside cooperative sector there are around 2000 weavers in and around the villages of Nalgonda and Warangal who are still actively dependent on the handloom weaving as the major source of livelihood though the number has drastically reduced over the years. The major marketing channels are (1) Cooperative (2) shops of master weavers/traders. The individual weavers earned between Rs. 2000-Rs. 4000 per month (for around 6 saris). This would vary across weavers depending on the design and use of zari. The traders often impose a markup of 15-40% depending on the season (marriage, festivals) whereas irrespective of rising cost of raw material or working capital delays, the cooperatives only impose a markup of 12% on the production cost.

GI qualification

In the case of Pochampalli too, interestingly, the initiative for GI registration, like in case of Swamimalai did not emerge out of the producers i.e. weavers. In fact, the entire process of registration was facilitated under the Cluster Development Programme (CDP) of the Textiles Committee, Government of India. The Regional Office which overlooked the CDP took the lead to sensitize the stakeholders about the GI Act. To facilitate the process of registration, the Textiles Committee roped in the services of Andhra Pradesh Technology Development and Promotion Corporation (APTDC) which houses the IPR Cell of Confederation of Indian Industry (CII). In fact, the major role played by APTDC was to translate the technical information about the Pochampalli Ikat weaving into legal language. They had engaged Anand & Anand (located in New Delhi), legal consultants, to facilitate the legal process of registration. APTDC also succeeded in involving National Bank for Agriculture and Rural Development (NABARD) which had borne the costs of filing the application (around Rs. 1.5 lakhs). In fact, in order to cultivate the sense of ownership among weavers, NABARD had suggested a part of the costs to be borne by the weavers. Nonetheless, since this was a pioneering initiative and the first product to apply for registration from textiles sector, NABARD funded the entire costs – to apply under 3 classes – 24, 25, 27. NABARD has borne all the costs inclusive of expenses of workshops, meeting of the GI consultative group from the Registry, legal fees and other miscellaneous expenditure. Textiles committee had identified Pochampalli Handloom Weavers Cooperative Society (PHWCS) and Pochampalli Handloom Tie & Dye Manufacturers Association (PHTDA) as applicants for the registrations and this was conveyed to APTDC. There have been series of workshops conducted for the weavers on sensitizing them about the relevance of GI. The application was moved in December 2003 and granted in 2004.

The most important part of post-GI activities for registered products in the Indian context is registration of producers under Part B of the Act. In case of Pochampalli Ikat, only PHTDA had moved the application for registration under Part B in mid 2009 and was granted the certificate in August 2011. However, it is to be noted here that the certificate has been issued to the PHTDA and not to the individual members or the weavers working under them. The other major event that succeeded the registration was the setting up of Pochampalli Handloom Park. Given the networking during the GI registration, several entrepreneurial weavers in Pochampalli formed an association and registered a company called Pochampalli Ikat Weavers Private Limited. Located about 10 kilometres away from Pochampalli Village in Nalgonda, in Kanumukkala Village, the Park has is situated in 24 acres of land with an outlay of Rs. 47 crores. Initially the consortium consisted of 28 members (Textiles Committee 2007) and now it stands at 36 promoters who run the management of the Handloom Park. It is a joint initiative of the local entrepreneurs, State and Central Government and Textiles Committee. Under the Cluster Development Programme of the Textiles Committee this initiative was encouraged. The capital for the project was raised by the members through short term and long term loans and later by Infrastructure Finance & Lending Services Limited (IF & LS) was hired to execute the project. Nonetheless, even after 5 years of establishment, their greatest constraint is working capital. It was also noted that the awareness about the GI registration was abysmally low even among weavers who were working under the registered proprietors namely the PHWCS and PHTDA. This is alarming given the fact that the survey took place almost a decade after filing of application and the registration was due for renewal (by 2014). The FGDs with weavers in various locations (Revanpally, Jangam, Vellamla, Koyalagudem HWCS, Yellanki HWCS) indicated that while weavers were aware of the fact that there were negotiations to ‘patent’ the product, they are neither aware of the details nor were they aware that GI and patents were different conceptually.

5. 0 IMPLICATIONS FOR PROMOTING RURAL LIVELIHOODS

It is evident from all the three case studies that ‘local’, ‘terroir’ is deeply embedded either in the form of use of natural resources (such as clay) or human skill (craftsmanship either in weaving or making of handicrafts). Nonetheless, all the three case studies throw interesting facts about qualification through GI and its implications for promoting rural livelihood. While there is no doubt that there is inextricable link between geography and quality of the product, the valorisation methods differ (from use of local natural resources to traditional knowledge transferred over generations) and there has been practically no addition or improvisation due to GI registration.

The following table summarises the highlights of the three case studies discussed above.

Particulars	Swamimalai Bronze Idols	Aranmula Mirror	Pochampalli Ikat
Socio-economic factors			
Approximate number of artisans	200-500	15-20	2000-2500
Employment Potential	High	Low	High
Main Source of Livelihood	Yes	Yes	Yes
Interest of Younger generation	No	Yes*	Yes (mostly in trade)
Production related			

Use of Machinery	None	None	Low (for sizing of yarn, hand-made looms)
Volume of Production	Low	Low	High
Raw materials	Available	Available	Available
Skilled Labour	Yes	Yes	Yes
Market Related			
Domestic Market	High/Seasonal	High/Seasonal	High/Seasonal
Export Potential	High	High	High
Promotion of the Product	Self	Self	Self/State
Distribution	Self/Government	Self/Government	Self/Government /Trader
Economic benefits to the producer	Varies by artisan		Varies by design
Competition	High	Low	High
GI Related			
Use of GI	No	Yes	No
Logo for GI	No	No	Yes, but by Handloom Park
Application moved by	Central Government Agency	Association of producers	of Association of producers
GI Awareness	Low	Low	Low
Authorised user	No	No	Not used
GI Factor	High	High	Medium (Ikat weaving prevalent in other parts of India)
Economic benefits due to GI	Not achieved	Not achieved	Not achieved

Source: Compilation by Authors Note: *The average age of the present artisan would be around 35. But as of now they are unsure of their children engaging in the craft because of the nature of the work.

The socio-economic context of the three products clearly varies as evident from table above. The employment potential of the primary producers by itself is high in case of SBI and PI whereas the craft remain the major source of livelihood for all the artisans. The lack of innovations and profit margin coupled with other opportunities of employment has weaned away younger generation, but in case of Ikat it could be observed that younger generation was actively involved in marketing and trade. Moreover, minimum use of machinery make the crafts a sustainable method of livelihood based on local resources. Though over time, dependency on raw material (yarn or metals) have become commercialized, there is still a strong link between geography and the human skill involved in the production of all the three products under study. In case of Ikat, the process of tie and dye has been acquired and the technique is prevalent in different parts of India (notably in Orissa and Gujarat) and this poses a serious problem in highlighting the authenticity of the product. Nonetheless, producers, regular customers and experts can differentiate between the different types of Ikat based on geographical origin though there has been no in-depth study undertaken to distinguish these in the wake of GI certification. Here it should be noted that Sambalpur Ikat has already been registered as GI in India. Domestic market is seasonal but high for all products. Because of the uniqueness of the product, the export potential too is high though the volume of production varies. The promotional and distribution activities are solely the responsibility of the producers though occasionally as part of tourism promotion, Aranmula and Ikat are promoted by the state government agencies. The economic returns depend on the artisans and designs and also vary as per the specifications and profile of the buyer. Given the demand of these products owing to its uniqueness, there exist high competition from similar products (Moradabad idol makers, low quality mirror makers in Aranmula and elsewhere, imitation of ikat weaving by powerlooms and mills). Thus, protection of the craft through qualification is justified in terms of socio-economic context, uniqueness of product, and competition in the market. These could have been achieved with systematic efforts to identify the production chain/authorized users.

Nonetheless, the GI certification though registered as per the legal framework, was not put to potential use in case of all the products covered in this paper. In case of Swamimalai Bronze, the Development Commissioner (DC), Handicrafts (Ministry of Textiles, New Delhi) is the registered proprietor. The application had mentioned establishing an inspection body with representatives from Regional Director of DC, Chennai; Crafts Council of India; Handicrafts NGO; National Institute of Design; non-official members associated with art and craft. Thus, it was neither a territorial, sectoral or marketing strategy by an individual firm rather a policy initiative by the central government in charge of handicrafts. In case of Aranmula mirror, the application was moved by an association which was set up only for the purpose of registration and the initiative for this initially came from non-practitioners of the crafts.⁴⁶⁷ In this case, while it can be perceived as a sectoral strategy (since the number of artisans involved is very less), there has been clearly little or no collective action since there exist conflict of interests between members and non-members of the society. Even within the members of the society it was pointed out that there has been practically no discussion on GI either about drawing a code of practice or that of use of GI as a marketing strategy. The GI certification is displayed in the premises of the society but the non-members neither use it nor promote it. There was clear mistrust evident between different stakeholders. Thus, it could be seen as part of a marketing strategy pursued by some individuals who are willing to be part of the society through membership. In case of Pochampalli Ikat, though the initiative came from the quality control body at the Central level through its territorial development programme for textiles (under the Cluster Development Programme), it was the

⁴⁶⁷ See Lalitha 2014 for more details.

producer organizations which were the registered proprietors both from within the cooperative and outside cooperative sector which dominate the production process. Moreover, the role of the Textiles Committee seem to be more of a facilitator in identifying potential proprietors, funders, legal experts and other stakeholders. Nonetheless, the level of cooperation, trust and linkages between the two registered proprietors has been weak. While the private manufacturers association had obtained the authorized user certification under the Part B of the GI Act, the PHWCS remained unaware of it. In addition, the Handloom Park was unable to procure the authorized user status under the legal framework since the conflict of interest between them and the registered proprietors could not be amicably solved. Nonetheless, the initiative could be termed semi-territorial, semi-sectoral strategy and has potential for further promoting livelihood since large number of artisans are involved and the domestic and export potential of the product is high. Nevertheless, except at the behest of the Handloom Park, there has been no initiative under these proprietors to engage in brand building through use of certification or use of logo for certification.

In all the three case studies, specific to Indian context, the craft has diverse forms of organization of production. It should also be noted that in case of Aranmula Mirror, Swamimalai Bronze and Pochampalli Ikat, it is predominantly dominated by specific caste – Vishwakarma in case of the first two and Padmashalis in case of the third. While kinship can be a binding force promoting cooperation (facilitating terms of credit, supply of raw materials, marketing) it can also lead to conflict of interests. The artisans in case of Aranmula mirror categorically pointed out that they would oppose if the craftsmanship is taken up by other caste groups while the major bone of contention with Handloom Park by the weaving community is that they impart training in learning of the process of tie and dye and weaving outside the specific caste. Even in case of Swamimalai Bronze, they face stiff competition from producers in Thanjavur and Moradabad. Moreover in all three cases one could observe differences in scale of production (from small scale producers to large scale producers; cooperative versus private producers; those with huge turnovers and proper institutional mechanism from procurement of raw material to those who are dependent on external sources raw material and marketing and sell only their labour). However, 'tradition' remains an important component which would motivate different actors to be brought together and this was evident across all the three case studies. But it is not enough to promote a rural development strategy and there is need to educate the actors about the potential of collective action through qualification perhaps as an important marketing strategy which would generate rent.

In other words, lack of an institutional mechanism, which overlooks the production along various stakeholders in the supply chain, can be seen as the reason for non-use of GI in the case studies presented. There has been no effort at the level of producers to draw up a code of practice which specifies description of the product, physical, scientific; details about ingredients and raw materials; defining the process of production; demonstration of the specific quality linked to GI; demarcation of the geographic production area; labeling rules and verification and monitoring mechanism to ensure standardization. These aspects would add to the credibility of the product and sales/marketing through authorized sources alone would have also ensured in reaping economic benefits by the artisans. The case in point is the Darjeeling Tea. The entire tea produced by the recognized tea gardens (which if formed into an association of producers) is sold only through one particular channel (also easily identified through the Darjeeling Tea logo) and hence the leakage is avoided and the standardization of quality is ensured. In addition, unlike in case of European Union or Thailand, there is no logo for GI products from India except the individual logos like that of Darjeeling Tea or Kota Doria. In other words, a governance mechanism which overlooks the supply chain is a pre-requisite for the successful use of GI.

CONCLUDING REMARKS

In this paper, through case studies from India which are registered Geographical Indications, we have tried to look at the implications of such qualifications (for non-agricultural products) on rural livelihoods. It is evident from case studies that the implications are mixed. Human skills along with geographic factors play an important role in creation of reputation. De-limiting production to a geographic region, thus, becomes challenging since perhaps over centuries informal rules controlled the relations of production. The case studies point out that while the uniqueness attributed to the product are exclusively based on human skills for PI, in case of SBI and AM, use of soil, from local river bed and paddy fields (respectively) form core of production process. Irrespective of this, the reputation of PI as unique to the region remains intact since regular customers distinguish between the diverse types of Ikat (for example Sambalpuri, Patan Patola) produced in different geographical locations. While, the employment potential is high in case of PI and SBI; the practitioners were limited to (15-20) in case of AM (but remain major source of livelihood for all three products); and the economic returns varied depending on the skills of the artisans and designs both in domestic and export markets. The uniqueness of the products has led to competition from similar products - Moradabad idol makers (SBI), low quality mirror makers (AI), imitation of ikat by powerlooms and mills. Despite these, there has been no use of GI tag as marker of authenticity. This could be attributed to the GI registration being moved by or facilitated by an external agency (SBI and PI respectively) and thus, the producers (even after a decade of registration and renewal) are neither aware nor are informed of potential benefits. Rather, qualification and its ownership have led to conflict of interests among various stakeholders. In this context, it is also pertinent to point out that Part B of the Indian Act pertains to registration of authorized users of products in addition to registered proprietors Awareness about this Part of the Act remain abysmally low. In the case studies mentioned, only Pochampalli Ikat has been awarded under Part B. Even in this case it was awarded to one of the registered proprietors and it has not been awarded to individual producers under the association or the weavers who work under the member master weaver/ traders. The case studies indicate that origin qualification pre-dates the legal framework and poses serious challenge in re-organising the supply chain. Thus, identifying the products, establishing code of practices focusing on the region and quality link which in turn is supported by an

institutional mechanism to overlook the implementation and use of qualification remain the need of the hour in turning the economic assets of the region into a viable tool for sustaining rural livelihoods.

REFERENCES

- Barham, Elizabeth (2003) 'Translating Terroir: The Global Challenge of French AOC labeling', *Journal of Rural Studies*, 19 (1): 127-138.
- Bowen, Sarah (2010) 'Embedding Local Places in Global Spaces: Geographical Indications as a Territorial Development Strategy', *Rural Sociology*, 75 (2): 209-243.
- Cerkia, Bramley, Estelle Bienabe and Johann Kirsten (2009) 'The Economics of Geographical Indications: Towards a Conceptual Framework for Geographical Indication research in Developing Countries', in *The Economics of Intellectual Property: Suggestions for Further Research in Developing Countries and Countries with Economies in Transition*, Geneva: WIPO (Available at http://www.wipo.int/export/sites/www/ip-development/en/economics/pdf/wo_1012_e.pdf#page=121, accessed April 20, 2014).
- Coombe, Rosemary J (2005) 'Legal Claims to Culture in and Against the Market: Neoliberalism and the Global Proliferation of Meaningful Difference', *Law Culture and Humanities*, 1 (1): 35-52 (Available at <http://lch.sagepub.com/cgi/content/abstract/1/1/35> accessed on July 27, 2014).
- Das Kasturi (2009), 'Socio Economic Implications of Protecting Geographical Indications in India', Centre for WTO Studies, New Delhi (Available at http://wtocentre.iift.ac.in/Papers/GI_Paper_CWS_August%2009_Revised.pdf accessed on April 20, 2014).
- Dharmaraju, P (2006) 'Angara and Koyyalagudem: Marketing in Handloom Cooperatives', *Economic and Political Weekly*, 41 (31): 3385-3387.
- Giovannucci, Daniele (n.d). Geographical Indications - Approaches and Value. (Available at http://www.ico.org/event_pdfs/gi/presentations/Giovannuccitxt.pdf, accessed on January 7, 2015).
- Giovannucci, Daniele and Claudia Ranaboldo (2008) 'Markets and Geographical Indications of Origin: Synthesis of Terra Madre Gathering and E-Forum', Monograph for RIMISP.
- Gopala Krishnan, Prabha Nair and Aravind Babu (2007), 'Exploring the Relationship between Geographical Indications and Traditional Knowledge-An Analysis of the Legal tools for the Protection of Geographical Indications in Asia', International Centre for Trade and Sustainable Development, Switzerland.
- Krishnakumar, Asha (2001) 'Silence of the Looms', *Front Line*, 18 (8), April 14-27.
- Lalitha, N (2014) *Socio-Economic Implications of Protecting Handicrafts Through Geographical Indications - A Case Study of Selected Products from Southern States*, Report submitted to Indian Council of Social Science Research, New Delhi.
- Moran, Warren (1993) 'Rural space as intellectual property', *Political Geography*, 12 (3): 263-77.
- Srivastava, Suresh C. (2003). Geographical Indications and Legal Framework in India. *Economic and Political Weekly*, 38 (38), 4022 - 33.
- Textiles Committee (2007) 'Pochampally Ikat: A Comparative Market Analysis for Pre & Post GI Registration Period', Mumbai: Textiles Committee (Available at <http://wtocentre.iift.ac.in/UNCTAD/01.pdf> accessed on May 10, 2012).
- Tregear, Angela, Filippo Arfini, Giovanni Belletti, Andrea Marescotti (2007) 'Regional foods and rural development: The role of product qualification', *Journal of Rural Studies*, 23(1): 12-22.
- Vadlapatla, Sribala (2011) 'Pochampalli weavers look for other jobs', *Times of India*, December 28, 2011 (Available at http://articles.timesofindia.indiatimes.com/2011-12-28/hyderabad/30564624_1_weavers-powerlooms-designs accessed on June 24, 2013).
- Vinayan, Soumya (2013) *Socio-economics of Geographical Indications in the Indian Handloom Sector: A Case Study of Pochampally*, Report submitted to Indian Council of Social Science Research, New Delhi.

SS10.4. Rural Transformation

1630 ECONOMIC GROWTH BEYOND BORDERS: AN ANALYSIS OF RURAL TRANSFORMATION FROM VILLAGES IN UGANDA TO THE BLACK BELT IN THE UNITED STATES

ABSTRACT

In order to meet the social and economic challenges of the modern era, rural economies are evolving. Globalization and sheer necessity have forced many communities to end an overreliance on agriculture and enhance agribusiness systems. From Africa to the North America, efforts are underway to transform rural economies by expanding infrastructure, improving living standards, and diversifying production. In the South Western and Central regions of Uganda, agriculture is the main sector of employment for households. The Uganda Bureau of Statistics estimates that about 72 percent of all Uganda’s working population is employed in agriculture. Much of Uganda’s rural transformation was built on agricultural income growth that benefited poor households. According to the World Bank, poverty reduction among households in agriculture accounts for 79 percent of national poverty reduction from 2006 to 2013. The Black Belt is a region of the Southern United States where rural communities have historically faced acute poverty because of the area’s relative isolation and lack of economic development. According to the 2000 U.S. Census, the 11 states that make up the Southern Black Belt have a combined rural poverty rate of 18.7 percent, translating into almost 1 in every 5 rural residents living in poverty. Population decline in rural areas, inadequate education programs, low educational attainment, poor health care, urban decay, substandard housing, and high levels of crime and unemployment have become hallmarks of this chronically underfunded and marginalized region. This mixed methods research examines the impact of agriculture and non-agricultural activities on rural development in parts of Uganda and the United States. Through statistical and document analyses, as well as interviews and observations, this study seeks to ascertain the methods, programs, and investments necessary to promote economic independence and global interdependence among rural communities. A two-phase triangulation design is used to set appropriate quantitative and qualitative parameters and examine specific phenomena to determine if findings from disparate data sets converge upon a single understanding of the investigated research problem. During the first phase, quantitative and qualitative methods were given equal priority and all data were collected simultaneously but analyzed separately. As part of the second phase, results from data analysis efforts were examined, combined, and interpreted to determine a convergence or divergence of certain ideas. By employing a panel data model consisting of portions of select states that make up the Black Belt region in the United States observed over a fifteen-year period from 2000 through 2015; and examining statistical data from the South Western region of Uganda, this study seeks to determine the economic impacts of agribusiness and public or private investments on rural economies. Preliminary results from assessments of these different data points suggest best practices from the two countries can have a significant impact on rural communities in both regions.

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1646 FARMING TOOLS AND PRACTICES AMONG SMALL AND MARGINAL HOLDINGS

ABSTRACT

Farm mechanization is a symbolic representation of transformation from traditional method to modern way of farming. In labour intensive countries, like ours, consideration of mechanization covers incorporation and utilization of improved tool, implement, machinery in enhancing workers’ efficiency and output, substituting human labor, minimizing drudgery and enhancing productivity and safety at work. However, various studies indicate input variables and approaches referring to the state of mechanization in a particular farming sector, broadly into three categories, such as machinery utilization, economic analysis and human energy expenditure. These approaches have not yet been adequately addressed for the small and marginal farm holdings that primarily depend on the conventional tools, methods and practices. Various mechanization indices that have been developed carry minimal utility among the small and marginal farm holdings. This study explores energy demand of the farmers from small and marginal holdings and elucidates their activity patterns in different crops and seasons. **Methods** - The study involved compilation of information of multiple methodological steps, covering methods of deriving mechanization status, production and energy use data from agricultural agencies, as well as generation of data from field based survey from selected regions of eastern India. Two primary crops, i.e. paddy and potato which are predominantly cultivated in the region were taken as sample crops for analysis. Field study allowed to gather data of different cropping activities, methods and tools applied, man power utilization in different activities, etc. **Results** - The studied farming areas have severely fragmented holding, limited resources and the farmers remain constrained to age-old manual methods. Overall the severity of work and energy demand of these farmers were classified as moderate to heavy in nature. Data on manual energy use pattern were further correlated with the land use and productivity over the farming seasons, indicating that the small farmers are more strained to that of mechanized sectors. Accordingly, an index of work output to energy demand with respect to the selected crops is proposed in this contribution, which may be useful for comparison of the holdings of similar dimension.

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SS11.1. The future of leisure: tourism, mobility and transportation

1039 TOURIST-LED REGIONAL DEVELOPMENT IN INDIA: DETERMINANTS AND IMPLICATIONS

ABSTRACT

Globalization has led to an increase in the number of visitors from foreign destinations to various parts of the world. Tourism is an important service sector growth in developing economies such as India. There are several world class tourist locations in India such as: Taj Mahal in Agra, Forts and Monuments in Jaipur, beaches in Goa, temples in Kanyakumari, and backwaters of Kerala, Ajanta and Ellora caves in Maharashtra, and tea estates in Darjeeling. These tourist locations generate foreign exchange earnings as well as income and employment to the local population from tourists who contributes to the demand for goods and services like hotels, food, local transport and shopping centers. Tourism enhances rental income and land prices in the tourist centers. They have potential for fostering regional development and can minimize geographical inequalities among leading and lagging regions. Eco-tourism and hill station development are strategies of regional development for fostering tourism-led development in India. This entails conservation of flora and fauna, development of basic infrastructure, decentralization of accommodation facility, and increasing number of affordable hotels. Given this overview the purpose of this research is to address the following four research questions: (1) What are the trends of tourism in India during the past decade (2003-2013)? (2) What are the determinants of tourist-led-regional development in India? (3) Can tourism-led-development lead to decrease in regional inequality in India? and (4) Can a typology of geographical tourist enclaves be identified in India? This research will employ a mixed methods approach to identify the determinants of tourist development in India at the regional levels. Data will be collected from the following documents from the year 2003-2013 from: Indian tourism statistics and indicators for socio-economic development variables will be collated from Statistical Yearbook of India, and Selected SocioEconomic Statistics of India. Secondary data from these sources will be put in excel format which will be used for mapping trends, converting data into shape files which can be read by a geographical information system (GIS) software such as ArcGIS and for preparing maps and conducting statistical analysis. These maps will reveal spatial changes and the data will be utilized to run exploratory data analysis. Further regression and spatial regression approaches will be used to identify determinants of tourist-led- regional development and rural-urban variations in tourist development in India.

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1202 IMPACT OF TOURISM INDUSTRY ON INDIAN ECONOMY: AN ANALYSIS OF GULMARG AND PAHALGAM TOURISM CENTERS IN JAMMU AND KASHMIR STATE

ABSTRACT

It is general perception about tourism industry that it is a social and cultural exchange activities sector but it has been changed at very large extent in many respects in the era of globalization because diverse tourists activities have been increased across the countries which led to increase inflow of tourists and revenue. Both developed and developing countries are injecting huge investment in tourism industry. Therefore, it becomes a largest and fastest growing industry of the world. The present study has estimated impact of tourism industry on Indian economy at macro level by using time series data of post reforms period and found that foreign exchange receipts from the tourism industry significantly contribute to gross domestic product, employment and infrastructure in terms rail, road and civil aviation . This study has also selected and Gulmarg and Pahalgam tourism centers at micro level in Jammu and Kashmir state on economic, natural and political grounds and found that tourism sector contributes more than three-fourth share to the revenue of the state at the time of independence but political condition in the state become worst and had severely affected tourism industry which has put adverse effect on peace, employment generation as well as the GDP of the State during last four decades. Both central and state governments are trying to establish tourism industry as main occupation for the generation of employment to the growing unemployed population of the state in the last few decades resulting the tourism industry in the state again emerged as a growing Industry. This study investigated the impact of tourism industry at micro level by using primary data and found that there is a positive impact on the income, employment and infrastructure development in tourist center Gulmarg and Pahalgam.

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1112 WELLNESS TOURISM PARTICIPATORY GOVERNANCE: A COMMON POOL RESOURCES APPROACH

ABSTRACT

The global growth currently observed in wellness tourism (Yeung and Johnston, 2015) opens opportunities for development of rural areas where resources for the attractiveness of these travellers can be found. As Smith and Diekmann (2017) systematize, natural assets, landscapes or local cultural values complement the spa-related services based on thermal water to fulfill their needs and motivations. The region of East Hokkaido has the resources to undertake innovative initiatives within this tourism segment, as observed by Romão et al. (2017) and acknowledged by an official report (Government of Japan, 2017). These resources can be framed within the concept of “Common Pool Resources”, usually indivisible and with boundaries difficult to delineate, and characterized by subtractability and nonexcludability (Briassoulis, 2002). Problems of overuse, degradation, lack of incentive for preservation or unequal appropriation of benefits often emerge (Dietz et al., 2003). A strategy of diversification of wellness tourism services oriented to regional sustainable development implies sustainable use of territorial resources, socio-economic benefits for local communities and participatory management process, involving the relevant stakeholders: accommodation and spa-service managers, institutions in charge of natural parks, cultural and educational facilities, and representatives of local residents, including indigenous Ainu communities, whose cultural values can contribute to differentiate the destination (Romão et al., forthcoming). In this paper, a governance model based on the principles for governing sustainable resources proposed by Ostrom (2008) is proposed, implying definition of boundaries, equivalence between benefits and costs, collective-choice arrangements, systematic monitoring and mechanisms for conflict resolution. This governance model considers international guidelines for utilization of natural and cultural resources in tourism (UNWTO, 2001; UNESCO, 2013), along with coordination with Destination Management Organizations being implemented in accordance to national policy guidelines. These guidelines point out wellness services, natural resources and cultural as tools for economic revitalization of rural areas in Japan (Government of Japan, 2013 – 2016).

References:

- Briassoulis, H. (2002) Sustainable tourism and the question of Commons. *Annals of Tourism Research*, 29 (4): 1065–1085.
- Dietz, T., Ostrom, E. and Stern, P.C. (2003). *The Struggle to Govern the Commons*. Science, 302: 1907-1912.
- Government of Japan (2013-2016) *Japan Revitalization Strategy*. Government of Japan, Tokyo.
- Government of Japan (2017) *Recommendations for revitalizing spa areas making use of regional resources such as nature*.
- Ministry of Environment of Japan, Tokyo. Ostrom, E. (2008) *The challenge of Common-Pool Resources*. *Environment*, 50(4):8-21.
- Romão, J., Machino, K. and Nijkamp, P. (2017) *Assessment of Wellness Tourism Development in Hokkaido: A Multicriteria and Strategic Choice Analysis*. *Asia-Pacific Journal of Regional Science*. 1(1), 265-290.
- Romão, J., Machino, K. and Nijkamp, P. (forthcoming) *Integrative diversification of wellness tourism services in rural areas: An operational framework model applied to East Hokkaido (Japan)*
- Smith, M.K. and Diekmann, A. (2017) *Tourism and wellbeing*. *Annals of Tourism Research*, 66: 1–13.
- UNESCO (2013) *Managing Cultural World Heritage*. UNESCO, Paris.
- UNWTO (2001) *Global code of ethics for tourism*. UNWTO Madrid.
- Yeung, O. and Johnston, K. (2015) *The global wellness tourism economy report 2013 and 2014*. Global Wellness Institute, Miami.

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SS11.2. The Future of Leisure: Tourism, Mobility and Transportation

1127 TOURISTS' IMPORTANCE AND SATISFACTION EVALUATION: THE CASE OF SELECTED TREKKING ROUTES OF KUMAON HIMALAYAS, UTTARAKHAND, INDIA

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INTRODUCTION

There is growing evidence that customer satisfaction is a driving force behind firm's business competitiveness and performance (Parasuraman et al., 1985, 1988; Zeithaml et al., 1996). This is absolutely true in the case of tourism, where there is a wide application of concepts, models and tools aimed to evaluate customer satisfaction. It is recognized in fact that, in order to identify the strengths and the weaknesses of a tourist destination and to improve its competitiveness, it is essential to "listen to the customer". Satisfaction is commonly considered the best indicator of the state of health of tourism, an industry that is difficult to evaluate in quantitative terms. Satisfaction, even for tourism, as well as for other industries, is also directly linked to the loyalty of "clients" and, therefore, to the sources of competitive advantage.

Tourist satisfaction essentially indicates the result of relationship between tourists' expectations about the destination based on their previous information and image of the destination (pre-travel expectations) and their assessment of the outcome of their experience (post-travel experiences) at the visited destination (Pizam, Neumann, & Reichel, 1978; Neal & Gursoy, 2008). It is a feeling generated both by cognitive and emotional aspects of tourism activities, as well as an accumulated evaluation of various components and features of the destination visited (Wang, Zhang, Gu, & Zhen, 2009). As tourist satisfaction influences tourists' behavioural intentions and plays a vital role in destination competitive advantage, it has attracted many academicians' interest and a large number of studies have focused on this aspect with regard to various tourist destinations throughout the world (Pizam et al., 1978; Baker & Crompton, 2000; Kozak & Rimmington, 2000; Yoon & Uysal, 2005; Wang & Qu, 2006; Cracoli & Nijkamp, 2008; Alegre & Garau, 2010; Chen & Chen, 2010; Marcussen, 2011)

Although there is a wide array of literature on mass tourism satisfaction analysis and destination management, documenting importance and satisfaction among trekkers, nature-based and adventure tourists is limited. Moreover the Uttarakhand State of India has received poor coverage in literature, despite having the excellent tourism attractions. Hence this paper adopts the trekkers'/ecotourists' perspective and it proposes the Importance-Performance (IPA) as a tool for evaluating trekkers' satisfaction levels arriving at selected trekking routes of Kumaon Himalayas, Uttarakhand. Information on the importance and performance of destination attributes in overall tourists' satisfaction enable recommendations on improving the quality of tourism offerings and services of the trekking routes and better management of the services provided to the trekkers visiting the areas. The present study contributes in the area of trekkers'/nature-based tourists' satisfaction by providing an empirical relationship between the performance of destination attributes and overall tourist satisfaction.

LITERATURE REVIEW

Enhancing tourist satisfaction is one of the primary functions of tourism destination and a prerequisite for the development of strategies leading to destination's improved attractiveness and competitive positioning (Dmitrovic et al., 2009). Although tourist satisfaction is a personal judgment, the understanding of tourists' satisfaction is necessary forevaluating the performance of destination, improving products and services offered, promoting tourism offerings effectively to target markets, gaining better destination image, and determine repeat visits and predisposition for recommending the destination to others (Kozak & Rimmington, 2000; Yuksel, 2001; Yoon & Uysal, 2005; Chi & Qu, 2008; Meng et al., 2008). Satisfied tourists normally recommend better tourist destinations to others or express their appreciation about the destination and are keen to visit again and vice-versa (Baker & Crompton, 2000; Kozak & Rimmington, 2000).

Interests in the application of consumer satisfaction to tourism research dates back to the 1970s (Pizam, Neumann and Reichel 1978), and the literature has grown considerably in recent years (Bowen 2001; Kozak 2001; Master and Prideaux 2000; Millán and Esteban 2004; Wong and Law 2003). Current literature has indicated that measuring and managing tourist satisfaction is critical to the sustainability of a product, an attraction, an activity or a destination (Sirakaya et al. 2004). Many tourism scholars (Hwang, Lee and Chen 2005; MacKay and Crompton 1990) have applied the service quality (SERVQUAL) model, developed in the management field (Parasuraman, Zeithaml and Berry 1988), to measure tourism satisfaction. However, satisfaction is generally deemed to be more affective or emotional than quality or cognitive (Iacobucci, Grayson and Ostrom 1994). Satisfaction is also distinct from either price or value, in that they might equally exist without an intimate structural interdependence (Bowen 2001).

The context of this study is nature-based tourism and trekking therefore findings from studies conducted in natural areas are briefly summarized here. Bowen (2001) measured satisfaction of a small group of tourist to Malaysia's Taman Negara National Park. He applied other theories relevant to management (services marketing) including performance, attribution, emotion and equity, and concluded that tourist satisfaction consists of a multitude of parameters and no single parameter would fully explain tourist satisfaction. Satisfaction level o backpackers with different attributes of accommodation in Youth Hostel was studied by Nash (2006), where levels of satisfaction exceeded the levels of importance attributed to the range and quality of facilities.

As noted earlier, research on nature-based tourists' satisfaction is very limited. This research applies the "importance-performance" construct in measuring the discrepancy between pre-travel importances attributed to lodge-related services and facilities, and perceived satisfaction level after the travel experience in selected trekking routes of Bageshwar District of Uttarakhand. The focus of the study was to identify key areas of satisfaction and concerns that tourists expressed regarding their overall trip and services received in the trekking routes under study.

OBJECTIVES

- + To evaluate nature-based tourists'/trekkers' importance and satisfaction levels at Pindari, Sundherdunga and Kafni trekking routes of Bageshwar district of Kumaon Himalayas, Uttarakhand with the help of IPA or Importance-Performance analysis.
- + To identify key areas of satisfaction and dissatisfaction and concerns that tourists expressed regarding their overall trip and services received during their stay.

THE IPA SCHEME

The IPA is a tool in line with the expectations-performance approach to the measure of quality perceptions and it is well documented in the marketing literature (Ennew et. al, 1993; Slack, 1994; Matzler et al., 2003); it is commonly used to provide directions for making strategic marketing decisions. Although the use of IPA lost favour in the last few years as consequence of the development of more complex quantitative methods (Duke, Mount, 1996), since this approach was proposed by Martilla and James (1977), academic literature is replete of studies which provide empirical application in several service settings, such as transportation (Huang, Hsu, 1996), banks (Joseph et al., 2005), universities (Pike, 2004), hospitality (Janes, Wisnom, 2003) and tourism (Fuchs, Weiermair, 2003). In particular, it has been argued that «for tourist destinations with rather little market research experience, Importance-Performance Analysis in its purest form can be used as a very powerful tool in marketing planning» (Hudson and Shephard, 1998).

It has been observed that looking at satisfaction and importance values separately is ineffective in assessing the success of a particular tourism destination in meeting tourists' needs. Hence both the values together are regarded to give interesting results. IPA employs a simple graphical approach to compare the mean score for 'perceived importance' of various attributes with the corresponding 'satisfaction rating' using a two-dimensional grid, where each quadrant can be summarized into a specific suggestion for management (Figure 1). In particular, poor performance on extremely important dimensions indicate high priority in intervention for improvement (Concentrate here quadrant); excellent performance on highly important features represent opportunities for gaining or maintaining a competitive advantage (Keep up the good work quadrant); slightly important features that are excellent in performance imply that resources would be better employed elsewhere (Possible Overkill quadrant); finally, fair performance on slightly important features suggest that it may not be necessary to focus additional effort to these attributes (Low priority quadrant).

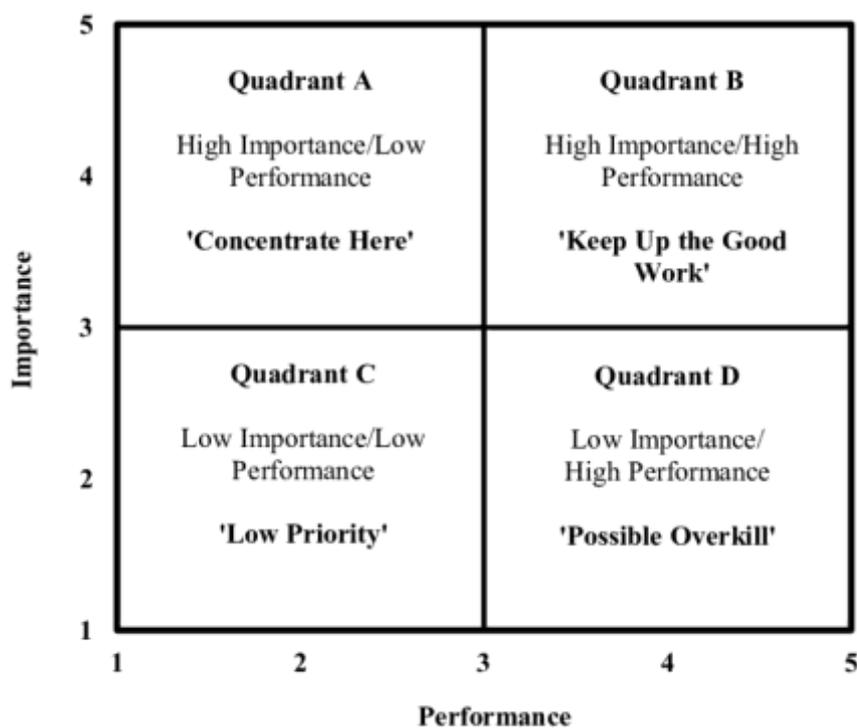


Figure-1: Importance-Performance Analysis

IPA has been proven to be a popular management tool and is well documented in various tourism studies (Oh, 2001; Fuchs & Weiermair, 2003; Zhang & Chow, 2004; Aksu, Icigen, & Ehtiyar, 2010; Ziegler et al., 2012; Chen, 2013; Lai & Hitchcock, 2015). It provides easy understanding of the drawbacks and strong points of a particular tourist destination and provides for easy management at various levels.

METHODOLOGY

The Study Area:

Trekking in India:

The last half of the last century has seen a dramatic rise in the development of travel and tourism in the world. While mass tourism dominated the sector, a niche market has always been involved in more nature and adventure oriented travel and tourism. However, the last few decades has seen a dramatic change in tourism with a shift towards more sustainable tourism. While this market is still niche and limited in numbers, it is growing rapidly. Much of the nature tourism market emanates from North America and Europe and is directed at pristine natural locations such as Asia and South America. Nepal, as the home of the Greater Himalayas, sees the majority of mountaineering and adventure tourism. Uttaranchal, located strategically near Nepal and with the Himalayas has great potential for development, in the present scenario, especially as a trekking destination.

Trekking in Uttarakhand:

Trekking in Uttarakhand can be categorized as either that related to adventure trekking or pilgrimage. While pilgrimage travel is more related to mass tourism, it constitutes the larger segment of trekking tourism to the State. While many of the pilgrimage routes don't require physical trekking, of the 27 popular and predominant treks, at least 7 (Gangotri, Kedarnath, Yamunotri, Badrinath, Chandrasilla, Devi Darshan and Panch Kedar) are pilgrimage treks or extensions of pilgrimage treks. Most of the adventure treks in Uttarakhand are popular both in the domestic and the international circuits. The majority of treks are located in Garhwal but the more remote and pristine treks are found in Kumaon.

Located in the eastern part of Uttarakhand, the Himalayas of Kumaon are one of the most underrated and picturesque in the country attracting tourists from all over the world. Among all the glaciers of Kumaon region, the most stupendous and well known are the Pindari, Sundherdunga and Kafni. The trekking routes leading to these three aforementioned glaciers are well known as well. The present study focuses on the three trekking routes and the visiting nature-based tourists/trekkers were surveyed.

The most accessible glacier in Kumaon region, Pindari is located at 3820m in Patti Malla Danpur of Bageshwar District. The glacier is 3 km long and 0.25 km broad and is connected to the southwestern slope of the outer wall of Nanda Devi Sanctuary. The main peaks near the glacier that adds beauty to the trekking experience are the Nandakot (6880m), Nandakhat (6611m), Pawalidwar (6663m), Baljuri (5922m), Changuch (6322m). The route to Pindari Glacier has government rest houses and local homestays at convenient sites.

The Kafni Glacier lies towards the left of Pindari valley below Nandakot. The main peaks near the glacier are Nandakot (6860m) and Nand Bhanar (6104m). This region is rich in wildlife and wildlife enthusiasts are frequent here. There are no rest houses beyond Dwali and tents or caves are used to spend the nights. The route to Pindari and Kafni Glaciers is common till Dwali (Fig.).

Sundherdunga comprises of two glaciers, Maiktole and Sukhram and the main peaks near to the glaciers are Tharkot (6100m), Mrigthuni(6856m), Maiktole (6804m).The route to Sundherdunga is the same as Pindari and Kafni till Khati village (Fig.). Each of the trails are about 40 km to 80km through deep gorges, fast flowing rivers, colourful villages and high mountain scenery.

The catastrophe that occurred on 16th June, 2013, in the wake of pre-monsoons in Uttarakhand affected everything, primarily the tourism sector of the state given the fact the tourism sector is one of the major sources of income of the people there. Although there has been more destruction in the Garhwal region, the Kumaon region remains underemphasized in terms of the loss that occurred. Apart from closure of the main points of touristic interests, all trekking routes were closed for 2 years since the disaster. Since trail routes are mostly amidst natural surroundings with narrow passes, snowbound regions and forested areas, they were highly damaged due to the torrential downpour. The trails have been constructed and mended but with the changing patterns of precipitation in the form of rain and snow and changing patterns of temperature there has been frequent changing of the trails, melting of the snowbound regions resulting in exposure of trenches and deep gorges which are difficult for trekkers to overcome. Hence annual frequency of trekking groups has dropped to a significant level. This is another reason why the tourists' satisfaction levels visiting these places are important for further destination management of the region.

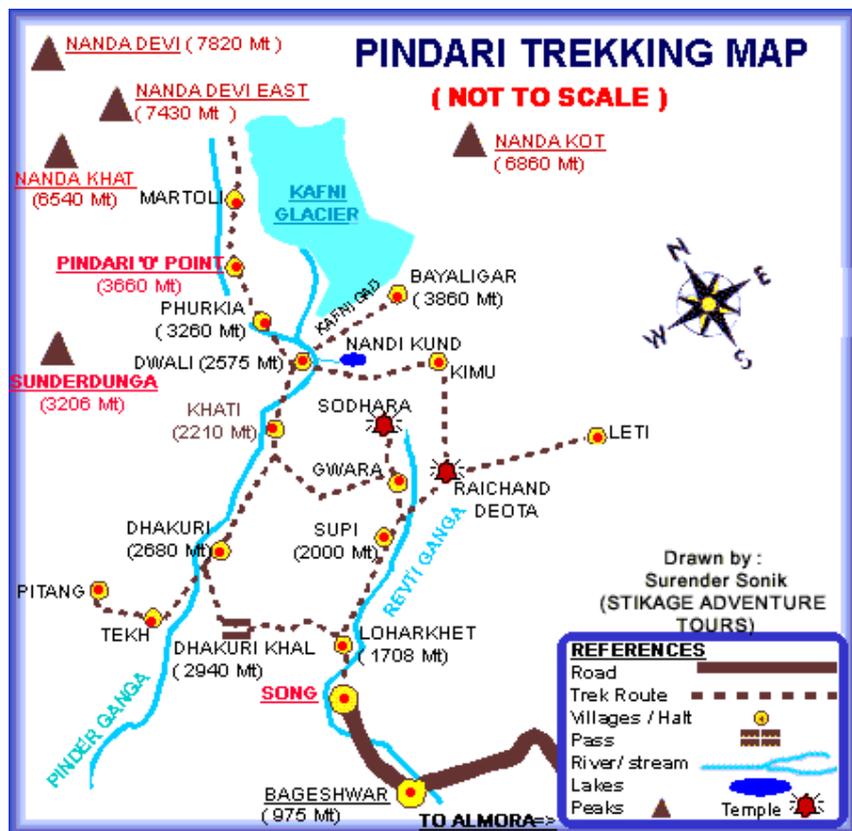


Figure-2: Study Area

Data Collection:

Importance and satisfaction variables related to nature-based, adventure-based and rural tourism were selected through direct interviews conducted with local tourism entrepreneurs, tour guides apart from consultations with a number of visitors. In addition, surveys of previous literature were also considered, for example, - Kozak and Rimmington (2000) in Mallorca, Spain, Nepal (2007) in Annapurna, Nepal, Chi and Qu (2008) in Arkansas, USA and Aksu et al. (2010) in Antalya, Turkey were studied and included in the survey instrument.

The sample population of the survey is 129 domestic and overseas trekkers who have stayed and trekked through any of the three trekking trails under study. The survey was conducted face-to-face using self-administrated questionnaires after the monsoon season in September- October, 2017. Tourists were approached at selected locations of the trails and also at Bageshwar (transit hub) according to convenience. 135 questionnaires were filled by respondents out of which 6 of them were excluded from the study as they were unreliable and improperly answered. The survey questionnaire consisted of demographic profile of the respondents, travel behaviour and tourists’ importance-satisfaction attributes of the destination. Respondents were asked to indicate their level of agreement on a five-point Likert scale ranging from 1 (Strongly disagree) to 5 (Strongly agree) against the 33 importance-satisfaction attributes on the survey questionnaire. The 33 attributes were related to weather conditions, uniqueness of the destination, quality of facilities, motivation factor and accommodation factors.

DATA ANALYSIS AND RESULTS

Demographic Profile and Travel Behaviour:

The sample shows dominance in male respondents (60.45%) although in case of overseas tourists’ sample male respondents comprise of 50%. The highest percentage of trekkers are in the age bracket 25-34 years, the least found in the above 45 years bracket. 58.13% are married and 27.13% of the respondents visited with their spouse and majority of the sample visited in a group of 3-6 persons. 48.20% of the sample did not hire any local support from guides and porters. Regarding the country of origin 74.41% (96) respondents were domestic and rest were overseas tourists who came from North America, various countries of Europe, countries of Asia-Pacific and South America.

Table-1: Demographic Profile and Travel Behavior of respondents (N=129)

Profile		F	Percentage (%)
Gender			
Male	Domestic	59	45.73
	International	37	28.68
Female	Domestic	19	14.72
	International	14	10.85
Age			

<25 years	Male	12	9.30
	Female	6	4.65
25-34 years	Male	32	24.80
	Female	24	18.60
35-45 years	Male	30	23.25
	Female	18	13.95
>45	Male	4	3.10
	Female	3	2.32
Education			
Professional degree		49	37.89
University and above		40	31.00
College		37	28.68
Secondary		3	2.32
Marital Status			
Married		75	58.13
Unmarried		54	41.86
Country of Origin			
India		96	74.41
Europe		11	8.52
North America (US & Canada)		13	10.07
South America		4	3.10
Asia-Pacific (Japan, Australia, New Zealand)		5	3.87
Trekking Group Size (No. of persons)			
1		19	15.00
2		35	27.13
3-6		55	42.63
>6		19	15.00
Status of Local Support employed			
No guide or porter		62	48.20
Both guide and porter		34	26.60
Guide only		26	20.20
Porter only		6	5.00
Source of information			
Friends		72	56.00
Travel Agent		25	19.37
Brochure		7	5.42
Newspaper/Magazine		25	19.37

Importance-Performance Means of Destination Attributes:

In order to obtain the IPA Scheme descriptive statistics and mean of the scores were performed in Table-2, showing the levels of importance and performance of the 33 destination attributes.

Table-2: Importance-Performance Means of Destination Attributes

Variables	Importance	Performance	Mean Difference
Weather and Accessibility	3.91	3.41	-0.25
Favourable weather and climate	4	2.3	-0.03
The destination is free from air and noise pollution	4.1	4.23	0.13
Availability and adequateness of transportation facilities	3.9	3.82	-0.08
Completeness of roads and road signage to destination	3.98	3.65	-0.33
Easy accessibility of hotels and lodges	3.74	3.66	-0.08
Telecommunication facilities near tourist destination	3.34	3.26	-0.08
Condition of trekking routes till destination is good	4.34	3.00	-1.34
Uniqueness of Destination			
Uniqueness of Destination	5.066	4.16	-0.056
Tranquility and panoramic view of natural environment	4.83	4.85	0.02
The wilderness and undisturbed nature	4.76	4.67	-0.09
A rich spiritual and cultural heritage	3.44	3.52	0.08
Variety of tourist attractions	4.13	3.92	-0.21
Protected cultural and natural resources	3.95	3.91	-0.04
The destination is unique and authentic	4.22	4.12	-0.1
Quality of Tourist Facilities			
Quality of Tourist Facilities	3.77	3.52	0.168
Quality & hygiene at tourist place, accommodation & eateries	3.95	3.78	-0.17
Availability of competent tourist guide	3.56	4.57	1.01
Maintenance of tourist attractions	3.8	3	0.14
Cleanliness & maintenance of public convenience facilities	3.72	2.9	-0.02
Availability of leisure and recreational activities	3.23	2.5	0.07

Uncrowded and unspoiled destination	4.4	4.38	-0.02
Accommodation related amenities 3.88		3.71	-0.17
Availability of bedroom options	3.5	3.2	-0.3
Good toilet facility	4.6	4.1	-0.5
Good shower facility	4.8	2.2	-2.6
Cleanliness of lodge and surrounding area	4.03	4.5	0.47
Good views of mountains/scenery	4.74	4.8	0.06
Host friendliness	3.6	4.62	1.02
Good local food	3.1	3.6	0.5
Reasonably priced	4.35	4.25	-0.1
Attached bathroom	2.23	2.14	-0.09
Tourist Motivation Factor	4.424	4.4	-0.024
Hospitality and friendliness of local people	4.8	4.82	0.02
Safety and security	4.55	4.3	-0.25
Availability of information center	3.7	4.13	0.43
Diversity of flora and fauna is high	4.82	4.73	-0.09
Adventure factor is high	4.25	4.02	-0.23

In order to examine tourist satisfaction with destination attributes, mean scores of all attributes were plotted on the IPA matrix as shown in figures of 3 to 6. For each IPA matrix, placements of axes on the grid were calculated through the grand mean of the given factors. Tourists' perception and importance values were plotted on the four quadrant grid that were formed based on the mean scores of importance performance ratings. Each attribute was then assessed by locating in the appropriate quadrant. Each quadrant suggests a different response from the tourism management and destination marketing strategy point of view.

Weather and Accessibility:

Quadrant B which is the 'Keep up the good work' quadrant includes the attributes which are the destination is free from air and noise pollution, availability of transportation facilities, easy accessibility of hotels. Low performance but high importance attributes including in quadrant A which is 'Concentrate here' were favourable weather and climate and condition of trekking routes till destination, which proves that trekkers were not quite satisfied with these. Low priority attribute in quadrant C was telecommunication facilities near tourist destination which proves that for the telecommunication facilities in the trekking trails was not something trekkers expect.

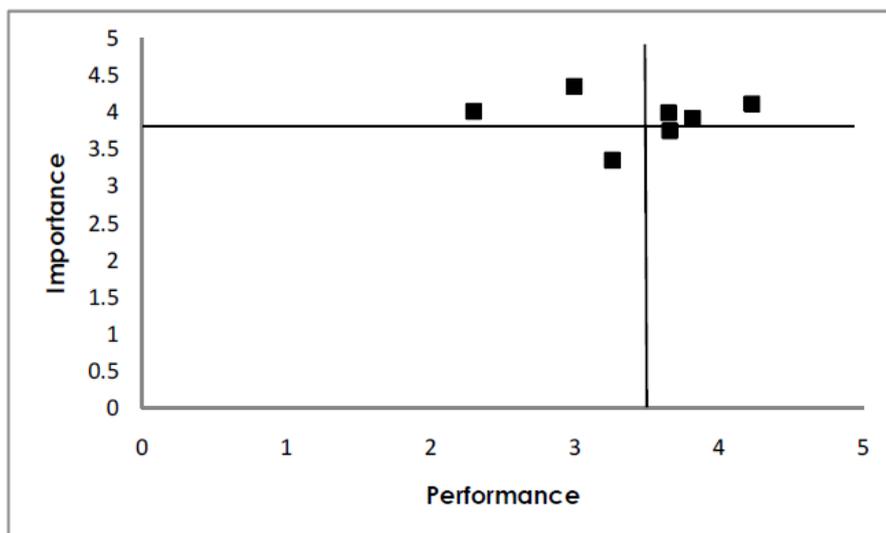


Figure-3: Weather and Accessibility

Uniqueness of Destination:

In case of uniqueness of destination tourists were satisfied with almost all attributes with are related to undisturbed nature, panoramic views and uniqueness of the destination. These were in the high importance and high performance quadrant. The low importance and low performance attribute was rich spiritual and cultural heritage included in the 'low priority' quadrant.

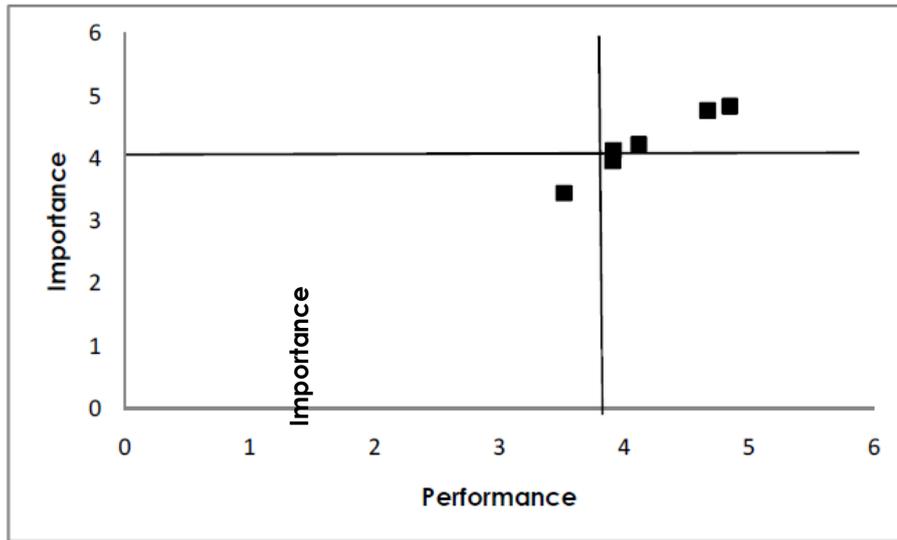


Figure-4: Uniqueness of Destination

Quality of Tourist Facilities:

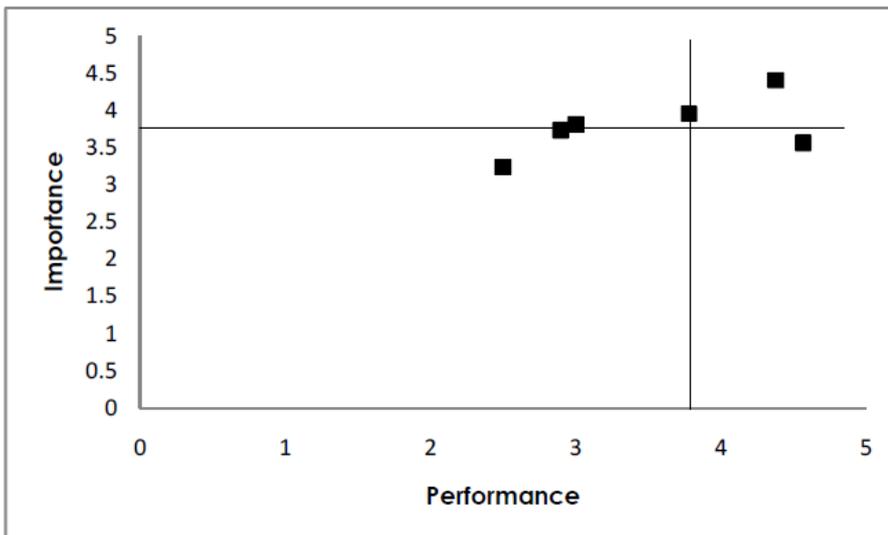


Figure-5: Quality of Tourist Facilities

Here the low importance-high performance attribute was the availability of competent tourist guides which proves that the region has good guides although trekkers have kept it on low priority. Cleanliness and maintenance of public places and lodges and maintenance of tourist places were included in the ‘concentrate here’ quadrant whereas unspoiled and uncrowded destination was included in the ‘keep up the good work’ quadrant proving the pristine nature of the destinations.

Accommodation related Amenities:

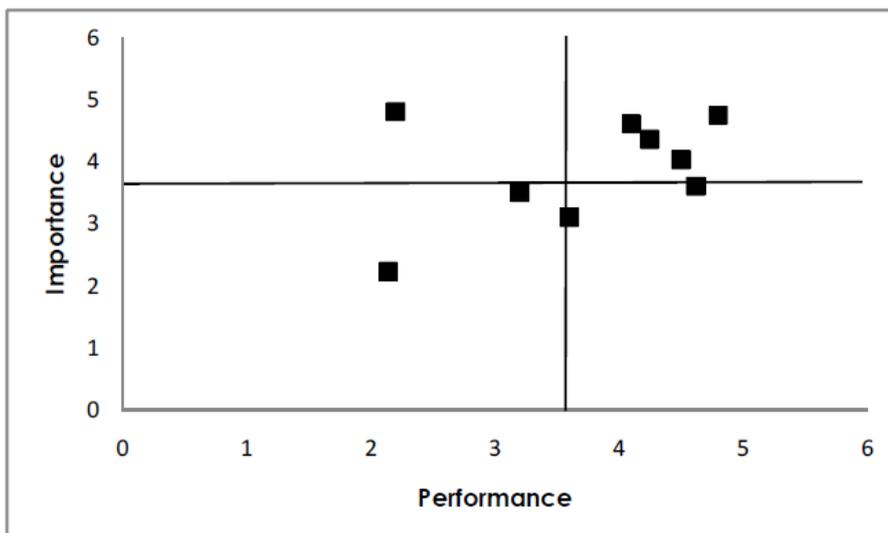


Figure-6: Accommodation related amenities

The low priority and low performance attributes in accommodation related amenities are attached bathroom and availability of bedroom options. The 'concentrate here' quadrant included shower facility which indicates that shower facility was clearly high priority but low performance. The low importance but high performance quadrant included good local food which was not of particular interest to the trekkers but performed well. Good views, reasonable prices and good toilet facility was in the 'keep up the good work' quadrant as the trekkers were satisfied with these.

Travel Motivation:

Friendliness of locals and hosts and diversity of flora and fauna were included in the 'keep up the good work' quadrant as these were high importance-high performance attributes. The other attributes like availability of information centre and high adventure factor were low priority-low performance attributes.

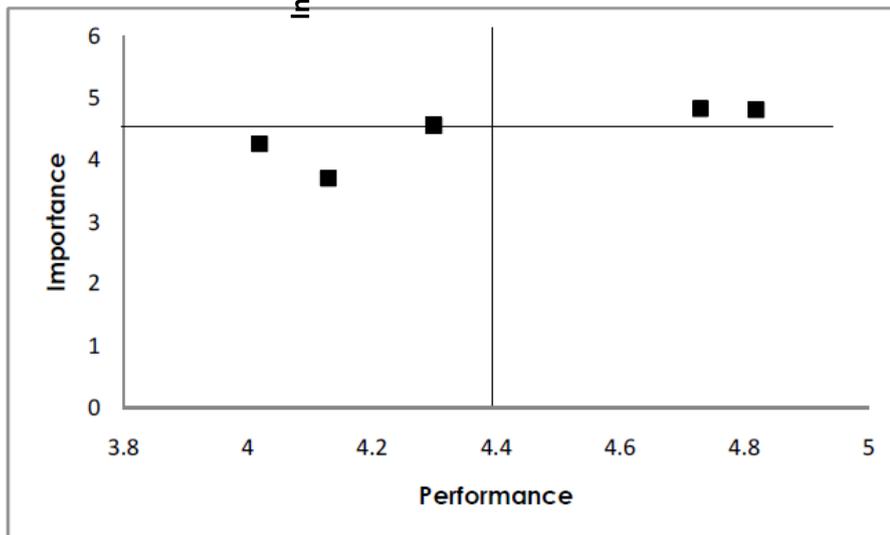


Figure-7: Travel Motivation

CONCLUSIONS AND IMPLICATIONS

This study has significant implications both for practitioners and for academics. From the management prospective our results may provide a clear guidance for the improvement of tourist offer, by identifying the main area of intervention according to the tourists' perceptions. In particular, in the case of Pindari, Sundherdunga and Kafni trails, policy makers should devote more efforts to the enhancement of better trail conditions, safe accessibility and transportation facilities, better roads and better signals on the trails, better shower facility. Such services are rated high in importance so they are perceived as relevant determinants of tourism/trekking experience. Although favourable weather and climate are uncontrollable but high on importance in the tourism industry. In terms of pristine, undisturbed and unexplored, the three trails are excellent and government should continue to keep it as uncrowded as possible.

From the research prospective, this study supports the adoption of the IPA as an alternative/integrative framework for evaluating tourist satisfaction. Such framework can be utilized in further research on tourist satisfaction and destination management in case of alternative tourism and ecotourism. Tourists' loyalty to a destination can only be strengthened through a positive total experience. A high quality nature-based tourism experience can only be ensured if immediate attention is paid to improvements in areas of concern.

REFERENCES

Bowen, D., Clarke, J. (2002), "Reflections on Tourist Satisfaction Research: Past, Present and Future", *Journal of Vacation Marketing*, Vol. 8, pp. 297-308.

Chhetri, P., Arrowsmith, C. and Jackson, M. (2004) Determining Hiking Experiences in NatureBased Tourist Destinations, *Tourism Management*, 25: 31-43.

Chi, C. G., & Qu, H. (2008). Examining the structural relationships of destination image, tourist satisfaction and destination loyalty: An integrated approach. *Tourism Management*, 29 (4), 624-636.

Kozak, M. (2001), "Comparative assessment of tourist satisfaction with destinations across two nationalities", *Tourism Management*, vol. 22, pp. 391-401.

Kozak, M., & Rimmington, M. (2000). Tourist satisfaction with Mallorca, Spain, as an offseason holiday destination. *Journal of Travel Research*, 38 (3), 260-269.

Lai, I. K. W., & Hitchcock, M. (2015). Importance-performance analysis in tourism: A framework for researchers. *Tourism Management*, 48 (June), 242-267.

Martilla, J.A. and James, J.C. (1977), "Importance-Performance Analysis", *Journal of Marketing*, Vol. 41 (1), pp. 77-79.

Master plan for development of trekking routes in Uttaranchal: Prepared for the Department of Tourism Government of Uttaranchal By Pannell Kerr Forster Consultants Pvt Ltd New Delhi, 2003

Nepal, S., Kohler, T. and Banzhaf, B. (2002). *Great Himalaya. Tourism and the Dynamics of Change in Nepal*. Berne: Swiss Foundation for Alpine Research.

Nyaupane, G. P. and Thapa, B. (2004). *Evaluation of Ecotourism: A Comparative Assessment in the Annapurna Conservation Area*

Project, Nepal, Journal of Ecotourism, 3: 20-45.

Oh, H. and Parks, S. C. (1997). Customer Satisfaction and Service Quality: A Critical Review of the Literature and Research Implications for the Hospitality Industry, Hospitality Research Journal, 20: 35-64.

Parasuraman, A., Zeithaml, V.A. and Berry, L.L. (1985), "A conceptual model of service quality and its implications for future research", Journal of Marketing, Vol. 49 No.Fall, pp.41-50.

Parasuraman, A., Zeithaml, V.A. and Berry, L.L. (1985), "A conceptual model of service quality and its implications for future research", Journal of Marketing, Vol. 49 (Fall), pp. 41- 50.

Parasuraman, A., Zeithaml, V.A. and Berry, L.L. (1988), "SERVQUAL: a multiple-item scale for measuring consumer perceptions of service quality", Journal of Retailing, Vol. 64 No.1, pp.12-40.

Parasuraman, A., Zeithaml, V.A. and Berry, L.L. (1988), "SERVQUAL: a multiple-item scale for measuring customer perceptions of service quality and its implications for future research", Journal of Retailing, Vol. 64, Spring, pp. 12-40.

Pizam, A and Milman A., (1993), "Predicting satisfaction among first time visitors to a destination by using the expectancy-disconfirmation theory", International Journal of Hospitality Management, Vol. 12(2), pp. 197-209.

Pizam, A. and Ellis, T. (1999), "Customer satisfaction and its measurement in hospitality enterprises", International Journal of Contemporary Hospitality Management, Vol. 11(7), pp. 326-339.

Uttarakhand Tourism Development Master Plan, 2007 – 2022 (2008). Government of India, Government of Uttarakhand, United Nations Development Program and World Tourism Organization, April, 2008.

1631 HOW DO SLOT RESTRICTIONS AFFECT AIRFARES? NEW EVIDENCE FROM THE US AIRLINE INDUSTRY

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ABSTRACT

This paper examines the impact of slot restrictions as a determinant of scarcity rent. Previous studies on this subject have a common limitation: they could not explicitly examine the effects of slot restrictions on airfare. To overcome that limitation, this paper took advantage of an exogenous regulatory change, the removal of slots at Newark Airport in October 2016. The results from the difference-in-differences estimation suggest that after the slot removal at Newark Airport, the average fare on routes to or from Newark decreased by about 2.8% compared to the average fare on routes to or from the two other slot-controlled New York-area airports. The estimation results from modified models suggest that the key driver lowering airfares on routes to or from Newark after the slot elimination was carriers other than the dominant carrier at Newark, though even the dominant carrier, United Airlines, was challenged by competition on relatively high-fare routes. Overall, the estimation results suggest that slot restrictions limit the effect of competition on airfare. Future research should focus on better understanding how to enhance competition on fares by improving the accessibility and transparency of the secondary slot-trading market or by replacing slot restrictions with market-based measures, such as congestion pricing and a slot auction mechanism.

Keywords: Entry barriers, price competition, airline industry

1 INTRODUCTION

This paper investigates the impact of slot restriction as a determinant of scarcity rent, i.e., markup on fares resulting from airport capacity shortages. Scarcity rent can arise at capacity-constrained airports when airport charges (e.g., landing fees) at the airports are lower than the market clearing price at which the level of demand would be in balance with the airport capacity available. In reality, it is widely believed that many congested airports charge carriers less than the market clearing price, and many carriers are taking advantage of this situation. Indeed, it is assumed that carriers often maintain their fares at the highest level the market will bear and make excess profits by exploiting the scarce airport slots (Starkie, 1998; Burghouwt et al., 2017). The scarcity rent is therefore transferred to carriers, not to passengers.

The effect of entry barriers, including airport slots, on the amount of scarcity rents has been studied extensively (Abramowitz & Brown, 1993; Borenstein, 1989; Ciliberto & Williams, 2010; Dresner et al., 2002; Evans & Kessides, 1993; Gayle & Wu, 2013; Morrison, 2001; Peteraf & Reed, 1994; Snider & Williams, 2015; Van Dender, 2007). However, no previous study has explicitly examined the effects of slot restrictions on airfare. This paper estimates the specific effects of slot restrictions on airfare by taking advantage of an exogenous regulatory change, the removal of slots at Newark Airport in October 2016.

I use a difference-in-differences strategy to estimate the impact of the elimination of slot restrictions at Newark Airport on airfare. The data are carrier-route-level quarterly unbalanced panel data that are constructed from the DOT's DB1B data for the period between the first quarter of 2016 and the second quarter of 2017, which includes three quarters before and after the slot removal at Newark Airport. The treatment group comprises routes to or from Newark Airport, and the control group consists of routes to or from the two other New York airports, John F. Kennedy and LaGuardia Airports, both of which were slot-controlled during the analysis period.

The base estimation results suggest that the average fare on routes to or from Newark Airport decreased by about 2.8% compared to the average fare on routes to or from the two other slot-controlled New York airports after the elimination of slot controls at Newark Airport. The estimation results from the modified model suggest that the key driver lowering fares on routes to or from Newark Airport after the slot elimination was carriers other than the dominant carrier at Newark Airport. Also, the results of estimation from a quantile regression approach suggest that the dominant carrier, United Airlines, may have been able to take advantage of its dominant position at Newark Airport and charge a premium ticket price on relatively low-fare routes even after the slot removal, even though it has been challenged by growing competition especially on relatively high-fare routes.

The paper is organized as follows: Section 2 summarizes the results of previous studies. Section 3 provides some background on slot restrictions at US airports, especially those in the New York area. Section 4 describes the estimation models, methods, and data that were used. Section 5 reports the estimation results and robustness checks, followed by a discussion in Section 6. Section 7 concludes with some policy implications of the analysis.

2 PREVIOUS STUDIES

The effect of entry barriers, including airport slots, on the amount of scarcity rents has been studied extensively. For example, Borenstein (1989), in one of the seminal papers on scarcity rent or fare premiums in the airline industry, estimated the effects of various forms of market power on airfares and found a significant fare premium at hub airports due to the market power arising from being a hub. Borenstein (1989) also found the presence of scarcity rents at some congested US airports. However, he did not explicitly examine the effects of slot restrictions on airfare. Indeed, Borenstein (1989) used airport dummies to estimate the amount of scarcity rents at congested airports. The estimated coefficients

of airport dummies represent not only the effects of scarcity rents due to slot restrictions, but also the effects of unobserved airport characteristics such as the availability and control of airport gates. As a result, the estimation indicates that significant positive “scarcity rents” are identified for both slot-constrained (O’Hare) and non-slot-constrained (Atlanta, Denver, Cleveland) congested airports.

A similar problem persists in the studies of Abramowitz & Brown (1993), Dresner et al. (2002), Gayle & Wu (2013), Morrison (2001), Peteraf & Reed (1994), and Van Dender (2007). These studies use slot-controlled airport dummies to identify the presence and magnitude of scarcity rents at slot-restricted airports. Unfortunately, this approach also could not fully differentiate slot-specific effects from unobserved airport- fixed effects on airfares because slot restrictions remained in effect at slot-restricted airports during all the periods these studies covered. Although the estimation results of these studies suggest that airfares are higher in markets that include slot-restricted airports as an endpoint, it is not clear whether and to what extent the higher airfares are due to the slot constraints.

Ciliberto & Williams (2010) and Snider & Williams (2015) made the most recent important contributions to the study of hub premiums, or scarcity rents. Indeed, these studies revealed that factors such as control of gates is a crucial determinant of hub premiums. This finding is an important update to Dresner et al. (2002), who found a similar result with respect to gate constraints and utilization. However, neither Ciliberto & Williams (2010) nor Snider & Williams (2015) could measure the magnitude of scarcity rents derived from slot restrictions because the fixed effects of slot-controlled airports were differenced out in their studies.

3 BACKGROUND ON SLOT RESTRICTIONS AT NEW YORK-AREA AIRPORTS

To overcome the limitations of the previously mentioned studies, this paper takes advantage of an exogenous regulatory change, the removal of slots at Newark Airport in October 2016. On March 18, 2008, the Federal Aviation Administration (FAA) proposed placing a temporary limitation on scheduled flight operations at Newark Airport. The airport has historically experienced a significant number of delays compared to other airports. The on-time performance at Newark Airport deteriorated in the 2000s. According to the FAA, the percent of on-time gate arrivals within 15 minutes of the scheduled time decreased from 70.66% in 2000 to 63.97% in 2006 and to 61.71% in 2007. The average daily count of arrival delays greater than one hour increased from 54 in 2000 to 79 in 2006 and to 93 in 2007. In addition, it was anticipated that carriers might try to add still more operations at Newark Airport because of an operational limitation at nearby John F. Kennedy Airport (73 FR 14552).

On May 21, 2008, the FAA issued an order that placed temporary limits on scheduled operations at Newark Airport to mitigate congestion and delays. Under the order, the FAA established hourly limits of 81 scheduled operations during the peak period. The order took effect on June 20, 2008 (73 FR 29550). Similar orders were issued and took effect at LaGuardia Airport on January 1, 2007 (71 FR 77854), and at John F. Kennedy Airport on March 30, 2008 (73 FR 3510), due to increasing congestion and delays. Therefore, the US Department of Transportation (US DOT) and FAA considered a longer-term and comprehensive approach to slot management at the New York-area airports (i.e., John F. Kennedy, LaGuardia, and Newark). On January 8, 2015, the agencies proposed a set of alternative rules that replaced the orders limiting scheduled operations at the three airports. During the review process of the comments received on the proposed rules, United Airlines and Delta Air Lines entered into controversial slot transactions on June 16, 2015. One transaction was a so-called slot lease agreement pursuant to which Delta would lease United 24 Newark slots for \$14 million. Although it was called a “slot lease agreement,” the lease was long term and automatically renewable. Thus, it was intended to effectuate a permanent transfer of the slots to United. The other transaction was a separate slot lease agreement pursuant to which United leased 30 slots at Kennedy Airport to Delta, also for \$14 million. This lease was also long term and automatically renewable, and thus it was intended to effectuate a permanent transfer of the slots to Delta. The latter transaction closed in June 2015 (US DOJ, 2015).

The former transaction was challenged by the US Department of Justice (US DOJ), however, because it allegedly posed a significant risk of anticompetitive harm to passengers using Newark Airport. At the time when the transaction was proposed, United controlled 73% of the slots (i.e., 902 of the 1233 allocated slots) at Newark. If United’s proposed acquisition of 24 slots from Delta were allowed to proceed, United would have a market share of approximately 75% of the Newark slot market and a correspondingly high share of the Newark air passenger service market. The US DOJ alleged the following:

United is already exercising this monopoly power, and has long been able to extract a “Newark premium” for its service. Indeed, airfares at Newark are among the highest in the country and service ranks among the worst... Through the proposed transaction and other actions, United is monopolizing and/or maintaining and enhancing its current monopoly over the markets for Newark slots and for scheduled air transportation in Newark... (US DOJ, 2015)

This is why the US DOJ brought an antitrust case against United and Delta.

At the same time, after the imposition of temporary limits on scheduled operations at Newark Airport, the FAA reviewed operational and performance data on an annual basis and found that scheduled demand was routinely below the hourly limits of 81 scheduled operations set by the order. Considering the results of the demand and capacity analysis, on April 1, 2016, the FAA announced that it decided to eliminate slot restrictions at Newark Airport. The elimination of slot restrictions became effective on October 30, 2016. In response to the impending regulatory change, on April 4, 2016, United terminated the slot lease agreement dated June 16, 2015. Based on United’s decision, the US DOJ dismissed the case on April 6, 2016 (US DOJ, 2016).

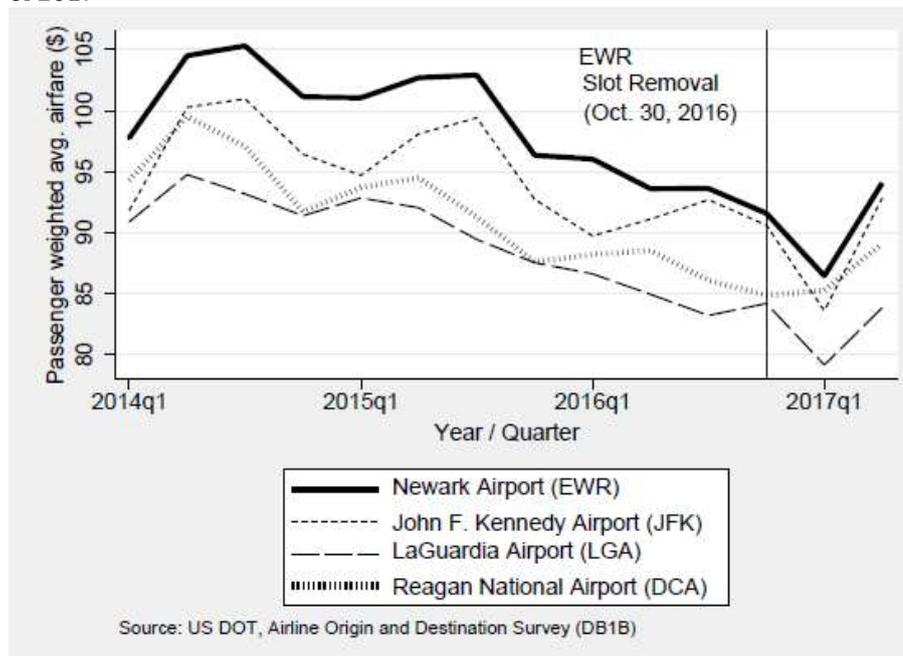
This paper takes advantage of the regulatory change, i.e., the elimination of slot restrictions at Newark Airport, to identify the presence and magnitude of scarcity rents due to the slot constraints at Newark Airport.

4 MODELS AND DATA

This paper uses a difference-in-differences strategy to differentiate slot-specific effects from unobserved airport-fixed effects and estimate the impact of the elimination of slot restrictions at Newark Airport on airfares. The data are carrier-route-level quarterly unbalanced panel data that are constructed mainly from the DOT's Airline Origin and Destination Survey (DB1B) data for the period between the first quarter of 2016 and the second quarter of 2017, which includes three quarters before and after the slot removal at Newark Airport. The treatment group comprises routes to or from Newark Airport, and the control group consists of routes to or from John F. Kennedy and LaGuardia Airports, both of which were slot controlled during the analysis period. By using the difference-in-differences approach, we can uncover systematic differences between slot-controlled airport and non-slot-controlled airport on airfares by explicitly controlling for airport fixed effects.

However, the key identifying assumption of the difference-in-differences strategy is that airfare trends would be the same in both groups in the absence of treatment, i.e., slot removal. Figure 1 plots the passenger-weighted average airfares (deflated by CPI-U) on routes to or from the four slot-controlled airports, Newark, Kennedy, LaGuardia, and Reagan National Airports, for the period from the first quarter of 2014 to the second quarter of 2017. The average airfares on routes to or from the four airports show a similar trend before the slot removal at Newark. The average airfares on routes to or from the three New York airports dropped sharply after the slot removal. In contrast, the average airfare on routes to or from Reagan National Airport slightly increased after the slot removal. Figure 1 provides visual evidence that the three New York airports have a common underlying trend, but Reagan National does not follow the common trend. Although the figure does not provide clear visual evidence that the slot removal at Newark induces a sharp deviation from this trend, it suggests that Kennedy and LaGuardia Airports may provide a good measure of counterfactual average airfares at Newark Airport in the absence of slot restriction.

Figure 1 Passenger weighted average airfare at EWR, JFK, LGA, and DCA: the first quarter of 2014 to the second quarter of 2017



4.1 Models

I estimate two models that allow arbitrary correlation between unobservable factors affecting airfares (including airport fixed effects) and explanatory variables in any time period. The first includes carrier-route fixed effects, which control for unobserved time-invariant differences across carriers and routes that would cause a systematic difference in airfares. In fact, carriers and routes may vary with factors such as the brand image of a carrier and the attractiveness of the location of an endpoint airport. The second model allows correlation between explanatory variables and time-invariant carrier-route characteristics, but with carrier- and route-specific trends. In this model, each carrier on each route has its own time trend, which may affect airfares (Cf., Heckman and Hotz, 1989; Papke, 1994; Wooldridge, 2010).

As will be explained in Section 4.2, the models include two potentially endogenous variables relating to competition as regressors. While a structural approach or an instrumental variable approach may be more desirable for dealing with the potential endogeneity of competition, this paper takes a reduced-form approach and uses lagged endogenous variables as predetermined variables because of the difficulty of finding valid instruments. Although the endogeneity bias could reduce the size of the competition effects, Gayle and Wu (2011) show that such bias is small in their study, which accounts for endogenous entry in airline markets.

The first model is given by Eq. (1):

$$\ln piodt = \theta t + \alpha EWRod + \beta REMOVALt + \gamma EWRod * REMOVALt + xiodt\delta + viodt \quad (1)$$

where $viodt$ is $ciod + uiodt$ (the unobserved fixed effects + the time-varying error).

The subscripts $i, o, d,$ and t represent carrier, origin, destination, and time. The dependent variable, $piodt$, is the passenger-weighted average fare calculated on a route/carrier/quarter basis, which is deflated by the quarterly average of monthly CPI (1982-84=100) (Source: US DOT, Airline Origin and Destination Survey (DB1B); US DOL, Consumer Price Index – All Urban Consumers). Newark Airport dummy, $EWRod$, represents a route that includes the airport as an endpoint. As mentioned previously, the elimination of slot restrictions at Newark became effective on October 30, 2016. In addition, the US DOT's DB1B consists of quarterly data. Thus, the dummy $REMOVALt$, which identifies the period after the slot removal at Newark Airport, equals 1 for the period after the fourth quarter of 2016. $EWRod * REMOVALt$ is an interaction term between these two dummies, $EWRod$ and $REMOVALt$, which is intended to capture the effect of the slot removal at Newark on airfares on routes to or from Newark.

The model includes a linear common trend, θt , and an array of control variables, $xiodt$. The error, $viodt$, is the composite error term, decomposed into $ciod + uiodt$. The fixed effect, $ciod$, captures all unobserved, time-constant characteristics of carriers and routes, such as the customer loyalty of carriers and the prestige of the location of endpoint airports that affect $piodt$. The error, $uiodt$, is the time-varying error. It represents unobserved factors that change over time and affect $piodt$. I assume that the error, $uiodt$, is uncorrelated with explanatory variables. However, pooled OLS is biased and inconsistent if $ciod$ and explanatory variables are correlated. Thus, Eq. (1) is first-differenced to eliminate $ciod$, unobserved carrier and route characteristics, and the resulting Eq. (2) is estimated by the pooled OLS:

$$\Delta \ln piodt = \theta + \beta \Delta REMOVALt + \gamma \Delta EWRod * REMOVALt + \Delta xiodt\delta + \Delta uiodt \quad (2)$$

where we use the fact that $\theta t - \theta(t - 1) = \theta$ and $(ciod + uiodt) - (ciod + uiodt-1) = \Delta uiodt$. The Newark Airport dummy, $EWRod$, and the unobserved time-constant effect, $ciod$, are differenced out. The coefficient of $\Delta REMOVALt$, β , represents the effect of the slot removal at Newark Airport on airfares on routes to or from airports other than Newark (i.e., routes to or from airports used as a control group). The coefficient of the interaction term ($\Delta EWRod * REMOVALt$), γ , captures the effect of the slot removal at Newark on airfares on routes to or from Newark compared to the airfares on routes to or from airports assigned as a control group. If slot restriction is a source of scarcity rent, the coefficient γ should be negative and statistically significant. The coefficient β could also be negative and statistically significant if the slot removal at Newark Airport has an indirect competition-enhancing effect on routes to or from airports adjacent to Newark Airport.

The second model, the carrier/route-specific trend model, is given by Eq. (3):

$$\ln piodt = giodt + \theta t + \alpha EWRod + \beta REMOVALt + \gamma EWRod * REMOVALt + xiodt\delta + viodt \quad (3)$$

where, again, $viodt$ is $ciod + uiodt$ (the unobserved fixed effects + the time-varying error).

The second model allows the explanatory variables to be correlated not only with time-constant carrier and route characteristics, $ciod$, but also with carrier- and route- specific trends, $giod$. In this model, aggregate time effects, θt , are allowed in addition to carrier- and route-specific trends. As with Eq. (1), we first-difference Eq. (3) to obtain Eq. (4):

$$\Delta \ln piodt = giod + \Delta \theta t + \beta \Delta REMOVALt + \gamma \Delta EWRod * REMOVALt + \Delta xiodt\delta + \Delta uiodt \quad (4)$$

where we again use the fact that $giodt - giod(t - 1) = giod$ and $(ciod + uiodt) - (ciod + uiodt-1)$

$= \Delta uiodt$. Eq. (4) is the standard unobserved effects model, which can be estimated by the fixed effects model.

Both models assume that slot removal at Newark has the same effect in each quarter after the removal. This may be too restrictive; the impacts of the slot removal could change over time, as suggested in Figure 1. Thus, in the robustness checks in Section 5, I relax this restriction and replace the slot removal dummy with three dummies for each quarter after the removal.

4.2 Data

The paper uses quarterly unbalanced panel data constructed on a carrier-route basis mainly from the US DOT's Airline Origin and Destination Survey (DB1B) data for the period between the first quarter of 2016 and the second quarter of 2017, which includes three quarters before and after the slot removal at Newark Airport. When constructing the data set, I define a market as directional travel between a pair of airports, following Borenstein & Rose (1994) and Snider & Williams (2015). I keep only one-way or round-trip travel in the data set, following previous studies such as Evans and Kessides (1994), Ciliberto & Williams (2010), Brueckner, et al (2013), and Snider & Williams (2015). In other words, the data set excludes open-jaw itineraries, in which a passenger's return flight is from a different airport than the passenger arrived to and/or a passenger does not return to the origin airport of his or her outbound flight. Also excluded are (1) tickets involving a non-reporting US carrier flying within North America or a foreign carrier flying between two US points, (2) tickets that are part of international travel, (3) itineraries with more than one marketing (or ticketing) carrier on a directional trip, which are known as interline tickets (in contrast, itineraries with a single marketing carrier but multiple operating carriers are included in the data set), (4) tickets flagged by the DOT as those with questionable fare value (e.g., extraordinarily high fares), (5) tickets with fares greater than \$2,500 or less than \$25, (6) tickets with fares in the bottom or top fifth percentile in their quarter, and (7) tickets with more than six coupons for round-trip itineraries and three coupons for one-way itineraries.

The dependent variable in our estimation models is each carrier’s passenger- weighted quarterly average fare on each route deflated by consumer price index for all urban consumers (CPI-U) (log-transformed). Following previous studies, the models include the following control variables (as components of the *xiodt* vector): (1) quarterly total number of carriers serving the market; (2) Southwest’s presence dummy, which is 1 if Southwest airlines is present at the origin or destination of the given route, 0 otherwise;

(3) log-transformed market distance (miles); (4) number of coupons in the market; (5) indicator of operating carrier change, which is 1 if the given itinerary involves more than one carrier, 0 otherwise; (6) indicator of round-trip, which is 1 if the given itinerary is round-trip, 0 otherwise; and (7) log-transformed quarterly total number of employment at route endpoints.

Several previous studies have included other variables in the estimation models, such as flight frequencies and number of passengers, which are constructed from the US DOT’s T-100 data. In this paper, however, considering the difference between the DB1B and the T-100 data, the estimation models do not include these variables constructed from the T-100 data. While the T-100 comprises non-stop segment data (i.e., direct flight data), the DB1B contains flight itinerary data, including not only direct flight data but also any connecting flight data. Thus, the T-100 data show poor coverage of itineraries included in the DB1B data. This makes it practically impossible to construct and include, e.g., a variable that represents flight frequencies of connecting flights in the estimation models. In general, increased competition results in lower airfares. Hence, negative coefficients would be expected for the two competition variables, the quarterly total number of carriers serving the market and the Southwest’s presence dummy (Source: US DOT, Airline Origin and Destination Survey (DB1BMarket); US DOT, T-100 Domestic Segment (All Carriers)). As suggested above, these competition variables are potentially endogenous. Indeed, markets with high fares due to lack of competition may be attractive targets for low-cost carriers. To deal with this reverse causality, which may bias the estimates, I use lagged endogenous variables as predetermined variables. The use of lagged competition variables has an additional advantage: It makes the analysis more realistic. Carriers’ route structures are relatively fixed in the short term. It usually takes more than a few months to launch new routes. Indeed, one carrier says “the lead-time for launching routes is normally 12-18 months” (British Airways, 2016). Thus, it is difficult for carriers to change their route structures immediately, even if the average fare on the given route increases due to lack of competition. In this sense, using the lagged competition variables is more realistic than using the competition variables in the current quarter, which suggests that a change in the average fare on the given route has an immediate and contemporaneous effect on carriers’ route entry and network configuration decisions.

Fares are usually higher for long-distance itineraries. Therefore, the log- transformed market distance variable should have a positive coefficient (Source: US DOT, Airline Origin and Destination Survey (DB1BMarket)). The greater the number of coupons, the higher the fare will be, because the greater number of coupons means that the itinerary includes multiple flight-legs, which could lead to higher fare. Hence, the coefficient of the variable representing the number of coupons will be positive (Source: US DOT, Airline Origin and Destination Survey (DB1BMarket)). A negative coefficient is expected for the operating carrier change variable. Indeed, other things being equal, an itinerary operated by one carrier is better for passengers in terms of service quality than an itinerary involving multiple operating carriers (Source: US DOT, Airline Origin and Destination Survey (DB1BMarket)). A round-trip ticket is typically cheaper than two one- way tickets. Accordingly, the round-trip dummy should have a negative coefficient (Source: US DOT, Airline Origin and Destination Survey (DB1BMarket)). Finally, the coefficients of the log-transformed quarterly total number of employment at route endpoints should be positive because the volume of business travel can increase as the employment level increases (US Bureau of Labor Statistics, Quarterly Census of Employment & Wages).

5. ESTIMATION RESULTS

5.1 Main results

Table 1 presents descriptive statistics for the data set, and Table 2 reports the results of estimating the first-differenced versions of the common trend model (Eq. (2)) and the carrier/route-specific trend model (Eq. (4)). The first column of Table 1 shows the estimation results from the common trend model without aggregate time effects (year and quarter fixed effects). The coefficient of $\Delta REMOVAL_t$, the period after the slot removal at Newark dummy, is negative and statistically significant. In our data set, the control group consists of routes to or from the two other New York airports, John F. Kennedy and LaGuardia Airports, both of which were slot-controlled during the analysis period. Thus, the coefficient suggests that the average airfare was decreased on routes to or from Kennedy and LaGuardia Airports after the removal of slots at Newark Airport. This may be due to an indirect competition-enhancing effect derived from the slot removal at Newark Airport. The coefficient of the dummy representing slot removal at Newark is also negative and statistically significant. The result seems to suggest that scarcity rent arose at Newark Airport during the period when temporary limits were placed on scheduled operations. However, Eq. (2) does not control for the time fixed effects. Hence, the impact of indirect competition and the amount of scarcity rent may be overestimated.

Table 1 Descriptive statistics

	Mean	SD	Min	Max
Δ Passenger weighted average fare calculated on a route-carrier-quarter basis, deflated by CPI-U (log-transformed)	0.00575	0.182	-1.281	1.258
$\Delta REMOVAL_t$: Period after the slot removal at Newark: 1 after the fourth quarter of 2016	0.167	0.373	0	1

$\Delta EWRod *REMOVALt$: Slot removal at Newark (interaction between the Newark0.0639 dummy and the period after the slot removal at Newark dummy)	0.245	0	1	
Δ Quarterly total number of carriers serving the market	-0.117	0.546	-3	3
Δ Dummy: Southwest's presence at origin or destination or both	-0.000977	0.0949	-1	1
Δ Market distance (miles) (log-transformed)	-0.000644	0.132	-1.101	1.103
Δ Number of coupons in the market	-0.00350	0.338	-3	3
Δ Dummy: Operating carrier change	-0.00334	0.375	-1	1
Δ Dummy: Round trip	-0.00910	0.603	-1	1
Δ Quarterly total number of employment at origin (log-transformed)	0.00305	0.0278	-0.589	0.562
Δ Quarterly total number of employment at destination (log-transformed)	0.00304	0.0287	-0.589	0.562
Observations	19445			

Notes: All variables are first-differenced. Year and quarter dummies are omitted for brevity.

Table 2 Estimation results

	(1) Common trend model 1	(2) Common trend model 2	(3) Common carrier/route trend model	(4) Common and carrier/route specific trend with quarter fixed effects model
$\Delta REMOVALt$: Period after the slot removal at Newark	-0.0399*** (0.00452)	-0.0378*** (0.00473)	-0.0346*** (0.00492)	-0.00788 (0.0117)
$\Delta EWRod *REMOVALt$: Slot removal at Newark	-0.0378*** (0.00567)	-0.0259*** (0.00560)	-0.0328*** (0.00688)	-0.0285*** (0.00718)
Δ Quarterly total number of carriers serving the market	-0.00104 (0.00234)	-0.00731** (0.00271)	-0.00597* (0.00285)	-0.00190 (0.00286)
Δ Dummy: Southwest's presence at origin or destination or both	-0.0220 (0.0195)	-0.0218 (0.0189)	-0.0219 (0.0197)	-0.0214 (0.0195)
Δ Market distance (miles) (log-transformed)	0.0347* (0.0138)	0.0367** (0.0137)	0.0341* (0.0140)	0.0338* (0.0139)
Δ Number of coupons in the market	0.0102+ (0.00534)	0.0104+ (0.00534)	0.00995+ (0.00548)	0.00783 (0.00540)
Δ Dummy: Operating carrier change	-0.00172 (0.00442)	-0.00164 (0.00438)	-0.00257 (0.00445)	-0.00239 (0.00442)
Δ Dummy: Round trip	-0.0194*** (0.00254)	-0.0197*** (0.00251)	-0.0196*** (0.00258)	-0.0189*** (0.00254)
Δ Quarterly total number of employment at origin (log-transformed)	0.561*** (0.0867)	0.0871 (0.0693)	0.0861 (0.0688)	0.0297 (0.0662)
Δ Quarterly total number of employment at destination (log-transformed)	0.537*** (0.0837)	0.0997 (0.0705)	0.0766 (0.0628)	0.0243 (0.0616)
Quarter and year dummies	No	Yes	Yes	Yes
Carrier specific quarter dummies	No	No	No	Yes
Carrier specific year dummies	No	No	No	Yes
Observations	19445			
Adjusted R2	0.027	0.043	-	-

Standard errors in parentheses are clustered by carrier and route. The data set is an unbalanced panel. The Slot restriction at Newark Airport was removed on October 30, 2016. Aggregate time effects (quarter and year dummies) are omitted for brevity. All variables are first-differenced.

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

To control for the time fixed effects, year and quarter dummies are included in Eq. (2). The estimation results, which are shown in column 2 of Table 2, indicate that the absolute values of the coefficients of $\Delta REMOVALt$ (the period after the slot removal at Newark dummy) and $\Delta EWRod *REMOVALt$ (the slot removal at Newark dummy) become smaller. However, the negative coefficient of $\Delta EWRod *REMOVALt$ is still statistically significant. The result suggests that the effect of competition on airfare was limited at Newark Airport by the slot restriction. Indeed, scarcity rent arose at Newark Airport during the period when temporary limits were placed on scheduled operations, and the scarcity rent was transferred to carriers, not to passengers. As a result of slot removal, the average airfare on routes to or from Newark Airport dropped by about 2.6% compared to the ones on routes to or from Kennedy and LaGuardia Airports. Interestingly, the coefficient of $\Delta REMOVALt$, the period after the slot removal at Newark dummy, is also still negative and statistically significant. The result can be interpreted as indirect evidence that adjacent competition generated by the slot removal at Newark Airport had a negative impact on the average fare on routes to or from Kennedy and LaGuardia Airports. Indeed, the average airfare on routes to or from the two slot-controlled New York airports dropped by about 3.7% compared to the period before the slot removal at Newark Airport.

Most of the control variables have the expected signs but are not necessarily statistically significant. The negative and statistically significant coefficient of the quarterly total number of carriers serving the market suggests that an additional competitor leads to a 0.7% decrease in the average airfare on routes to or from the three New York airports. The coefficient of the Southwest presence dummy has an expected negative sign. However, it is not statistically significant.

Although the presence of Southwest Airlines at route endpoints could be a potential competitive threat for the incumbent carriers on the given route, the threat may not be substantial enough for the incumbents to lower their airfare if Southwest Airlines does not enter the route. The variables of market distance and the number of coupons have positive and statistically significant coefficients as expected, though the coefficient of the latter variable is significant only at the 10% level. The negative but statistically insignificant coefficient of the operating carrier change variable suggests that an itinerary involving multiple operating carriers is potentially unattractive for passengers compared to an itinerary operated by one carrier, though its unattractiveness is not as important as other factors, such as whether a flight is round-trip, that would lead to a lower fare. As column 1 of Table 2 shows, the coefficients of the quarterly total employment at route endpoints was positive and statistically significant when year and quarter fixed effects were not controlled for. However, column 2 of Table 2 indicates that the coefficients turn statistically insignificant when year and quarter fixed effects are controlled for. The aggregate time fixed effects may absorb the effects of the employment variables.

5.2 Robustness checks

To check the robustness of the above estimation results, I also estimate the carrier/route-specific trend model (Eq. (4)), which allows the explanatory variables to be correlated not only with time-constant carrier and route characteristics, but with carrier- and route-specific trends. The estimation results are shown in column 3 of Table 2. The overall pattern of the estimation results remains the same. This time, the fare-reducing effect of the slot removal at Newark gets slightly larger. Indeed, the results suggest that the average airfare on routes to or from Newark Airport lowered by about 3.2% compared to that on routes to or from the two other New York airports. In addition, the coefficient of the dummy for the period after the slot removal at Newark is again negative and statistically significant. This suggests that the average airfare on routes to or from Kennedy and LaGuardia Airports decreased by about 3.4% compared to the period before the slot removal at Newark.

Eq. (4), however, does not control for carrier-specific time and seasonal fixed effects. Thus, carrier-specific year and quarter dummies are included in Eq. (4) to control for carrier-specific time and seasonal fixed effects. Column 4 of Table 2 shows that coefficients of three variables (i.e., the number of carriers serving the market, the period after the slot removal at Newark, and the number of coupons) become statistically insignificant. In particular, the coefficient of $\Delta REMOVAL_t$, the dummy representing the period after the slot removal at Newark, becomes smaller in its absolute value and is no longer statistically significant, albeit still negative. The estimation results presented in columns 1 through 3 suggest that adjacent competition generated by the slot removal at Newark Airport had a negative impact on the average fare on routes to or from Kennedy and LaGuardia Airports. This impact of adjacent competition seems to be absorbed by carrier-specific time and seasonal fixed effects. In contrast, the coefficient of $\Delta EWRod * REMOVAL_t$, the slot removal at Newark dummy, remains negative and statistically significant, which suggests that the average airfare on routes to or from Newark Airport is about 2.8% lower than that on routes to or from Kennedy and LaGuardia Airports.

Overall, the estimation results suggest that the slot restriction at Newark Airport had a negative effect on competition, which created scarcity rents that were transferred to carriers, not to passengers. Put differently, the additional competition created by the slot removal at Newark competes scarcity rents away. The adjacent competition generated by the slot removal at Newark Airport may have lowered the average fare on routes to or from Kennedy and LaGuardia Airports. However, this adjacent competition effect disappeared once the carrier-specific time and seasonal fixed effects were controlled for.

6 DISCUSSIONS

6.1 Which carrier was the key driver lowering airfares?

As pointed out in Section 3, Newark Airport is a hub airport for United Airlines. As of June 2015, United controlled 73% of the slots at Newark Airport. Carriers' reaction to the removal of slot controls at Newark may have differed depending on whether they were dominant carriers or not. Indeed, incumbent fringe carriers or new entrant carriers or both would aggressively compete with dominant carriers by lowering airfares, increasing flight frequencies, and launching new routes. Dominant carriers may respond aggressively to competitors on competitive routes. However, if the dominant carriers control access to the airport facilities, such as gates, they can deter market entry of competitors and may not necessarily need to lower their airfare even after a slot removal. In sum, the key driver lowering airfares may not have been the dominant carrier, but rather incumbent fringe carriers or new entrant carriers.

The above estimation models, Eqs. (2) and (4), assume that all carriers react to the slot removal at Newark in the same manner. Because of this strong restriction, Eqs. (2) and (4) could not identify the key driver lowering airfares on routes to or from Newark Airport after the slot removal. To relax this restriction, the dummy representing slot removal at Newark is divided into two groups, one including only the dominant carrier, United Airlines, and the other including other carriers. Eq. (5) is the common trend model, and Eq. (6) is the carrier/route-specific trend model. UA_i and $OTHER_i$ stand for United Airlines and other carriers, respectively.

$$\Delta \ln p_{i0dt} = \theta + \beta \Delta REMOVAL_t + \gamma 1 \Delta EWRod * REMOVAL_t * UA_i + \gamma 2 \Delta EWRod * REMOVAL_t * OTHER_i + \Delta x_{i0dt} \delta + \Delta u_{i0dt} \quad (5)$$

$$\Delta \ln p_{i0dt} = g_{i0d} + \Delta \theta + \beta \Delta REMOVAL_t + \gamma 1 \Delta EWRod * REMOVAL_t * UA_i + \gamma 2 \Delta EWRod * REMOVAL_t * OTHER_i + \Delta x_{i0dt} \delta + \Delta u_{i0dt} \quad (6)$$

Table 3 Estimation results

	(1) Common trend model	(2) Common trend model	(3) Common carrier/route specific trend model	(4) Common and carrier/route specific trend with quarter fixed effects model
$\Delta REMOVALt$: Period after the slot removal at Newark	-0.0399*** (0.00452)	-0.0379*** (0.00473)	-0.0346*** (0.00492)	-0.00359 (0.0117)
$\Delta EWRod *REMOVALt*UAI$: Slot removal at Newark for United	-0.0280*** (0.00761)	-0.0171* (0.00749)	-0.0165+ (0.00889)	0.00255 (0.0152)
$\Delta EWRod *REMOVALt*OTHERi$: Slot removal at Newark for other carriers	-0.0418*** (0.00647)	-0.0295*** (0.00642)	-0.0395*** (0.00797)	-0.0378*** (0.00809)
Δ Quarterly total number of carriers serving the market	-0.00103 (0.00234)	-0.00729** (0.00271)	-0.00588* (0.00285)	-0.00193 (0.00285)
Δ Dummy: Southwest's presence at origin or destination or both	-0.0220 (0.0195)	-0.0218 (0.0189)	-0.0219 (0.0197)	-0.0220 (0.0195)
Δ Market distance (miles) (log-transformed)	0.0347* (0.0138)	0.0367** (0.0137)	0.0341* (0.0140)	0.0337* (0.0139)
Δ Number of coupons in the market	0.0102+ (0.00534)	0.0104+ (0.00534)	0.00995+ (0.00548)	0.00779 (0.00540)
Δ Dummy: Operating carrier change	-0.00172 (0.00442)	-0.00164 (0.00437)	-0.00258 (0.00444)	-0.00238 (0.00442)
Δ Dummy: Round trip	-0.0194*** (0.00254)	-0.0197*** (0.00251)	-0.0196*** (0.00258)	-0.0189*** (0.00254)
Δ Quarterly total number of employment at origin (log-transformed)	-0.561*** (0.0867)	0.0877 (0.0693)	0.0871 (0.0688)	0.0298 (0.0661)
Δ Quarterly total number of employment at destination (log-transformed)	0.537*** (0.0836)	0.100 (0.0705)	0.0775 (0.0627)	0.0242 (0.0616)
Quarter and year dummies	No	Yes	Yes	Yes
Carrier specific quarter dummies	No	No	No	Yes
Carrier specific year dummies	No	No	No	Yes
Observations			19445	
Adjusted R2	0.027	0.043	-	-

Standard errors in parentheses are clustered by carrier and route. The data set is an unbalanced panel. The Slot restriction at Newark Airport was removed on October 30, 2016. Aggregate time effects (quarter and year dummies) are omitted for brevity. All variables are first-differenced.

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

The first two columns of Table 3 show the estimation results obtained from the common trend model without and with aggregate time fixed effects (quarter and year dummies). Both results suggest that the key driver lowering fares on routes to or from Newark Airport after the slot removal was carriers other than the dominant carrier at Newark Airport. For example, column 2 of Table 3 suggests that, after aggregate time fixed effects are controlled for, the average airfare of United on routes to or from Newark Airport decreased by about 1.7% compared to that on routes to or from Kennedy and LaGuardia Airports, whereas the average airfare of carriers other than United is about 2.9% lower than that on routes to or from the two other New York airports. Column 3 of Table 3, which presents the estimation results obtained from the carrier/route-specific trend model, indicates that the overall pattern of the results remains the same. However, if we allow the explanatory variables to be correlated not only with time-constant carrier and route characteristics but also with carrier- and route-specific trends, the fare-reducing effect of Newark slot removal for United slightly decreases (1.6%). In addition, it is statistically significant only at the 10% level. In contrast, the fare-reducing effect of Newark slot removal for carriers other than United increases (-3.9%) and is statistically significant at the 0.1% level. As column 4 of Table 3 shows, the fare-reducing effect of Newark slot removal for carriers other than United is still statistically significant (-3.7%) even after controlling for carrier-specific year and quarter fixed effects, but the same effect becomes positive and statistically insignificant for United.

Although the null hypothesis that the coefficients of $\Delta EWRod *REMOVALt*UAI$ and $\Delta EWRod *REMOVALt*OTHERi$ are equal is not rejected for columns 1 and 2 of Table 3, it is rejected at the 5% level for columns 3 and 4. This partially supports the hypotheses that carriers react differently to the slot removal at Newark Airport and that the key driver lowering fares on routes to or from Newark Airport after the slot removal is carriers other than United Airlines.

6.2 Does the dominant carrier's fare premium persist even after the slot removal at Newark Airport?

The above results are interesting and do not run counter to common expectations. But they are slightly puzzling. Indeed, the positive and statistically insignificant coefficient of $\Delta EWRod *REMOVALt*UAI$ (the slot removal at the Newark for United dummy) is counterintuitive. Even though United has enjoyed a competitive advantage derived from its dominant position over other carriers at Newark Airport, it would be forced to react to increasing competition after the slot removal. However, Eqs. (5) and (6) impose the restriction that the slot removal has the same effect in each quarter. This may be too restrictive because the effects of the slot removal could change over time. Hence, Eqs. (7) and (8) relax it:

$$\begin{aligned} \Delta \ln \text{piodt} = & \theta + \beta_1 \Delta \text{REMOVAL1t} + \beta_2 \Delta \text{REMOVAL2t} + \beta_3 \Delta \text{REMOVAL3t} \\ & + \gamma_1 \Delta \text{EWRod} * \text{REMOVAL1t} * \text{UAI} + \gamma_2 \Delta \text{EWRod} * \text{REMOVAL2t} * \text{UAI} \\ & + \gamma_3 \Delta \text{EWRod} * \text{REMOVAL3t} * \text{UAI} \\ & + \gamma_4 \Delta \text{EWRod} * \text{REMOVAL1t} * \text{OTHERi} + \gamma_4 \Delta \text{EWRod} * \text{REMOVAL2t} * \text{OTHERi} \\ & + \gamma_4 \Delta \text{EWRod} * \text{REMOVAL3t} * \text{OTHERi} \\ & + \Delta \text{xiodt} \delta + \Delta \text{uiodt} (7) \end{aligned}$$

$$\begin{aligned} \Delta \ln \text{piodt} = & \text{giod} + \Delta \theta + \beta_1 \Delta \text{REMOVAL1t} + \beta_2 \Delta \text{REMOVAL2t} + \beta_3 \Delta \text{REMOVAL3t} \\ & + \gamma_1 \Delta \text{EWRod} * \text{REMOVAL1t} * \text{UAI} + \gamma_2 \Delta \text{EWRod} * \text{REMOVAL2t} * \text{UAI} \\ & + \gamma_3 \Delta \text{EWRod} * \text{REMOVAL3t} * \text{UAI} \\ & + \gamma_4 \Delta \text{EWRod} * \text{REMOVAL1t} * \text{OTHERi} + \gamma_4 \Delta \text{EWRod} * \text{REMOVAL2t} * \text{OTHERi} \\ & + \gamma_4 \Delta \text{EWRod} * \text{REMOVAL3t} * \text{OTHERi} \\ & + \Delta \text{xiodt} \delta + \Delta \text{uiodt} (8) \end{aligned}$$

Eqs. (7) and (8) are extensions of Eqs. (5) and (6) with the dummy representing the period after the slot removal at Newark, *REMOVALt*, replaced by three dummies for each quarter after the removal. *REMOVAL1t* equals 1 for times *t* within one quarter of the slot removal at Newark, and 0 otherwise. *REMOVAL2t* and *REMOVAL3t* equal 1 for times *t* within two and three quarters, respectively, of the slot removal at Newark, and 0 otherwise.

Table 4 Estimation results

	(1) Common trend model	(2) Common trend model	(3) Common carrier/route specific trend model	(4) Common carrier/route specific trend with year and quarter fixed effects model
$\Delta \text{REMOVAL1t}$: Period within the first quarter after the slot removal at Newark	-0.0200*** (0.00464)	-0.0208*** (0.00481)	-0.0186*** (0.00496)	0.0142 (0.0117)
$\Delta \text{REMOVAL2t}$: Period within the second quarter after the slot removal at Newark	-0.0532*** (0.00611)	-0.0626*** (0.00673)	-0.0583*** (0.00719)	-0.0364* (0.0178)
$\Delta \text{REMOVAL3t}$: Period within the third quarter after the slot removal at Newark	0.0180** (0.00687)	-0.00216 (0.00797)	0.00498 (0.00852)	0.0298 (0.0188)
$\Delta \text{EWRod} * \text{REMOVAL1t} * \text{UAI}$: Slot removal at Newark for United - within the first quarter after the removal	-0.0198** (0.00750)	-0.0167* (0.00748)	-0.00468 (0.00910)	0.0128 (0.0152)
$\Delta \text{EWRod} * \text{REMOVAL2t} * \text{UAI}$: Slot removal at Newark for United - within the second quarter after the removal	0.0303** (0.0107)	0.0336** (0.0107)	0.0561*** (0.0138)	0.0670** (0.0221)
$\Delta \text{EWRod} * \text{REMOVAL3t} * \text{UAI}$: Slot removal at Newark for United - within the third quarter after the removal	0.0167 (0.0103)	0.0198+ (0.0102)	0.0531** (0.0162)	0.0615* (0.0246)
$\Delta \text{EWRod} * \text{REMOVAL1t} * \text{OTHERi}$: Slot removal at Newark for other carriers - within the first quarter after the removal	-0.0325*** (0.00641)	-0.0289*** (0.00642)	-0.0390*** (0.00793)	-0.0359*** (0.00804)
$\Delta \text{EWRod} * \text{REMOVAL2t} * \text{OTHERi}$: Slot removal at Newark for other carriers - within the second quarter after the removal	-0.0363*** (0.00855)	-0.0327*** (0.00852)	-0.0525*** (0.0115)	-0.0354** (0.0117)
$\Delta \text{EWRod} * \text{REMOVAL3t} * \text{OTHERi}$: Slot removal at Newark for other carriers - within the third quarter after the removal	-0.0103 (0.00824)	-0.00668 (0.00820)	-0.0388** (0.0134)	-0.0287* (0.0137)
Δ Quarterly total number of carriers serving the market	-0.00433+ (0.00242)	-0.00988*** (0.00272)	-0.00847** (0.00285)	-0.00464 (0.00286)
Δ Dummy: Southwest's presence at origin or destination or both	-0.0176 (0.0191)	-0.0189 (0.0189)	-0.0182 (0.0197)	-0.0181 (0.0195)
Δ Market distance (miles) (log-transformed)	0.0339* (0.0135)	0.0349** (0.0135)	0.0318* (0.0138)	0.0321* (0.0137)
Δ Number of coupons in the market	0.0102+ (0.00532)	0.0102+ (0.00533)	0.00973+ (0.00547)	0.00774 (0.00540)
Δ Dummy: Operating carrier change	-0.000896 (0.00434)	-0.00106 (0.00434)	-0.00201 (0.00441)	-0.00212 (0.00439)
Δ Dummy: Round trip	-0.0196*** (0.00250)	-0.0197*** (0.00249)	-0.0196*** (0.00256)	-0.0189*** (0.00252)
Δ Quarterly total number of employment at origin (log-transformed)	0.209** (0.0696)	0.0735 (0.0695)	0.0669 (0.0696)	0.0113 (0.0668)

Δ Quarterly total number of employment destination (log-transformed)	at0.205** (0.0692)	0.0824 (0.0704)	0.0550 (0.0635)	0.00302 (0.0624)
Quarter and year dummies	No	Yes	Yes	Yes
Carrier specific quarter dummies	No	No	No	Yes
Carrier specific year dummies	No	No	No	Yes
Observations			19445	
Adjusted R2	0.054	0.056	-	-

Standard errors in parentheses are clustered by carrier and route. The data set is an unbalanced panel. The Slot restriction at Newark Airport was removed on October 30, 2016. Aggregate time effects (quarter and year dummies) are omitted for brevity. All variables are first-differenced.

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Table 4 reports the estimation results obtained from the common trend model without and with aggregate time fixed effects (columns 1 and 2) and the results obtained from the carrier/route-specific trend model without and with carrier-specific year and quarter fixed effects (columns 3 and 4). The results from the common trend model (columns 1 and 2) show that the fare-reducing effect for carriers other than United persists at least two quarters after the slot removal. Besides, the results from the carrier/route-specific trend model (columns 3 and 4) indicate that the effect persists three quarters after the slot removal. While the null hypothesis that the coefficients of $\Delta EWRod$

$*REMOVAL1t*OTHERi, \Delta EWRod$ $*REMOVAL2t*OTHERi$ and $\Delta EWRod$

$*REMOVAL3t*OTHERi$ are equal is rejected at the 1% level for columns 1 and 2 of Table 4, it is not rejected for columns 3 and 4. The test results suggest that the fare-reducing effect for carriers other than United persists after the slot removal at Newark, but it does not seem to change over time.

Interestingly, the estimation results again suggest that the slot removal at Newark Airport does not have the same fare-reducing effect for United as for other carriers. The results obtained from the common trend model (columns 1 and 2 of Table 4) suggest that during the first quarter after the slot removal, United’s average airfare on routes to or from Newark Airport was lower by about 1.7% to 2.0% compared to that on routes to or from Kennedy and LaGuardia Airports. However, during the second quarter after the slot removal, United’s average airfare on routes to or from Newark Airport was higher by about 3.1% to 3.4% than that on routes to or from the two other slot-controlled New York airports. The results obtained from the carrier/route-specific trend model (columns 3 and 4 of Table 4) further suggest that United’s average airfare on routes to or from Newark Airport was not lower than that on routes to or from Kennedy and LaGuardia Airports during the three quarters after the slot removal. Rather, the results from the carrier/route-specific trend model suggest that during the second and third quarters after the slot removal, United’s average airfare was about 5.5% to 6.9% higher than that on routes to or from the two other slot-controlled New York airports.

These results suggest that United could still take advantage of its dominant position at Newark Airport even after the slot removal. United’s market share at Newark calculated on the basis of domestic passengers carried was 69.8% in 2015. Although slightly decreased, it was maintained as high as 67.9% even in 2017, i.e., a full year after the slot removal. In contrast, at Kennedy and LaGuardia Airports, the largest carrier, Delta Airlines, had only about a 40% market share in terms of passengers carried in 2017: 40.1% at Kennedy and 41.7% at LaGuardia (Source: The Port Authority of NY & NJ, December Traffic Report, 2015-2017). As several previous studies have pointed out, airport dominance enhances a carrier’s ability to charge higher fares (Borenstein, 1989; Ciliberto & Williams, 2010; Evans & Kessides, 1993; Peteraf & Reed, 1994; Snider & Williams, 2015). The persistence of United’s “fare premium” after the slot removal may be due to its control of critical airport facilities such as gates at Newark Airport.

6.3 How did United react to the slot removal at Newark Airport?

It is understandable that the dominant carrier’s fare premium would persist even after the slot removal because of its control of airport facilities such as gates. However, it is not necessarily clear whether United could charge a fare premium on all routes to or from Newark Airport. How did the dominant carrier, United Airlines, and other carriers react differently to the slot removal at Newark Airport?

To examine whether United’s average fares were uniformly higher on all routes, I re-estimated the modified estimation model using a quantile regression approach. Fixed effects quantile regression is an active area of research (Abrevaya and Dahl, 2008; Canay, 2011; Galvao & Wang, 2015). Unfortunately, there seems to be no established method for estimating quantile regression with fixed effects at present. Thus, I estimate the Eq. (5) (i.e., the common trend model with aggregate time fixed effects) with carrier-specific quarter and year fixed effects using a simultaneous quantile regression method.

Table 5 Estimation results

Common trend model with carrier specific year and quarter fixed effects	(1) Q = 0.1	(2) Q = 0.2	(3) Q = 0.3	(4) Q = 0.4	(5) Q = 0.5
$\Delta REMOVALt$: Period after the slot removal at Newark	0.0118 (0.0127)	0.00720 (0.00965)	-0.00779 (0.00907)	-0.00714 (0.00900)	-0.00803 (0.00787)
$\Delta EWRod *REMOVALt*UAI$: Slot removal at Newark for United	0.0834*** (0.0207)	0.0555*** (0.0159)	0.0231 (0.0157)	0.0181+ (0.0106)	-0.00513 (0.0140)
$\Delta EWRod *REMOVALt*OTHERi$: Slot removal at Newark for other carriers	-0.0220* (0.0112)	-0.0314*** (0.00859)	-0.0280*** (0.00696)	-0.0256*** (0.00602)	-0.0307*** (0.00582)
Δ Quarterly total number of carriers serving the-	-0.0202***	-0.0102***	-0.00607*	-0.00304	-0.000754

market	(0.00477)	(0.00300)	(0.00250)	(0.00259)	(0.00233)
Δ Dummy: Southwest's presence at origin or destination or both	-0.00772 (0.0258)	-0.0246 (0.0229)	-0.0212 (0.0186)	-0.00456 (0.0158)	-0.00949 (0.0164)
Δ Market distance (miles) (log-transformed)	0.0412* (0.0164)	0.0107 (0.0129)	0.0144 (0.0111)	0.0191+ (0.0106)	0.0179+ (0.0103)
Δ Number of coupons in the market	0.0149* (0.00712)	0.0135** (0.00496)	0.00848* (0.00383)	0.00531 (0.00341)	0.00110 (0.00353)
Δ Dummy: Operating carrier change	-0.0105+ (0.00550)	-0.00219 (0.00461)	-0.000491 (0.00410)	-0.0000567 (0.00316)	-0.000813 (0.00349)
Δ Dummy: Round trip	-0.0213*** (0.00356)	-0.0172*** (0.00265)	-0.0138*** (0.00221)	-0.0129*** (0.00203)	-0.0104*** (0.00186)
Δ Quarterly total number of employment at origin (log-transformed)	0.00808 (0.116)	0.0404 (0.0894)	0.0578 (0.0672)	0.0282 (0.0893)	0.0336 (0.0813)
Δ Quarterly total number of employment at destination (log-transformed)	-0.0476 (0.0854)	0.0707 (0.0818)	0.0702 (0.0829)	0.0407 (0.0607)	0.0479 (0.0443)
Quarter and year dummies	Yes	Yes	Yes	Yes	Yes
Carrier specific quarter dummies	Yes	Yes	Yes	Yes	Yes
Carrier specific year dummies	Yes	Yes	Yes	Yes	Yes
Observations			19445		
Pseudo R2	0.0495	0.0423	0.0420	0.0433	0.0447

Standard errors in parentheses are obtained by 1000 bootstrap replications. The data set is an unbalanced panel. The Slot restriction at Newark Airport was removed on October 30, 2016. Aggregate time effects (quarter and year dummies) are omitted for brevity. All variables are first- differenced.

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Table 5 (continued) Estimation results

Common trend model with carrier specific year and quarter fixed effects	(1) Q = 0.6	(2) Q = 0.7	(3) Q = 0.8	(4) Q = 0.9
Δ REMOVALt: Period after the slot removal at Newark	-0.0135+ (0.00810)	-0.0261** (0.00797)	-0.0332** (0.0105)	-0.0266 (0.0203)
Δ EWRod *REMOVALt*UAI: Slot removal at Newark for United	-0.0123 (0.0115)	-0.0386* (0.0154)	-0.0536** (0.0163)	-0.0931** (0.0327)
Δ EWRod *REMOVALt*OTHERi: Slot removal at Newark for other carriers	-0.0317*** (0.00624)	-0.0288*** (0.00703)	-0.0196* (0.00812)	-0.0146 (0.0130)
Δ Quarterly total number of carriers serving the market	-0.00249 (0.00261)	-0.00208 (0.00224)	0.00273 (0.00347)	0.00270 (0.00567)
Δ Dummy: Southwest's presence at origin or destination or both	-0.0280** (0.0104)	-0.0316 (0.0200)	-0.0342* (0.0173)	-0.0297 (0.0342)
Δ Market distance (miles) (log-transformed)	0.0239* (0.0102)	0.0244* (0.0105)	0.0444** (0.0145)	0.0322 (0.0200)
Δ Number of coupons in the market	0.000756 (0.00418)	-0.00112 (0.00461)	-0.00271 (0.00579)	0.00287 (0.00840)
Δ Dummy: Operating carrier change	0.00135 (0.00319)	0.00402 (0.00390)	0.000431 (0.00408)	-0.00322 (0.00676)
Δ Dummy: Round trip	-0.0115*** (0.00189)	-0.0138*** (0.00215)	-0.0147*** (0.00254)	-0.0198*** (0.00395)
Δ Quarterly total number of employment at origin (log-transformed)	-0.0125 (0.0682)	0.0456 (0.0614)	0.00968 (0.0644)	-0.101 (0.111)
Δ Quarterly total number of employment at destination (log-transformed)	0.0711 (0.0446)	0.0494 (0.0527)	0.0465 (0.0564)	-0.0200 (0.121)
Quarter and year dummies	Yes	Yes	Yes	Yes
Carrier specific quarter dummies	Yes	Yes	Yes	Yes
Carrier specific year dummies	Yes	Yes	Yes	Yes
Observations			19445	
Pseudo R2	0.0470	0.0505	0.0549	0.0594

Standard errors in parentheses are obtained by 1000 bootstrap replications. The data set is an unbalanced panel. The Slot restriction at Newark Airport was removed on October 30, 2016. Aggregate time effects (quarter and year dummies) are omitted for brevity. All variables are first- differenced.

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

The results of the re-estimation reveal some interesting features of United's and other carriers' reactions to the slot removal at Newark Airport. The nine columns of Table 5 show that all coefficients of Δ EWRod*REMOVALt*OTHERi have negative signs and are statistically significant except for the 0.9 quantile coefficient. In addition, the quantile coefficients of Δ EWRod*REMOVALt*OTHERi are relatively similar across the quantiles: they range from about -1.96 (the 0.8 quantile coefficient) to about -3.17 (the 0.6 quantile coefficient), which suggests that carriers other than United responded to the slot removal at Newark Airport by reducing the average ticket prices on routes to or from Newark Airport by about 1.94% to 3.12% compared to those on routes to or from the two other New York airports. In contrast, the coefficients of Δ EWRod*REMOVALt*UAI have negative signs for the upper quantiles (those at or above the 0.5) but positive signs for the lower quantiles (those at or below 0.4). The 0.1, 0.2, 0.7, 0.8, and 0.9 quantiles, which

range from -0.0931 (the 0.9 quantile) to 0.0834 (the 0.1 quantile), are statistically significant at or below the 5% level. The results suggest that United responded to the slot removal by increasing the average ticket prices by about 5.71% to 8.70% at the lower quantiles (0.1 and 0.2) of the conditional fare distribution, while simultaneously lowering the average ticket prices by about 3.79% to 8.89% at the higher quantiles (0.7 – 0.9) of the conditional fare distribution compared to the average ticket prices on routes to or from the two other New York airports.

Overall, the above estimation results suggest that United Airlines may have been able to take advantage of its dominant position at Newark Airport and charge a premium ticket price on relatively low-fare routes even after the slot removal, even as it was being challenged by (possibly growing) competition, especially on relatively high-fare routes.

7 CONCLUSIONS

This paper examined the impact of slot restriction as a determinant of scarcity rent, i.e., markup on fares resulting from airport capacity shortages. Previous studies on this subject have a common limitation: they could not explicitly examine the effects of slot restrictions on airfare. To overcome this limitation, this paper employed the exogenous regulatory change, i.e., the removal of slots at Newark Airport in October 2016. The results from the difference-in-differences estimation, in which the treatment group comprises routes to or from Newark and the control group consists of routes to or from the two other slot-controlled New York airports, suggest that the average fare on routes to or from Newark Airport decreased by about 2.8% compared to the average fare on routes to or from the two other slot-controlled New York airports after the slot removal at Newark Airport. The estimation results from a modified model and a quantile regression approach suggest that the key driver lowering fares on routes to or from Newark Airport after the slot elimination is carriers other than the dominant carrier at Newark, i.e., United, though it is challenged by competition on relatively high-fare routes.

In sum, the estimation results imply that (1) scarcity rent arose at Newark Airport during the period when it was a slot-controlled airport; (2) the scarcity rent was transferred to carriers, not to passengers; and (3) the fare-reducing effect of Newark slot removal was stronger for the non-dominant carriers than for the dominant carrier, United; however, (4) even United seems to have lowered its ticket prices on relatively high-fare routes to or from Newark Airport, perhaps due to growing competition after the slot removal at the airport. Put differently, at slot-controlled airports, slot restrictions limit the effect of competition on airfare, and the scarcity rent is not transferred to passengers. If this situation is considered inequitable, future research should focus on better understanding how to enhance competition by improving the accessibility and transparency of the secondary slot-trading market (Fukui, 2010, 2012, 2014) or by replacing slot restrictions with market-based measures, such as congestion pricing or a slot auction mechanism (Brueckner, 2009; Gillen & Starkie, 2016; Starkie, 1998). The latter measures will transfer scarcity rents from carriers to the government, which could be used to increase airport capacity and competition among carriers.

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REFERENCES

- Abrevaya, J., & Dahl, C. M. (2008). The effects of birth inputs on birthweight: Evidence from quantile estimation on panel data. *Journal of Business and Economic Statistics*, 26(4), 379–397.
- Abramowitz, A. D., & Brown, S. M. (1993). Market share and price determination in the contemporary airline industry. *Review of Industrial Organization*, 8(4), 419–433.
- Borenstein, S. (1989). Hubs and High Fares: Dominance and Market Power in the U.S. Airline Industry. *The RAND Journal of Economics*, 20(3), 344–365.
- British Airways (2016). Ever wondered how British Airways decides where to deploy the A380 double-decker aircraft? Here are all the details from the people in the know (May 2016). <https://www.britishairways.com/en-gb/business-travel/articles/how-we-decide-our-a380-routes> (Accessed on April 10, 2018)
- Brueckner, J. K. (2009). Price vs. quantity-based approaches to airport congestion management. *Journal of Public Economics*, 93(5–6), 681–690.
- Burghouwt, G., et al (2017). The impact of airport capacity constraints on air fares. SEO Amsterdam Economics. Amsterdam.
- Canay, I. A. (2011). A simple approach to quantile regression for panel data. *Econometrics Journal*, 14(3), 368–386.
- Ciliberto, F., & Williams, J. W. (2010). Limited Access to Airport Facilities and Market Power in the Airline Industry. *Journal of Law and Economics*, 53(3), 467–495.
- Dresner, M., Windle, R., & Yao, Y. (2002). Airport Barriers to Entry in the US. *Journal of Transport Economics and Policy*, 36(2), 389–405.
- Evans, W. N., & Kessides, N. (1993). Localized Market Power in the U.S. Airline Industry. *The Review of Economics and Statistics*, 75(1), 66–75.
- Fukui, H. (2010). An empirical analysis of airport slot trading in the United States. *Transportation Research Part B: Methodological*, 44(3), 330–357.
- Fukui, H. (2012). Do carriers abuse the slot system to inhibit airport capacity usage? Evidence from the US experience. *Journal of Air Transport Management*, 24, 1–6.
- Fukui, H. (2014). Effect of slot trading on route-level competition: Evidence from experience in the UK. *Transportation Research Part A: Policy and Practice*, 69, 124–141.
- Galvao, A. F., & Wang, L. (2015). Efficient minimum distance estimator for quantile regression fixed effects panel data. *Journal of Multivariate Analysis*, 133, 1–26.

- Gayle, P. G., & Wu, C. Y. (2013). A re-examination of incumbents' response to the threat of entry: Evidence from the airline industry. *Economics of Transportation*, 2(4), 119-130.
- Gillen, D., & Starkie, D. (2016). EU Slot Policy at Congested Hubs, and Incentives to Add Capacity. *Journal of Transport Economics and Policy*, 50(2), 151-163.
- Heckman, J. J., & Hotz, V. J. (1989). Choosing Among Alternative Nonexperimental Methods for Estimating the Impact of Social Programs: The Case of Manpower Training. *Journal of the American Statistical Association*, 84(408), 862-874.
- Morrison, S. A. (2001). Actual, Adjacent, and Potential Competition - Estimating the Full Effect of Southwest Airlines. *Journal of Transport Economics and Policy*, 35(2), 239-256.
- Papke, L. E. (1994). Tax policy and urban development: Evidence from the Indiana enterprise zone program. *Journal of Public Economics*, 54, 37-49.
- Peteraf, M. A., & Reed, R. (1994). Pricing and Performance in Monopoly Airline Markets. *Journal of Law and Economics*, 37(1), 193-213.
- Snider, C., & Williams, J. W. (2015). Barriers to entry in the airline industry: A multidimensional regression-discontinuity analysis of AIR-21. *Review of Economics and Statistics*, 97(4), 1002-1022.
- Starkie, D. (1998). Allocating airport slots: a role for the market? *Journal of Air Transport Management*, 4(2), 111-116.
- US Department of Justice (US DOJ). (2015). *United States v. United Continental Holdings, Inc., and Delta Air Lines Inc. - Verified Complaint*.
- US Department of Justice (US DOJ). (2016). *United States v. United Continental Holdings, Inc., and Delta Air Lines Inc. - Stipulation of Dismissal*.
- Van Dender, K. (2007). Determinants of fares and operating revenues at US airports. *Journal of Urban Economics*, 62(2), 317-336.
- Wooldridge, J. M. (2010). *Econometric Analysis of Cross Section and Panel Data, Second Edition*. The MIT Press, Cambridge, Massachusetts.

1187 TOURISM, MOBILITY AND TRANSPORTATION: CHANGING SPACES IN LISBON (2007-2017)

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ABSTRACT

The city of Lisbon has been witnessing a strong growth in the tourism sector, being the 2nd fastest growing city destination in Europe, from 2009 to 2016 (Global Destinations Cities Index - GDCI/Mastercard), with an increase from 5,6 million visitors (hotel stays) in 2009 to 11 million in 2016 (National Institute of Statistics, Portugal). This growth is the combined result of a number of factors, among which a reorganization of the European and global tourism markets, the opening of various low-cost airline routes to Lisbon and the perception of a friendly and warm-welcoming destination, combining a local flavour of tradition with an increasingly cosmopolitan urban beat. On the other hand, this increase in tourism cannot outlook major transformations in the city's infrastructural and spatial amenities, among which 1) transport infrastructure, 2) mobility services and 3) public space systems.

The paper addresses the recent change (since 2007) in these three systems, highlighting urban and infrastructural projects in which meaningful interplays between tourism and mobility can be found.

Keywords: touristification, mobility infrastructure, public space, urban regeneration, Lisbon

1 INTRODUCTION

This paper outlines the emerging fields of relationship between tourism and recently developed projects of infrastructure, mobility and public space in Lisbon. This discussion stems from previously developed lines of research regarding Lisbon's urban and metropolitan morphogenesis and its relationship with large scale infrastructural networks (Santos, 2012).

The discussion will be structured in three parts. Firstly, an overview of the recent trends in the Portuguese spatial development framework, its urban policies and funding. This outline establishes the responsibilities and decision levels in which urban development and mobility-related policies occur. In this field, urban policies have been focusing on public space and infrastructural projects, not so much on housing and economic activities, since the early 2000's. Municipalities have a strong role in urban planning, but limited resources to guide or control private investment. Public expenditure is, therefore, seen as an initiator, triggering follow-up dynamics, with considerable investment on public urban networks.

Secondly, a mapping of urban transformations in the three above-mentioned systems is presented, emphasising the areas where improvement in mobility nodes and public space intersect to drive tourism attraction upwards. This mapping is accompanied by a short overview of relevant projects associated with the change in international and metropolitan transport hubs, the regeneration of the city's waterfront and the public space improvement in the hilly inner-city districts.

Finally, a third part concerns the main threads of discussion regarding the critical issues raised by the recent paths of urban change. A fragile social fabric in the older city districts is faced with gentrification and touristification – much of it as the result of new and improved mobility and public space amenities. The city's public transportation networks (i.e. metro, river boats, trams and historical funiculars) – faced with budget cuts and service downgrade during the recent economic and financial crisis – are increasingly sought by tourists and incapable of providing adequate service to local users.

Nevertheless, considerable positive effects can be underlined when transport and public space projects are spatially intertwined to deliver quality urban spaces. Either a circumstantial or more permanent trend, tourism growth has triggered challenges but also new opportunities in Lisbon. A fundamental question open for debate is how tourism-oriented mobility products (i.e. tuk-tuk, amphibious vehicles, Segway-type personal movers) can feed-back as smart solutions for everyday's urban mobility.

This paper's specific contribution links the spatial apparatus of metropolitan scale infrastructure with the smaller scaled fabric of Lisbon's central city districts. The focus on public space projects, associated with those of heavy infrastructure, provide the common ground between the morphological approach, post-network criticism and their linkages with specific patterns of urban life – in this case, tourism. An in-depth analysis of Lisbon's tourism is intentionally left behind in the discussion, as the main thematic focus stems from infrastructural space. Tourism, however, is a field from which a timely discussion regarding future prospects for Lisbon's urban development can emerge. Tourism can be approached as a commercial product but also as spatial package with which multiple actors are engaged.

2 POLICY FRAMEWORK FOR URBAN REGENERATION IN PORTUGAL (2007-2017)

With most of housing in central Lisbon in private hands, the municipality's investment in urban regeneration is mainly focused on infrastructure and public space. This focus also stems from national and EU guidelines, in which public funding in recent years has been directed to environmental qualification and promotion of soft mobility. Such approach, in which physical interventions are prioritised can be better described as urban revitalization initiatives (Balsas, 2007, Mendes, 2013a). National policies on urban development during the late 1990's and early 2000's included a line of investment in

the upgrade of spatial, environmental and mobility systems in several cities (MAOT, 2000; SEAOT, 2008). According to Baptista (2013), this investment – labelled *Polis Program* – is embedded in a Welfare State rationale:

“its focus on public-led intervention, public space for public use, and disciplining of private developers, makes sense in the context of a state apparatus that was still thinking of itself as “modernizing” toward a “European” welfare ideal already in decline elsewhere in the EU and the world at large. With its impetus to extend the benefits of modern city living to a greater number of urban citizens, to fix urban problems, and to use the powers of the state to redistribute social goods and stimulate social cohesion, the Polis Program constitutes an exemplar of state intervention within a welfare logic that seeks to be a corrective to the logics of capitalist accumulation.” (Baptista, 2013: 600).

From 2008 onwards, and according to new EU funding guidelines, the national urban policies framework is adapted in order to foster social cohesion, inclusion and local partners involvement criteria. In Lisbon, the Municipality establishes as policy priorities the reversion of a four-decade-long demographic loss trend, the attraction of younger inhabitants, and the promotion of inclusion, innovation and creativity through strategic initiatives (Carta Estratégica de Lisboa – Lisbon’s Strategic Charter: CML, 2009a), urban planning (Plano Director Municipal – Municipal Master Plan: CML, 2012) and local interventions (CML, 2009b, UPM, 2009 e 2010, Mendes, 2013b).

Along with the major restructuring and expansion of the underground network in the late 1990’s came the opportunity to redevelop major plazas and squares. *Rossio* and *Praça da Figueira* were the first to be renewed, with underground parking spaces, new pavements, lighting, furniture and trees, with a more generous approach to pedestrian space. After a first generation of piecemeal interventions (Balsas, 2007: 248), a more consistent and systemic approach to public space improvement can be detected, especially after 2006 (CBC, 2006; CML, 2008; Salgado, 2012; CML, 2016). *Frente Tejo, SA*, a specific purpose public agency, is established by the Government to lead a large scale urban revitalization project in the riverfront (Conselho de Ministros, 2008).

3 MAPPING CHANGING SPACES OF MOBILITY, PUBLIC SPACE AND TOURISM IN LISBON (2007-2017)

The last decade can be seen as a stage of transition in Lisbon’s metropolitan infrastructural strata to what it was called the layering of a *connective fabric* (Santos, 2012). At the city scale, this fabric is established through: 1) the introduction of complex intermodal transport nodes and 2) the development of well-connected patches of urban development bridging or regenerating spatial and functional gaps in the metropolitan fabric.

3.1 The connection of metropolitan nodes in the central districts

Transformations at a local level in the city of Lisbon began to be sensed as the underground system is expanded and connected to the railway, the airport, and to river and bus terminals in a number of new intermodal stations. Public space qualification and urban renewal projects started to be programmed in the areas adjacent to these new stations, taking a role in the framing of a better balanced and cohesive urban structure.

Specifically relevant to tourism, the downtown and riverfront transport hubs of *Terreiro do Paço*, *Rossio*, *Cais do Sodré* and *Santa Apolónia* played a key role in redefining the city’s urban flows. These transport hubs were simple terminals of river traffic and railroad lines, without proper connection to other urban networks. Since the late 1990’s, they were connected to the underground network defining the first step towards an efficient mobility network in the city central districts. More importantly, they provided a qualified spatial apparatus for commuters, city users and tourists in some of the noblest areas of the city such as the riverfront and the city’s main plazas.

The underground station of *Baixa-Chiado* was also an important landmark for bringing that network to the hitherto declining commercial heart of Lisbon. It offers two entrances: one at the downtown district (*Baixa*), the other at the *Chiado* hill. Over the station, one of the most cherished department stores that had burnt down in the late 1980’s – as the result of declining commercial tradition – was refurbished as a new shopping mall while maintaining a remarkable urban and architectural integrity. The station and shopping mall became popular links between the districts’ lower and upper levels, driving a lasting commercial revival, both for Lisboners and tourists.

The investment in these transport nodes was a meaningful departure from decades of very limited public and political concern with the commercial and urban attractiveness of Lisbon’s central districts. The 1970’s and 1980’s were mainly shaped by powerful centrifugal trends towards suburban axes, accompanied by strong population loss in the inner-city neighborhoods.

The 2011 census has shown, however, a slight tendency of demographic recovery in the most central districts, associated with a new type of residents: young singles and couples, with above average income and attracted to the trendy urban scene. This recovery cannot be properly assessed without a broader perspective on other urban activities, in which tourism is clearly playing a role as a trend-setter in recent years. On one hand, tourist accommodation has increased in number and diversity, its quality being widely acknowledged. On another hand, public space and other urban amenities have also been systematically upgraded and renovated, offering the needed infrastructure to support residential, working and tourist city users. Public space, together with heavy mobility infrastructure, can be said to be a key driver of urban regeneration in central Lisbon. The following section briefly outlines this recently upgraded public space system.

3.2 The improvement in the public space system associated with urban attractors

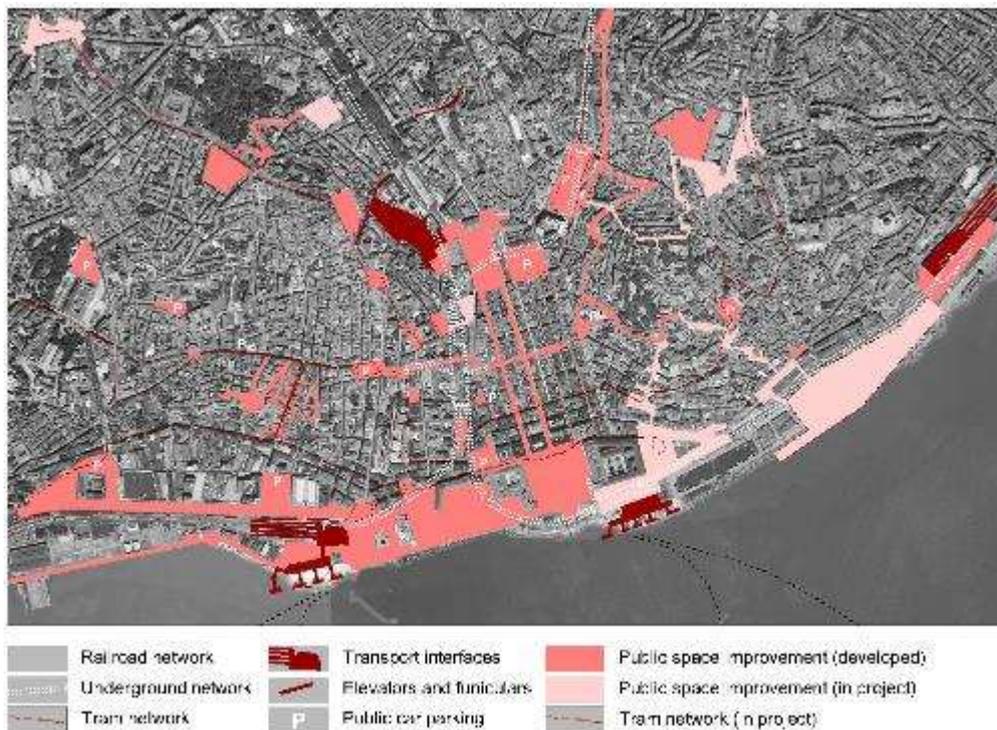
This process has extended to other open spaces, defining an increasingly coherent network of qualified public space, of which one can trace three main systems:

- the riverfront system (Figure 1): *Cais do Sodré – Ribeira das Naus – Terreiro do Paço – Campo das Cebolas – Santa Apolónia*;
- the garden and belvedere system: *Príncipe Real – São Pedro de Alcântara – Graça – Senhora do Monte*;
- the street and square system: *Santa Catarina – Bica – Chiado – Baixa- Rossio – Martim Moniz – Mouraria – Castelo – Alfama*



Figure 1: The riverfront system in 2014. Source: <http://portugalfotografiaaerea.blogspot.com>

The upgrade of these systems (Figure 2) during the last fifteen years had a clear impact in the spatial attractiveness of some of the city's most outstanding places, but more importantly, established a continuous and coherent public realm system. Other than the UNESCO listed monuments of Belém (Jerónimos Monastery and Torre de Belém), Lisbon best touristic offer comes from the diversified character of its urban fabric, from the sensual relationship with topography and from the dialogue with the Tagus river. On the other hand, the overall upgrade of such public realm system had a clear impact on the everyday life in central Lisbon, with a sharp increase in commercial and leisure-related offer.



Drawing by the author

Figure 2: public space and transport infrastructure projects in central Lisbon, since 2000.

In fact, most of these public space improvements were accompanied by the development of food & beverage establishments and some fashion retail stores. This commercial profile reveals a clear prevalence of visitor-oriented commerce, either from outside (tourists) or from the metropolitan area. The reinforcement of pedestrianized spaces was accompanied by the building of several multi-level parking areas, some of them under large squares, in a process not exempt from controversy (Balsas, 2007). Just as happened with the patterns of commercial change, these parking facilities were mainly targeted at visitors. As it will be discussed in the following chapter, the appropriation of these renewed spaces didn't necessarily translate in benefits to local residents or traditional city uses. Notwithstanding an

undeniable urban spatial qualification, these improvements were also the drivers of a new pattern of use and flow, in which tourism and leisure were clearly favoured in terms of urban amenities or the involvement of local communities.

Finally, they share the relationship with heavy infrastructure: underground stations, underground car parkings and recently upgraded public realm in the vicinity. Despite controversy in terms of management regime and public amenity privatisation, these cases remain, however, as evidence of a rather successful strategy to associate urban attractors with the public space system, maintaining some democratic balance in its use and appropriation. Far from thematised enclaves so often seen in other *touristified* cities, Lisbon’s public space maintains a clear Mediterranean character, in which continuity and some sort of functional promiscuity stand as the fundamental city structure.

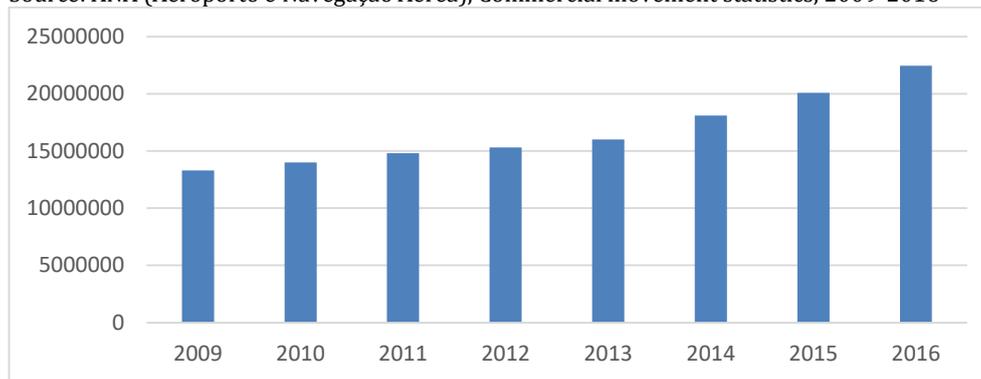
4 CRITICAL ISSUES: GENTRIFICATION, TOURISTIFICATION AND THE PROVISION OF PUBLIC SPACE AND MOBILITY AMENITIES

4.1 The emerging tourism landscape of Lisbon

After initial flagship projects with high international visibility, such as the 1994 European Capital of Culture, the 1998 International Exhibition and the 2004 European Football Championship, Lisbon became an increasingly sought tourist destination in the European scene. These projects brought considerable change to the city’s infrastructure and spatial amenities, with a strong commitment to the valorisation of urban heritage, public space and cultural venues. International visibility combined with attractive local conditions (relatively affordable prices, mild climate, strong identity, remarkable heritage and landscape sites, friendliness and safety, diversified and cosmopolitan leisure and nightlife offer) resulted in steady increases in the number of international visitors, visible both in the growing airport attractivity (Graph 1) and in the number of hotel stays (Graph 2). Since 2009, tourism sector in Lisbon has increased at an average level of 6% per year with European markets remaining as the main origin of visitors (55%), despite increasing numbers from Brazil, Russia and China (ATL, 2012, 2013, 2015).

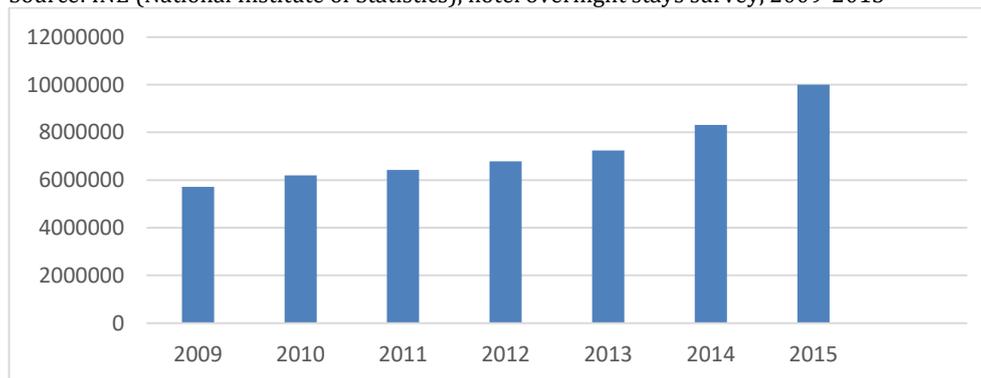
Graph 1. Passenger movement in Lisbon airport.

Source: ANA (Aeroporto e Navegação Aérea), Commercial movement statistics, 2009-2016



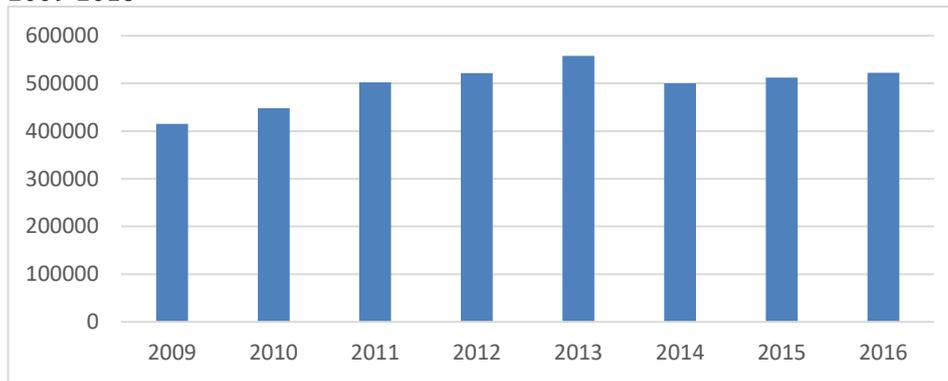
Graph 2. Overnight stays in Lisbon (city).

Source: INE (National Institute of Statistics), hotel overnight stays survey, 2009-2015



Additionally, specific tourism niches began to take shape and grow as major vehicles of attraction: the cruise ship market (Graph 3), the low-cost airline operators, the hostel and *bnb* sectors (JLL, 2015). City-breaks are currently the most important tourism category in Lisbon, taking advantage of easy access, while maintaining the rather unique blend between European and Mediterranean culture. One interesting issue is discussing Lisbon’s touristic performance is related to the severe austerity context it is going through, namely since 2011. Tourism is virtually the only major sector in Lisbon in which high growth rates can be observed. It is, however, a growth that must critically observed, namely in its long-term perspective. Current offer, despite acknowledged as innovative and attractive to urban visitors, remains targeted at a rather lower economic strata of visitors. Lisbon’s position in term of economic value remains distant from other cities with comparable numbers.

Graph 3. Cruise ship movement in Lisbon port. Source: APL (Administração do Porto de Lisboa), Port activity statistics, 2009-2016



Tourist offer are mainly centred on conventional city landmarks, such as the historical districts and the monumental area of Belém, but has been successful in diversifying to other stems of attraction, such as the immaterial cultural heritage (*Fado*, popular festivities, creative hubs, renewed impetus on local associations), the riverfront and other outstanding landscape sites (the city's belvederes or the out-of-town landmarks of Sintra and Cascais), or the less massified activities related to wine production, horse riding, bird watching, nautical and other open air activities, all of which gaining prominence in the metropolitan outskirt regions.

4.2 The overload of infrastructure

Coming out from decades of poorly developed mobility network, Lisbon's major improvements in this field shadowed other less visible trends of overload. The extension and interconnecting of major railroad, underground, river traffic and airport networks in the city increased its overall capacity significantly, despite a strong pressure from private car and individual motorization.

Aside from the large-scale infrastructures, such as the airport and its limitations in terms of future expansion, other local infrastructures are facing increasing levels of overload because of tourism development. Some major attractions in Lisbon are precisely associated with traditional modes of transportations, as is the case of three funiculars and one lift dating from the late 19th century, or the *ex-libris* fleet of yellow tram cars. Riding them without a previously purchased ticket is now almost three times more expensive than before. Long queues, delayed stops in popular locations, and overloaded vehicles push local users away. Yet, they are crucial in maintaining this ageing network in terms of financial sustainability, after many years of line closing and replacement by bus lines.

As previously seen, mobility investments are targeting the connections in central districts, especially in the hilly areas, together with the upgrade of public and pedestrian space. However, the interesting side of this investment is being confronted with growing conflict from new forms of transport, especially tailored for tourists (Bloomberg Business, 2015, Público, 2014 and 2015b): *tuk-tuks* that run noisily in the narrow city's streetscape; the tour buses taking and leaving hundreds of cruise ship passengers in central squares for local excursions or dinner at one of the many *fado* restaurants; the queuing taxi cars waiting for the opportunity of a tourist ride.

While legitimized by a consensual discourse on public space improvement, restriction of private car traffic in the central city or decrease of air pollution control, many of the above discussed initiatives led by the municipality resulted in conflictive side effects in other areas of the city. Traffic restrictions in outstanding sites such as *Baixa* and *Terreiro do Paço*, diverted urban traffic to neighbouring districts which, in turn, fail to accommodate the increased pressure. Additionally, the surge of new amenities attracted visitors from other parts of Lisbon and from its metropolitan area, often using their own car. This phenomenon is can be especially seen at night and weekends, when public transport becomes a far less convenient alternative. The impact of spatio-temporalities of tourism, leisure and urban attraction in urban infrastructure seems too difficult to grasp and anticipate. Their state of constant flux offers, however, an opportunity to devise new levels of service (i.e. mobility) that better suits the needs and demands of a wider metropolitan realm, while taking advantage of recent investment in heavy infrastructure.

4.3 The vision behind strategic infrastructural investments

A critical area, in which future development is being reassessed under wider political visions, is the one relating to the heavy metropolitan infrastructures: the airport, the port and the railroad system. Notwithstanding its overarching complexity, the short-term change in national infrastructural policies has had – and will continue to have – important repercussions on the evolution of the country's capital city. The role tourism and its stakeholders play in this equation is critical. Two examples reveal this dilemma.

After a five decade-long debate regarding the development of a new international airport 40 km from Lisbon, current decision points to the improvement of existing facilities, taking full advantage of its capacity. The cost-benefit debate has often been assessed in terms of geo-strategic reasoning (Lisbon as a new hub for Africa and South America) and spatial development (the new infrastructure as a driver of regional economic and urban balance in Lisbon metropolis). However, the presence of an airport right in the middle of the city stands as a major argument for current tourism market. Easy and effective connections enable the city-break market associated with a friendly, easily manageable human scale of the

metropolis. Privatization and liberalization in airport and airline market, along with the support of low-cost bases, come together to shape the future configuration of global connection and indeed the spatial pattern of Lisbon metropolis.

The second example comes from the port. Being a multi-terminal port in various locations in both banks of the River Tagus, the port is at cross-roads in terms of the future of city terminals. With major cargo terminals located in very central areas of Lisbon, the competition of scarce space resources is having direct impact in port and municipal decision-making. Unlike many other waterfront cities, Lisbon has kept a vision of a working port city, favouring the maintenance of cargo operations in the city. This approach has not been consensual and considerable debate and claims have been made regarding the need to return unused port spaces to the city. Vast areas of landfill have been redesigned as public space for leisure, culture and commercial amenities, though far from some of the well-known Anglo-Saxon experiences. Prospects regarding the increasing presence of cruise ships and the relocation of large cargo terminals for new urban uses are still far from clarified. Yet, they provide a test-bed to assess the interplay of these different stakeholders.

5 CONCLUSIONS

Taking Lisbon as a test-bed for a leveraged approach to urban tourism, mobility and public space can be said to play a meaningful role as a common ground to overcome and go beyond strict confrontation between city residents and visitors. When considered as common ground, mobility and public space are key contributors to make the city as a value in itself. Instead of competition-driven rationale, in which cities are seen as *quasi-enterprise* entities fighting for a prominent position in the global arena, the argument of a strong relationship between public space improvements and the upgrade of trans-scalar metropolitan connectivity can be seen as a socially aware alternative.

In what urban planning is concerned, the planning of public space upgrade and improved mobility connections as part of a robust network of shared spaces remains as a valued approach to a democratic and socially equitable city. Unlike other approaches in which infrastructural and public space development occur under a rather focused economic rationale, Lisbon's initiatives have maintained relatively high levels of concern with various strata of city users, going beyond the strict duality of tourists vs. residents. Recent project can hardly be accused of single-mind concern with tourist markets as many of the city's most cherished places were in need of renewal and qualification. Despite an obvious increase of touristification and gentrification processes in the inner city, urban infrastructure policies provide a fair basis for urban development, improving both the quality of access and the quality of urban landscape. If undesired trends are to be fought, then other levels of urban policy must be enforced – namely in terms of private activities, accommodation and quality of service.

REFERENCES

- Balsas, C. (2007) City Centre Revitalization in Portugal: A Study of Lisbon and Porto. *Journal of Urban Design* 12:2, 231-259.
- Baptista, I. (2013). The Travels of Critiques of Neoliberalism: Urban Experiences from the "Borderlands". *Urban Geography* 34:5, 590-611.
- Bloomberg Business (2015) Lisbon Tourist Invasion Seen Threatening Ancient City's Identity. <https://www.bloomberg.com/news/articles/2014-10-01/lisbon-tourist-invasion-seen-threatening-ancient-city-s-identity>, accessed 9 May 2017.
- CBC, COMISSARIADO PARA A BAIXA-CHIADO (2006). Proposta de Revitalização da Baixa-Chiado. Lisboa: Comissariado da Baixa-Chiado [*Proposal for the Revitalization of Baixa-Chiado District*]. Lisboa: CBC
- CML, CÂMARA MUNICIPAL DE LISBOA (2008) Plano Geral de Intervenções da Frente Ribeirinha de Lisboa – Documento de Enquadramento [*General Plan of Interventions in Lisbon's Waterfront*]. Lisboa: Câmara Municipal de Lisboa.
- CML, CÂMARA MUNICIPAL DE LISBOA (2009a) Carta Estratégica de Lisboa 2010-2024 – Um compromisso para o futuro da cidade [*Lisbon's Strategic Charter 2010-2024 – A commitment with the city's future*]. Lisboa: Câmara Municipal de Lisboa.
- CML, CÂMARA MUNICIPAL DE LISBOA (2009b) Plano de Acessibilidade Suave e Assistida à Colina do Castelo [*Plan for Soft and Assisted Accessibility to Castle Hill*]. Lisboa: Câmara Municipal de Lisboa.
- CML, CÂMARA MUNICIPAL DE LISBOA (2012) Plano Director Municipal de Lisboa [*Lisbon's Urbanistic Master Plan*]. Lisboa: Câmara Municipal de Lisboa.
- CML, CÂMARA MUNICIPAL DE LISBOA (2016). Projectos Frente Ribeirinha (do Cais do Sodré ao Campo das Cebolas) [*Projects for the Waterfront – from Cais do Sodré up to Campo das Cebolas*], <http://www.cm-lisboa.pt/viver/urbanismo/espaco-publico/projetos-frente-ribeirinha>, accessed 9 May 2017.
- Conselho de Ministros (2008), Resolução do Conselho de Ministros n.º 78/2008, de 15 de Maio [*Council of Ministers' Resolution n. 78/2008, of May 15th*]. Lisboa: Presidência do Conselho de Ministros.
- JLL (2015), Apartamentos turísticos em Lisboa – Um Mercado em Crescimento [*Touristic apartments in Lisbon – a growing market*]. Lisboa: JLL.
- MAOT, Ministério do Ambiente e do Ordenamento do Território (2000) Programa Polis, Programa de Requalificação Urbana e Valorização Ambiental de Cidades. Lisboa [*Polis Program, Program for the Urban Requalification and Environmental Valorization of Cities*], Portugal: Ministério do Ambiente e do Ordenamento do Território.
- Mendes, L. (2013a) A regeneração urbana na política de cidades: inflexão entre o fordismo e o pós-fordismo [*Urban regeneration in urban policies: inflection between fordism and post-fordism*]. *urbe. Revista Brasileira de Gestão Urbana* 1:5, 33-45.
- Mendes, L. (2013b), Public policies on urban rehabilitation and their effects on gentrification in Lisbon. *AGIR – Revista Interdisciplinar de Ciências Sociais e Humanas*, 1:5, 200-218.
- Público (2014) A turistificação de Lisboa ainda pode crescer [*Lisbon's touristification can still grow*]. *Publico*, 31 August.
- Público (2015b) Lisboetas sentem-se cada vez mais acossados pelos turistas [*Lisboners feeling increasingly disturbed by tourists*], *Publico*, 1 June.
- Salgado, M. (2012) Reconquista da Frente Ribeirinha de Lisboa [*Reconquering Lisbon's Waterfront*], *Portus Plus* 3, http://retedigital.com/wp-content/themes/rete/pdfs/portus_plus/3_2012/Contribuciones/Manuel_Salgado.pdf, accessed in 1 March 2016.

Santos, J.R. (2012) Espaços de mediação infraestrutural: Interpretação e projecto na produção do urbano no território metropolitano de Lisboa [*Spaces of infrastructural mediation: Interpretation and design in the production of the urban in the metropolitan territory of Lisbon*], PhD Thesis in Urbanism, Faculdade de Arquitectura, Universidade Técnica de Lisboa. <https://www.repository.utl.pt/handle/10400.5/5429>

SEAOT, Secretaria de Estado do Ordenamento do Território e das Cidades (2008), Política de Cidades Polis XXI - Bases para as acções preparatórias do Programa Redes Urbanas para a Competitividade e Inovação [*City Policy Polis XXI – Basis for preparatory actions of Urban Networks for Competitivity and Innovation Program*], Lisboa: Ministério do Ambiente, do Ordenamento do Território e do Desenvolvimento Regional, Gabinete do Secretário de Estado do Ordenamento do Território e das Cidades

UPM, UNIDADE DE PROJECTO DA MOURARIA (2009) Programa de Acção da Mouraria: As Cidades dentro da Cidade [*Action Program for Mouraria Distric: the Cities in the City*], Unidade de Projecto da Mouraria. Lisboa: Câmara Municipal de Lisboa.

UPM, UNIDADE DE PROJECTO DA MOURARIA (2010) Documento de candidatura ao QREN Mouraria [*Application document for NSRF*]. Lisboa: Câmara Municipal de Lisboa

1643 AN APPROACH TO UNDERSTAND PEOPLE'S EXPECTATION FOR DESIRED WALK-ABILITY IN URBAN SPACE CASE STUDY: GARIAHAT, KOLKATA

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ABSTRACT

Benefits offered by a walkable public space are many folds. An understanding of the multi-folded benefits has led to a shift of paradigm in development of cities as whole and public spaces within cities, specifically. Today, cities are increasingly becoming more “people centric” and “pedestrian oriented”. But pedestrians take individual decisions within a space. Similar decisions taken by many individuals generate flow patterns reflecting a collective aspiration pattern. Therefore, for making public spaces better in terms of quality of life, is extremely necessary to observe pedestrian space in terms of these collective activity pattern and aggregate user expectations and then, draw meaningful relationships between people and spaces.

Street vendor encroachments make these spaces further complex and multifunctional. On one hand, decreases the width of sidewalk makes pedestrian environments dense and congested and on the other hand, it adds on to the diversity, safety and increases the involvement in space.

The paper documents and explores a specific case of Gariahat, Kolkata in depth, the activities and processes, which takes place within a pedestrian walk and then identifies the elements, components and sub-components, which shape the place. Then it draws meaningful and desired relationship between the spatial structure, organizational pattern of elements, functionality and people's expectation from space. The results provide an insight in creating a stronger linkage between the collective ecosystem of people and space in planning and redesigning encroached public spaces with high pedestrian volumes.

Keywords: the collective ecosystem of people and space, “people centric” and “pedestrian oriented”, walk-ability in urban space

1 INTRODUCTION

The benefits offered by a walkable physical environment ranges from personal health to development of local economy or reducing dependency on fossil fuel. These benefits have raised a concern throughout the world to create adequate conditions for walkability. Walking is the oldest, cheapest and pollution free mode of commuting. It is also the only mode for economically weaker sections. In India, about 3% of pedestrians are captive users, while 72% road users do not have access to private vehicles (Pendakur, 2000). This generates both physical, social and economic need to plan spaces for pedestrian. But most of the developing countries including India has Informal vendors along the pedestrian walks; though every-one agrees to the fact that It offers livelihood to low or minimally skilled or educated urban and sub-urban population, indeed they play a dual role in these spaces- they make these spaces congested, inadequate for people to walk, yet making them diverse, providing safety through “eyes on street” and essentially provides a supply of goods and services. Therefore, the presence of a street vendor signifies a particular need which remains unserved by the formal sector. Presence of a group of vendors would definitely mean both a collective demand of goods and services and Through a cases-study of a particular node and a stretch of road, this paper tries to find out the pedestrian expectation from space some of the essential services provided by these vendors to enhance the quality of pedestrian walk. This paper finally links these identified (unserved) demands to direct a vision towards policy planning of urban pedestrian spaces.

The first part of the paper shares the preliminary understanding of people starting off as “pedestrians”- their considerations before and during the journey.

The paper is further divided into the following parts:

Urban Context of Gariahat- which gives a brief introduction to the urban character of Gariahat

Methodology- this part briefly describes the details regarding the sample size, the methodology of data collection.

Analysis of Spaces-the analysis acknowledges the fact that the need of individual user is combined to form a collective demand of service from spaces. Therefore, for the purpose of analysis individual need and demand from space is assessed at various scales starting from individual user level to the site level.

Discovering the Links and directing towards the vision-This part of the paper identifies the present state of problems, spatial and planning limitations and finally attempts to link the user needs and expectation to the vision so that there is a “win-win” situations for all.

Finally a Conclusion drawn from the study

1.1 An understanding of the pedestrian Space

A person who walks is a pedestrian. A part of any journey is always performed on foot. The pedestrian activities can be classified at three different levels: *Strategic level, Tactical level and Operational level* (O. Marina, 2011). At Strategic level, a person decides the nature of activities to be performed the choice of area and the broad order of activities. This is predominantly dependent on the landuse and urban functions. These are beyond the control of an urban designer. At Tactical level, takes short term decisions taking into account the surroundings and relative movement pattern of people

and vehicles. At this level, the route choice, order of activity is decided depending on the configuration of streets, street character and other area level determinants. While at the operational level, a pedestrian takes instantaneous decisions depending on both area level determinants as well as the immediate surroundings. At this level, there is maximum interaction between pedestrians and the built environment. Thus, above two levels can be controlled through design strategies. Therefore, for designing a “pedestrian friendly environment” or policy framing for a pedestrian friendly city, a combination of both top down and bottom up approaches are required.

But, being regarded as a mode of transportation, design and policy planning for walkability has traditionally been a quantitative process; therefore, it has been mostly addressed in terms of pedestrian flows, density, intensity of usage etc. The paper demonstrates a methodology, how, with minimum direct intervention, the quality of space can be improved, just by augmenting elements and supporting the activities and processes. Finally, it also shows how these decisions can help in better decision making and policy formation with respect to improving quality of pedestrian space in densely encroached pedestrian walk. For the purpose of a demonstrative example, a densely encroached pedestrian walks at Gariahat, in Kolkata, India is selected.

2 DOMAIN OF INTEREST

Pedestrian walk is a part of public space dedicated to walking. These are the interfaces where the buildings meet the city environment. It links the “private” to the “public” and so it is called is the most “important urban public space” or the “vital organs” of a city. (Jacobs, 1961). Jan Gehl points out that these spaces essentially serve three major purposes. They provide accessibility and connectivity; act as a meeting place, and a market place.

Sir Christopher Alexander, in his seminal works *The Pattern Language*; & *The Timeless Way of Building*, describes a similar methodology to create “livable “spaces. The process of evolving a “form” from its context. By “form”, the author means the interfaces which need to be changed or redesigned & by “context” the author means the things which would remain constant & shape the form. This is done by the linking present user-activity-pattern & the physical & non-physical context which surrounds it. Then analyzing the course of future development, projecting the future needs and finally, directing the course of development towards a vision. This method is used as a tool to identify the user requirements at the *Site Level* (overall Gariahat area) *Area Level* (built environment around schools, colleges, Waiting Areas, On Street Parking, & Intermediate Paratransit (IPT) stops), and Individual User Level. Finally, these were combined to form a vision for policy formation regarding pedestrian walks in Kolkata

2 URBAN CONTEXT OF GARIAHAT



Image Courtesy: Wonobo.com

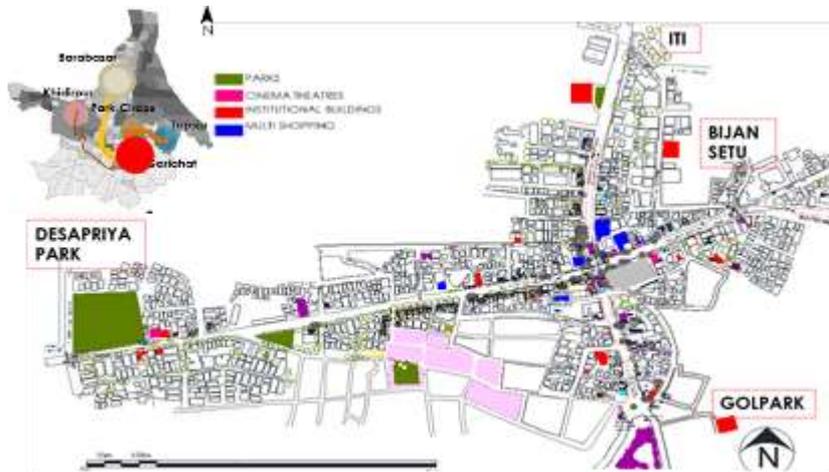
Figure 119: Street View of Gariahat represents buildings with porticos, louvered windows

The city of Kolkata has expanded from North to South and Gariahat marked the southern edge of the city. It was a home to the “wealthy middle class” way back in 1930’s. The houses had huge entrances with plinth stairs and large porticos overhang verandas, and wooden louvered windows -typical features of architecture of Bengal. These façade elements along with the small scale urban design elements like small temples, type of trees, nature of shops-all contribute to the continuum of space which connects it to areas in north of Gariahat like Rashbehri, Hazra etc. These elements have contributed to walkability, encroachment and pedestrian experience within a sidewalk- particularly Gariahat area. For this paper, Gariahat refers to the intersection of Leela Roy Sarani (North South) and Rashbehari avenue (East West) while the boundaries are marked by Bijan Setu bridge in the east Desapriya Park in the west; the North- South boundaries is marked by Golpark & Ballygaunge Shiksha Sadan School respectively.

2.1 Street Conditions at Gariahat

Physical observations at gariahat reveal vehicular congestions in the carriage ways, encroached pedestrian walks with minimal space available for walking and pedestrians forced to walk out of the pedestrian walk

3. METHODOLOGY



Map 1: Map Representing Gariahat in Urban Context of Kolkata

The methodology consisted of identifying the individual user level requirements identifying the area level requirements, comparing them with the existing standards and finding the gap areas and finally designing strategies for augmenting

3.1 Mapping and Data Collection

Data collection was done from the month of October-December with attention to festival like Diwali, Christmas-New-Year, & Holi. A quick reconnaissance was done to map the spatial structure, typology of permanent shops, typology & nature street vendor encroachment and Photographic & video graphic recordings at important junctions in Gariahat. This was followed by a questionnaire based primary Survey of street vendors and pedestrians, collection of secondary data like ward demographics and an expert opinion survey to understand the current situation and direction of future growth. The data obtained was then co-related to the areas, spaces, adjacent building and landmarks.

The findings of the survey are represented in form of sketches, maps, diagrams and tables. Street Vendor Encroachments considerably reduce the effective width of a footpath. An extensive survey on nature, ownership, relocation intent, of the street vendors have been done, which however remains beyond the scope of this paper. This paper only presents the urban design related issues regarding walkability and pedestrian experience of space. The following set of maps represent material specific details of encroachments, along with the density of encroachments.

3.2 Survey Locations and Sample size

The survey was conducted at all important nodes along the main road & internal streets within the specified boundaries.

Street Vendors	Pedestrian Survey
Total no of street vendors mapped=1049 For sample survey, Confidence level taken to be: 95 % Confidence interval is taken as + 5 Sample size -285 Proportioned in ratio of their occurrence	Pedestrian survey has been done on all important nodes, four times a from day, for 10 samples each & for all sides of Gariahat crossing, 20 samples four times a day, both on all week days & holidays & special occasions like Diwali, Christmas, New Year amounting to a total No. of 480 pedestrian surveys

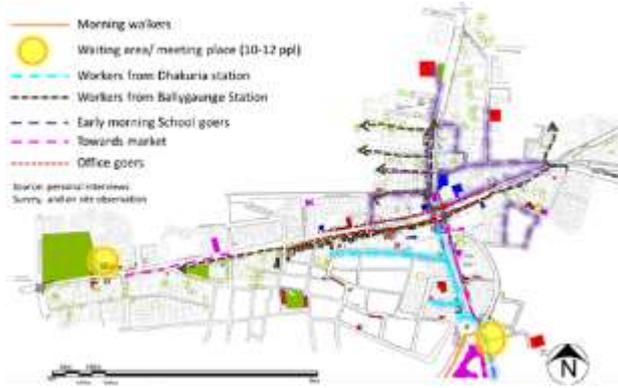
3.3 Findings from the Survey

The main objective of the survey was to provide a combination of qualitative and quantitative measure to assess a pedestrian space.

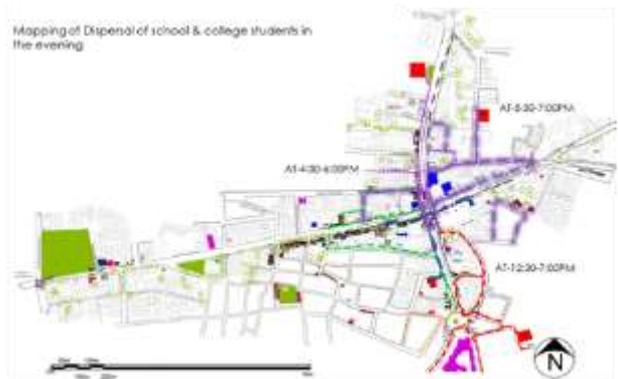
4. SITE LEVEL ANALYSIS OF SPACES

4.1 Maps representing Pedestrian Density Pedestrian Purpose of Visit

Video graphic surveys were performed at varying time intervals all important junctions on all six-working days, Sundays and some special occasions like Diwali, Christmas, New year, to obtain pedestrian volumes. Following maps summarize the nature of pedestrian demand from the space. A set of pedestrian surveys were conducted at Morning_6:30, 8:30, 11:30 and Evening 6:30 and at night 8:30 to obtain pedestrian density & purpose of visit.



Map 6a: Map Representing Pedestrian Density and Purpose of Visit during morning Hours



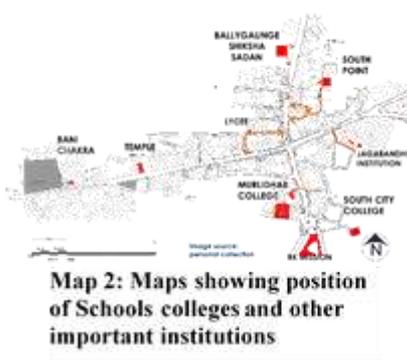
Map 6b: Map Representing Pedestrian Density and Purpose of Visit during Evening Hours

4.2 Quantitative Demand from Pedestrian Space

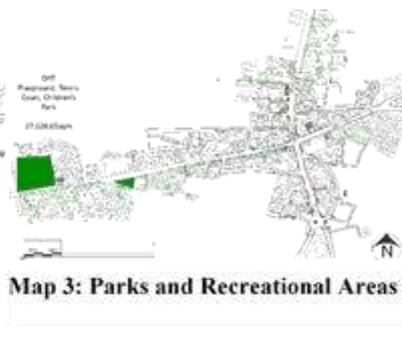
The maps as well as the table represent there is a clear correlation of pedestrian density and nature of space usage to the encroachment pattern, onset of shops etc. Overlapping Effective Width (width of clear space available for walking) to the pedestrian maximum density patterns we can quantitatively assess a space in terms of Pedestrian Level of Service (PLOS). The flowing map represents the PLOS at main roads of Gariahat.

4.3 Analysis of User requirements at Landuse and Network Structure level

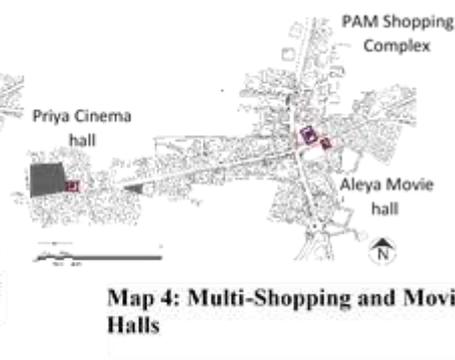
Urban Landuse is the key determinant the nature of relationship of people to the city. In this section, Gariahat the spaces which generate pedestrian activities are individually taken into consideration. The north-south roads from Gariahat crossing to Golpark is intercepted at various points by the internal roads (with very low vehicular density) which diagonally join the East - West roads. Houses along these streets belong to the low-income groups. They act as principal offsite storage areas for informal shops.



Map 2: Maps showing position of Schools colleges and other important institutions



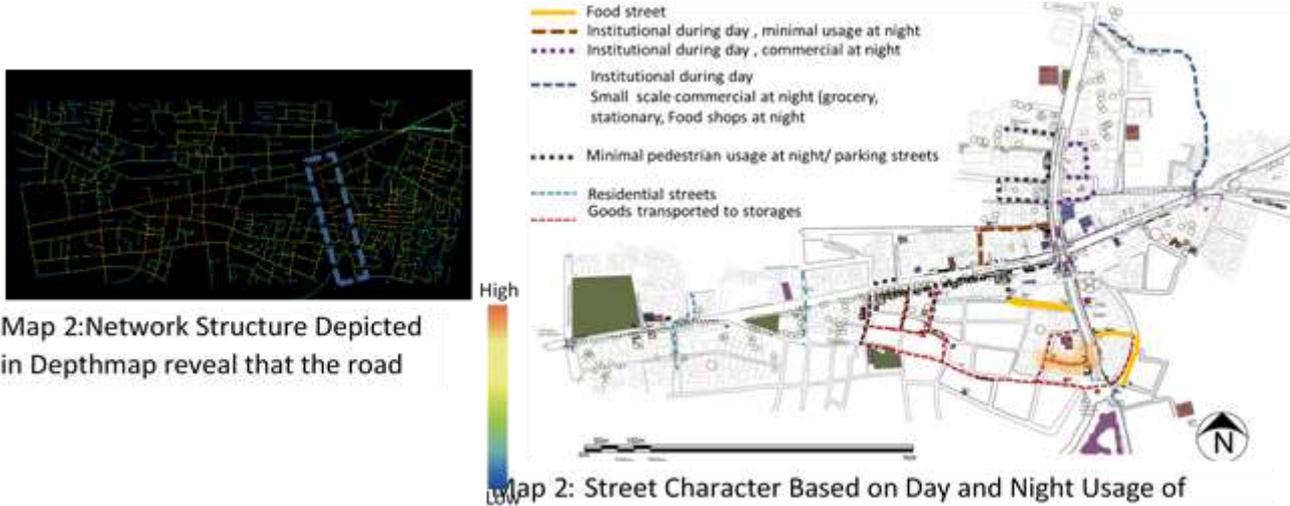
Map 3: Parks and Recreational Areas



Map 4: Multi-Shopping and Movie Halls

4.4 Analysis of User requirements at Street level

Connectivity structure and use of spaces



Character of streets

Gariahat is was principally a residential area at its inception which is being upgraded to commercial and mixed-use developments A number of city level services like fire stations, neighborhood level services like rationing shops are located in this area. Since a number of public buildings are located in this street the area has developed into zone of informally encroached food vendors.

The streets which are primarily institutional remain unused during the night. Therefore, the landuse structure of some of the streets adjacent to schools have been upgraded to alternative uses like boutiques, hobby classes etc. (source: primary survey)



There is minimal activity in the residential streets especially during the night. The streets are predominantly used for on-street parking.

The internal roads display a typical residential character, though, gradually being upgraded to mixed used with commercial at the ground floor. There streets are wide and relatively used lesser and can be used to Opportunities creating Variations, interchange of spaces/ increasing interactions

4.5 Area Level Analysis of Spaces

4.5.1 Identified Areas with special zones in Gariahat which attract a different type (and volumes) of pedestrian interactions

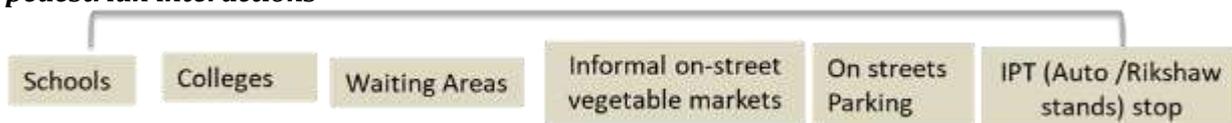


Table 54: Discovering Area Level Pedestrian Requirements and their links to the individual level & Site Level Determinants

Areas	Location plan	Recognition of the conflicts and Pedestrian expectation from Sidewalk
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<p>Schools</p>	<p>Traffic Calming Measures at intersection</p> 	<p>Waiting Areas for parents. Adequate car parking for Pooled cars Adequate buffer of pedestrian walks from main roads. <i>Observations reveal that at places, informal vendors act as a buffer, obstructing access to the main road.</i> Use of Elements in the areas that link the main road to the kids</p>
<p>College</p>		<p>Spaces for waiting & Snacks. <i>This need is served by the informal vendors of the area, who would particularly gather during starting or end of college times</i></p>
<p>Waiting Areas</p>		<p>The important landmarks act as waiting areas of the pedestrians. <i>The informal vendors provide for seating areas along with tea and snacks shops in zones (1-5) while formal food and beverage counter are provided at zone 6</i></p>
<p>On Street Parking</p>		<p>Majority of internal roads and parts of Main road (Leela Roy Sarani) are used for on-street parking signifying high demands of on-street parking <i>These spaces can be provided with parklets thereby providing opportunities for waiting areas as well as accommodating on-street parking</i></p>
<p>Intermediate Para-transit (IPT). Stops-Auto & Rikshaw Stops</p>		<p>Parked Auto-rikshaws make in accessible, leading to pedestrian waking on vehicular Road Low Vehicular Density</p>

4.6 Individual User Level Analysis of Spaces

To obtain the individual user level requirements a Revealed Performance analysis on Likert scale analysis was performed at every important intersection regarding their opinions on safety, shading and protection from monsoon, dedensification (removal of Street Vendors), basic services like toilets and drinking water, way findings, Night Illumination, and urban design improvements like beautification, street furniture. The results suggested that they feel safe in general safe in these areas while maximum amount of improvements was required in terms of shading and monsoon protection followed night illuminations and urban design improvements and dedensification strategies.

5 DISCOVERING THE LINKS AND DIRECTING TOWARDS THE VISION

Tasks	Findings	Vison
<p>Activity Pattern & space usage pattern Analysis (individual spaces)</p>	<p>The onset & typology of goods offered for sale bear a relationship to the pedestrian dynamism on streets Density of street vendor varies from inner core, (the crossing-) outwards</p>	<p>Relocation of working area, (wherever possible -like flower Vendors) but display counters remaining</p>

Carrying capacity of streets & pedestrian walks	Both pedestrian walks & vehicular roads are congested. A Vehicular Level of Service Analysis conducted on the carriage way suggested that the No scope for shrinking of vehicular road to increase foot path width	Increasing width of foot path only at nodes
Analysis of space usage along main road	Spaces lack waiting areas & transitional spaces	Integrating waiting areas within the sidewalks, at nodes Elements to lean on, while standing,
Analysis of space usage along internal streets	Internal roads of Gariahat are wider, have very low pedestrian & vehicular density	Directing street vendor towards internal roads
Street vendor change typology of goods offered for sale according to the change in market demand	The change particularly takes place in identified stretches (e.g.) in case of Gariahat, K.M.C (Kolkata Municipal Corporation) market entrance to Golpark is the place which takes major part in seasonal diversity & has the most no. Of people who keep on changing the material typology offered for sale.	Urban design detailing

7 CONCLUSION

In India, there is a high rate of population growth, high level of unemployment with the presence of low educated low skilled people. Street Vending can act as a symptomatic solution to these problems meanwhile, adequate measures for long-term plans like education, skill development or infrastructural development in rural areas can take place.

The results show that the street vendors serve a local demand of the pedestrians and thus, pedestrians and the street vendors share a symbiotic relationship with each other. in India, there are functional overlap in public spaces. This makes it very difficult for planners and designers to comprehend spaces. Decomposing spaces in terms of pattern hierarchy (Site level, area level, Street Level and User Level) and linking them to adequate solutions.

BIBLIOGRAPHY

- A. Patil, A. D. (2014). Emergent Properties of Public Realm & Encroachments in Urban Environment. *Nexus Network Journal*, 437-465.
- Alexander, C. (1978). *The Pattern Language*.
- Alexander, C. (1980). *The Timeless Way of Building*.
- Badami, M. G. (n.d.). Urban Transport Policy as if People and the Environment Mattered: Pedestrian Accessibility the First Step. *Economic and Political Weekly*, 44(33), 43-51.
- Jacobs, J. (1961). *The Death and Life of Great American Cities*. New York: Random House.
- O. Marina, J. I. (2011). Modelling Pedestrian Mobility as a Designer's Tool in Urban Protected Areas. *11th International Conference on Reliability and Statistics in Transportation and Communication*, (pp. 408-419).
- Pendakur, V. (2000). *World Bank Urban Transport Strategy Review*. Yokohama.

SS11.3. The Future of Leisure: Tourism, Mobility and Transportation

1395 MANAGING TOURISM DESTINATIONS IN RELATION TO URBAN AND REGIONAL PLANNING: AN AREA MARKETING AND MANAGEMENT APPROACH PERSPECTIVE

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INTRODUCTION

Nishii (2014) 1) reviewed studies on tourism-related travel behaviors in Japan after the 1990s and divided them into three main streams that are characterized by their side-by-side comparisons. As indicated in **Figure 1**, the first stream is called transportation planning and policies in tourist areas. Various approaches to tourist travel demand forecasting methods have been developed for transportation planning and policy making, whereas tour based trip chaining models and activity-based approaches have been applied to tourists' travel behavior data as well as traditional trip based and discrete choice models. Moreover, travel demand management measures have been implemented to reduce traffic congestion in major tourist areas during annual peak periods. The area development involving tourism (ADIT) was established during the second stream, specifically, in the beginning of the 2000s. The ADIT studies aimed to promote attractive tourist areas while taking into consideration the preferences for the spatial scales of the targeted areas. The focus of these studies, however, has changed from transport-sector oriented themes to area development themes that involve tourism. This shift implies that we must face further challenges when evaluating the effect of area development measures not only with respect to the increase in the number of visitors but also with respect to the sustainable local economic growth in the area. The ADIT is featured as part of the tourism destination based approach in which area restoration and area revitalization are achieved through tourism-related policies and projects in the targeted areas. Accordingly, although it is noted that consistency between the goals of area development and tourism destination policies is required in destination-based approach, in some cases, it is determined that the goal of the tourism destination policy is not always compatible with that of achieving the sustainable development of the targeted areas. This may be caused by the fact that there exists both spatial and temporal divergence between tourism destination policies and area development planning. Based on the diversification of tourism-related travel behavior studies, this study is devoted to developing an area marketing and management approach (AMMA) as a third stream.



Figure 1 Diversification of tourism studies in Japan

The AMMA is comprised of four basic components, namely, area, tourism, area marketing and area management, and incorporates certain specific features (Nishii (2009) 2)). The first of these is concerned with the system in which area marketing and area management are comprehensively linked. The second feature, however, which is more essential to the AMMA, explicitly expresses the separation of area and tourism while simultaneously highlighting the separation of tourism from the tourist area and

the separation of area from the tourist area. This is because the AMMA is capable of targeting not only tourists/visitors but also local residents as important actors in the sustainable development of the tourist area. From a problem-oriented perspective, it is also expected that this separation contributes to a

better understanding of comprehensive area development measures and policies. Nishii (2012) 3) has criticized Umekawa (2012)'s 4) definition of the ADIT as follows: "As shown in the word, that is to say, 'ADIT (area development involving tourism),' it is clear that both 'tourism destination policy & planning' and 'area development policy & planning' should be discussed in a comprehensive system. It is also necessary for us to clarify how we define the relationship between

‘tourism’ in the targeted areas and its effect on the ‘area development.’ This therefore means that we need to eradicate ambiguous issues on tourism destinations such as, the subject(s), the target(s), the measures and their evaluation viewpoints.”

Based on the above statement by Nishii (2012), this paper aims to identify basic issues on managing tourism destinations in relation to urban and regional planning from the perspective of the AMMA. This paper consists of four sections. Following this introductory section, the second section introduces the basic concept of area management in the AMMA and identifies some essential prerequisites for area management in the ADIT. In the third section, the concept of the tourism area life cycle (TALC) is introduced. The TALC model proposed by Butler (1980) 5) and the acceptance capacity in a tourist area

has often been the subject of debate. The model, which expresses the growth curve in the targeted tourist area, focuses on the annual trend of the number of visitors to the area(s) and divides it into several stages, namely, exploration, involvement, development, consolidation, and stagnation. The TALC, which significantly influences strategic destination management, incorporates destination planning as well as destination marketing (see Butler (2006) 6), Butler (2011) 7) and Morrison (2013)8)). This means that as one of the prerequisites for the sustainable management of the area, we must identify at which stage of the TALC the targeted area should be positioned. Furthermore, we must discuss which orientation drives the marketing and management of tourism destinations. Especially, in the case that the targeted area is positioned as a stage of stagnation, the roles and missions in the strategic management area are important for the sustainable development of the area. Finally, the tourism statistical analysis of the TALC is intended for a typical wellness-tourism destination, i.e., onsen tourism in Japanese, Noboribetsu in Hokkaido. The TALC analysis aims to provide useful information for discussing how to organize destination management/marketing organization (DMO) and what missions should be identified as part of the DMO for each tourism destination. In the conclusion of this paper, basic challenges regarding the DMOs of the onsen tourism destinations are discussed.

THE FRAMEWORK OF THE AMMA

Figure 2 graphically depicts the AMMA as consisting of area, tourism, area marketing and area management. The ‘Area’ is classified into several levels of hierarchical spatial structure according to the spatial spread as shown in **Table 1**. The table provides an example of a classification of the spatial scale of the targeted area(s). While this table corresponds to the case of tourism-related transportation planning in general, the AMMA is therefore required to include a variety of survey and analytical methods depending on the spatial spread of the targeted areas.

Table 1 Classification of tourism-planned areas by scale level

Level	Scale of area	Name of plans	The expected effects of road network improvement
I	Nation-wide unit	Nation-wide plan	Improvement of airline access may increase potential of inbound tourism.
II	Regional block	Wide area excursion plan	Gaining the ascendancy over wide area excursion may lead up to the formation of an attractive route.
III	Tourist region	Tourist region formation plan	Formation of the tourist region stretching over more than one prefecture promotes the endogenous development with increasing both LOS in transportation and tourism demand.
IV	Tourist area	Tourist area plan	Smoothing mobility in the tourist area may give tourists satisfaction.
V	Tourist spot	Tourist spot plan	Walk trail improvement in a tourist spot makes the excursion more attractive.

On the other hand, for the purpose of our discussion, the term tourist area is divided into two areas, namely, one is the area as a destination for tourists and the other is the area as a city/region for local residents and workers. Thus, the separation of area and tourism is explicitly expressed. It also highlights the separation of tourism from tourist area just as it does the separation of area from tourist area (see Nishii and Goulias (2016) 9)).

Furthermore, it is emphasized that the AMMA incorporates both area marketing and area management in a comprehensive system. From a methodological perspective, the method of area marketing is regarded as a short-term tool for triggering tourist demand in the area. In contrast, that of area management is concerned with relatively long-term decision-making with respect to sustainable area development. For example, the task of area marketing is to analyze the market to explore what would be an effective strategy of increasing both the attractiveness of and the sales for the targeted areas. Conversely, area management aims to develop a sustainable system in which such a marketing strategy will affect the area(s) in the years and decades to come.

This figure also displays the general challenges related to our AMMA. Some of these challenges will be discussed and focus on how to identify basic challenges to area management in the ADIT from the AMMA link with urban and regional planning.



Figure 2 A framework of the AMMA and its challenges

BASIC CONCEPTS OF THE AREA MANAGEMENT IN AMMA

While the definition of a managing area(s) in the AMMA is based on that of managing a corporation/firm, there is a difference with respect to the number of stakeholders. This is because there exist various types of stakeholders who commit themselves to area management when considering the spatial spread of the targeted area(s). Managing the area(s) is therefore defined as follows: To achieve the goal of business activities within the area and perform them smoothly requires that four manageable area-oriented resources, such as humans, goods, money and information, be procured and combined. However, managing the area can also be defined as the activity in which comprehensive strategies should be developed and promoted for area marketing (see Nishii (20167) 10)).

Let us here compare area management as defined above with destination management as defined by Morrison (2013), He defines it as follows: “*Destination management is a professional approach to guiding all of the efforts in a place that has decided to pursue tourism as an economic activity. Destination management involves coordinated and integrated management of the destination mix (attractions and events, facilities, transportation, infrastructure and hospitality resources)*” referring to the definitions of the UNWTO (pp6-7).

Hence, it is noted that while a tourism destination is originally defined as a simple unit of a tourist place, the spatial range of the geographic area can cover from the largest country to the smallest states, territories, regions and cities. He further emphasizes that “*there is a variety of destinations in the world and an enormous range of DMOs are involved*” (p4). While ‘*all of the efforts*’ corresponds to ‘*the destination mix (attractions and events, facilities, transportation, infrastructure and hospitality resources)*’, it also means that “*effective destination management requires a strategic or long term approach based upon a platform of destination visioning and tourism planning*” (p5) and that “*destination management is accomplished through specialized organizations, known as DMOs, and they can coordinate many stakeholders to achieve the destination’s vision and goals for tourism*” (p5).

Two essential prerequisites for area management in the ADIT are identified. The first clarifies the importance of the role of tourism destination planning to manage the areas over the long term. This suggests that area management in the ADIT should be positioned so that it includes long-term tourism destination planning. Morrison (2013) further introduces the definition of destination management roles as proposed by the Destination Consultant Group (denoted DCG), namely, planning and research, marketing and promotion, leadership and coordination, partnerships and team building, community relations, and product development. **Figure 3** presents a variety of missions with respect to area management that consider process as part of the mission. Moreover, due to its broad definition, tourism destination management is followed by the process of tourism destination planning, which suggests that the policy-making decision process with respect to tourism destinations is a comprehensive system composed of long-term tourism planning, marketing and management that includes the continued monitoring and evaluating of the outcomes of tourism destination policies and measures.

When aiming to achieve sustainability in tourism destination development, the basic strategy in our area management approach is to change the patterns of production and consumption and find a way to avoid trade-offs between economic growth and environmental loading in critical areas. Thus, area management requires long-term tourism planning as part of the decision-making process (Nishii, Furuya and Romao (2017) 11)).



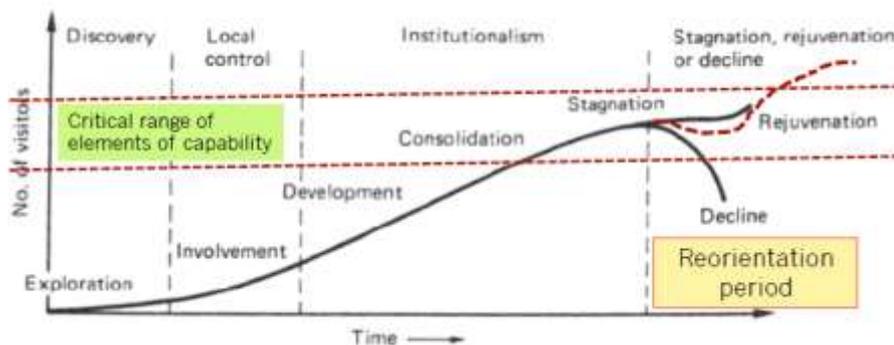
Figure 3 Missions of tourism destination management

The second prerequisite is to explicitly consider the TALC when managing tourism destinations. The concept of Butler's TALC model is introduced as a growth curve of the annual trend of the number of visitors to the area(s). The model allows us to explore in which stage of the TALC the targeted area is actually positioned.

These two prerequisites are linked given that the TALC significantly influences the strategic destination management and that the preceding destination planning process could identify the challenges related to the reorientation of the targeted area.

TOURISM AREA LIFE CYCLE (TALC) FOR THE AREA MANAGEMENT

The concept of the TALC of targeted areas was first proposed by Butler (1980). As presented in **Figure 4**, the cycle can be expressed as an S-shaped growth curve. When focusing on the annual trend of the number of visitors to an area(s), it can be divided into several stages, namely, exploration, involvement, development, consolidation, and stagnation. Zmysolny (2011)12) introduces Getz (1992)'s claim that *"the concept of the destination life cycle has apparent potential to advance the theory and practice of tourism planning, particularly as a conceptual framework within which long-term changes can be forecasted and strategies for land use, economic development, and marketing can be harmonized."* Additionally, the TALC significantly influences strategic destination management, which incorporates destination planning and destination marketing (see Morrison (2013)).



Source: Butler, 1980. 'The concept of the tourist area life-cycle of evolution, implications for management of resources, Canadian Geographer, 24(1), 5-12.

Figure 4 The tourism area life cycle (TALC)

The concept of the TALC embraces a perspective common to the limits of economic growth in tourism destination as argued by Mishan (1969) and Beckerman (1974) and which Hirsch (1978) referred to as social limits to growth (see Urry (1995)13)). Their arguments were concerned with the economic growth limits that were caused primarily by the overcrowded tourism destination. The maximum feature of the proposed TALC model was to assume that the carrying capacity of a resort represents its evolution by applying the product life cycle (PLC) to that of a tourism destination. The TALC model is also intended to represent a general concept of the resort life cycle by focusing on its evolutionary nature and to allow tourism destinations during the stagnation period to avoid moving into the decline period either by applying appropriate market intervention strategies or resource management. However, it is further noted that the causal structural approach, in which both external (marketer side) and internal (tourist side) determining factors are explicitly postulated, has not been applied to the modeling of such an evolutionary transition in chronological order. Martin and Uysal (1990)14) discussed the factors impacting the stagnation stage and the following decline of a destination. Conversely, Pornphol and McGrath (2010)15) suggest that there may be a benefit in implementing the TALC as an advisory expert system. They also claim, *"a number of tourism and hospitality researchers have reported on instances of*

where different rejuvenation approaches have been tried and they and others have also specified classification schemes and frameworks for the various types of rejuvenation strategies.” Accordingly, once entering the stagnation stage, there exist a variety of strategic rejuvenation approaches in tourism destination management. Furthermore, such diversification is the result of both internal and external factors that determine the market circumstances in tourism destinations.

Lumsdon (1997)16 suggests that tourism destinations appeal to different markets according to the corresponding stages of the TALC under the assumption that a primary segment of visitors play a leading role in the economic growth of the tourism destination. He further emphasizes that such an assumption is based on the concept of the PLC, i.e., diffusion of innovations by Rogers (1962).

Two principal perspectives regarding the concept of the TALC since the 1990s require summation. The first perspective focuses on the difference between the PLC and the TALC such that the heterogeneity of tourism services is distinguished according to general goods and services. The services instantly supplied at the tourism destination have specific characteristics, whereas locational goods depend not only on the historical and cultural backgrounds but also on the spatial spread of tourism destinations developed by cooperating with the surrounding areas and the higher levels of governments. Thus, it is noted that, as there exists a variety of TALC patterns, it is difficult to assume a standardized pattern of economic growth in tourism destinations. Finally, it is also necessary to cautiously observe their transitions over time by making full use of a retrospective approach.

The second perspective concerns the diversified situations that occur during the reorientation period of the TALC. Such diversification covers situations that range from decline to stability to rejuvenation. In the case of the TALC, tourism destination marketers rarely intend to withdraw from their own markets but rather intend to reorient forward to the post-stagnation stage. Nonetheless, it is not always advisable to forecast situations based on a general business model because the types of destination management strategies that should be implemented vary, and thus, their results also vary from case to case depending on the circumstances specific to identified targeted area. That said, a better understanding of the actual situations of the TALC in the targeted tourism destinations results in better decisions with respect to area management strategies.

AN EMPIRICAL ANALYSIS OF THE TALC IN ONSEN TOURISM AREAS

Romao et al. (2017) 17) defined the concept of onsen tourism as follows. “...a varied set of products, services and activities are required for the attraction and satisfaction of wellness travelers. At the spatial level of the establishment, apart for the accommodation facilities, these services normally include diverse spa-related services (massage, different water treatments, aromatherapy, beauty care, etc.), other facilities for health-oriented activities (gyms or sports facilities) or the supply of healthy food. Other wellness activities identified in the literature relate to the spatial level of the destination, including hiking, biking, open-air sports, enjoyment of natural landscapes, or cultural and educational activities, including the interaction with local communities and their specific values.”

He also introduced the concept of new-toji tourism. The Japan Tourism Agency in Japan defines this term as follows: It is “a combination of the traditional Japanese onsen experience with other educational and recreational facilities, by defining various programs of activities oriented for relatively long stays and based on the surrounding nature, local history and culture or high quality food, aiming at a physical and mental rejuvenation, while promoting the interaction with local communities.”

As Noboribetsu is one of the typical onsen tourism destinations in Hokkaido, it is important to explore the trend of the number of visitors to Hokkaido, as this trend clearly determines the changes in the TALC in Noboribetsu over time. Because this explorative analysis is based on the AMMA, the spatial spread of Noboribetsu areas is assumed to form the stratified structure of onsen tourism destinations that cooperate with the surrounding areas. This assumption suggests that there exists the Hokkaido bloc, which is positioned as the upper spread of the Noboribetsu tourism destination such that the Noboribetsu onsen area plays a core role as the wellness tourism destination, which is then followed by the surrounding small-size tourism areas.

Figure 5 presents the trend regarding the number of visitors to Hokkaido from 1960 to 2016 based on the data obtained from the Department of Tourism in Division of Economics of Hokkaido and their referred comments. It is apparent that the number of visitors to Hokkaido increases or decreases due to the macro-environmental factors that determine the various types of external events that occur over time.

As Johnston (2006) 18) noted, “macro-structural conditions (roughly synonymous with external events) are important ontologically because they function as structures, meaning they constrain or enable development from outside – the role of climate in eco-succession, for example.”

As presented in **Table 2**, the macro environmental factors are listed and the external events that occurred during the period are classified into several categories, including the components of the PEST analysis, natural phenomena, and value and norm-consciousness. The table indicates that a variety of macro factors clearly determine the changes in each stage of the TALC. Because the TALC entered the stage of development in the early 1970s, the increase in the number of visitors has been accelerated by the upward factors. These factors include the following:

- + strong economic growth (the bubbled economy from 1980 to 1990) as a macroeconomic factor,
- + opening of the Aomori-Hakodate tunnel (1988),
- + increase in domestic direct flights (1995, 1996, and 1997), and

+ entry of AIRDO as a social-capital factor.

However, even during the development -stage, i.e., from the early 1970s to the end of the 1990s, via the bubbled economy, the downward factors significantly influenced the decline in the number of tourists to Hokkaido. Specifically, the factors are mainly concerned with the natural phenomena in Hokkaido:

- The eruption of Mt. Ushu (1977 and 2000),
- The earthquakes on Okushiri Island and southwest offshore (1993), and
- The unusual/unsettled weather (days and seasons) (1981, 1983, 1993, 1995, 1996, and 1999).

Other downward-factors include:

- The end of the bubbled economy (1991) and the depression in the economy in Hokkaido (1993 and 1999), and
- Marine EXPO '75 in Okinawa, which was a microenvironment factor related to the competitive tourism market.

Since the 2000s, as tourism destinations have entered the stages of either consolidation or stagnation in the TALC, both upward and downward factors have impacted the fluctuation in the number of visitors to Hokkaido. Specifically, with respect to upward factors, they are mainly concerned with the macroeconomic issues, which include:

- + The strong yen-rate (2013) and economic growth (2014),
- + The new entry of SKYMARK (2006) into service and the increase in international direct-flights (2015),
- + The entry of DOTO expressways into service (2012), and
- + The opening of Hokkaido Shinkansen (to Hakodate; 2016).

In addition, the political factors related to the governmental tourism planning and policy, which the Japan tourism agency has promoted since the early 2000s, and the changes in preferences for inbound tourism for Asian tourists with respect to the tourists' needs and wants include the following:

- + An increase in inbound tourism to Hokkaido (2001-)
- + Visits to the Japan campaign (2004-) and the visa-relaxation policy (2004),
- + The Hokkaido tourism campaign (1999 and 2012), and
- + The Aomori-Hakodate destination campaign (2016).

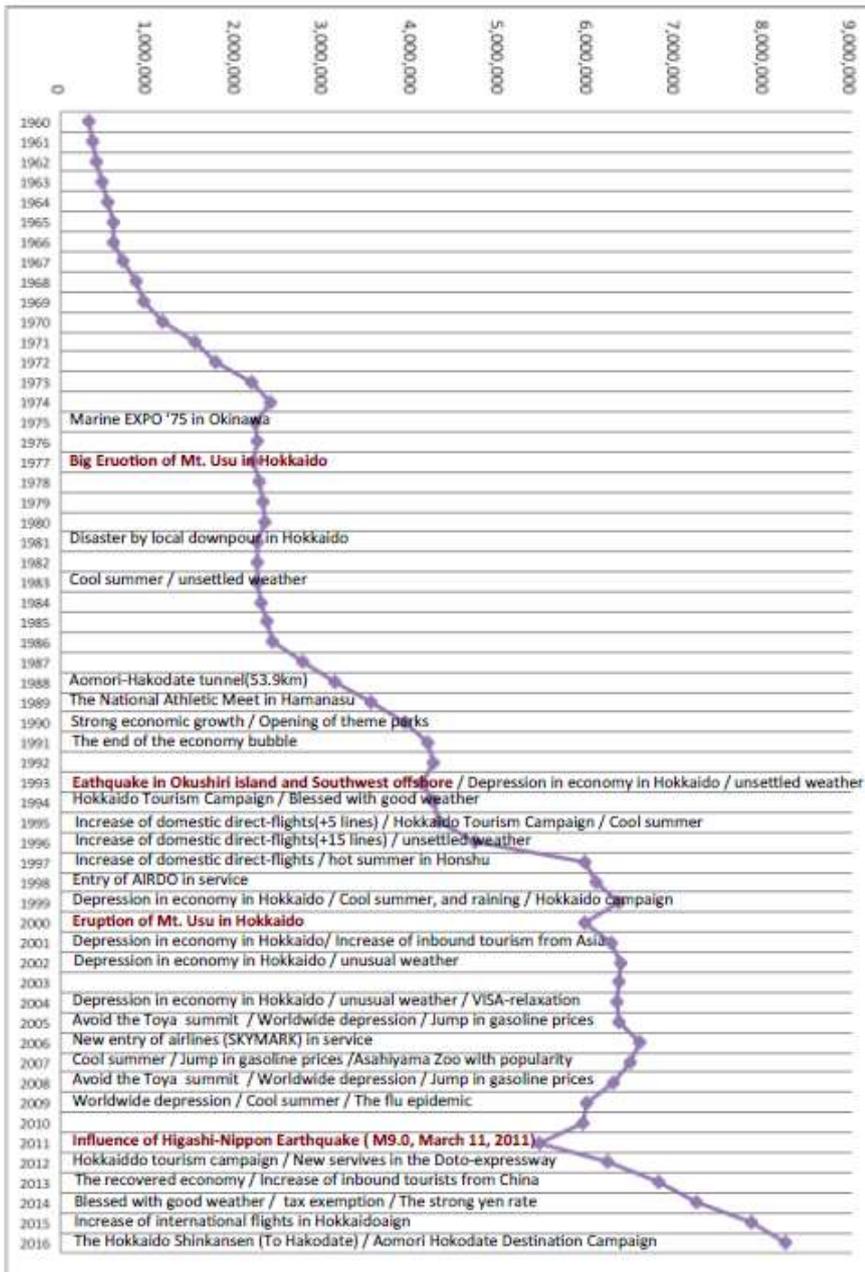
Conversely, the downward factors that determine the fluctuation during the 2000 to 2016 period are extremely similar to those in the previous period, i.e., the 1970s to the end of the 1990s:

Among the natural phenomena in Hokkaido, the downward factors are as follows:

- The influence of the earthquake in the Higashi-Nippon areas (2011.3.11), and
- The unusual/unsettled weather (days and seasons) in 2002 to 2004, 2007, and 2009.

The following socio-economic situation/external events are also listed as additional downward factors:

- The depression in Hokkaido (1993 and 1994 to 2004) and worldwide depression (2008 and 2009),
- Increase in gasoline prices (2007 and 2008),
- Terrorist attack in the US (2001.9.11),
- The Toya summit (2008) avoidance, and
- The flu epidemic (2009).



Source: The Annual Report of Survey on Number of Visitors to Hokkaido 1960 – 2016 [By Department of Tourism in Division of Economics of Hokkaido]

Figure 5 Trend regarding the number of visitors to Hokkaido

Table 2 The factors determining trends regarding the number of tourists to Hokkaido and the leading events and phenomena over time

Spatial level	Environmental Factors / Categories / Items		The leading events and phenomena (referred by Tourism Department in Hokkaido)		
		Items	- downward	+ upward	
Outside of Hokkaido	Political	Law/Regulation/Tax/Subsidies	Immigration/Visa-relaxation/Tax-Free	* Tax exemption (2014) / + Visa-relaxation policy (2004)	
			Governmental Tourism Promotion Policy & Planning	* Visit JAPAN Campaign (2004-)	
	Economic	Macro economic factors	Economic trend/economic growth rate	- Worldwide depression (2008, 2009) / - Depression in Hokkaido (1993, 1999-2004) / - Jump in gasoline prices (2007, 2008) / - The end of the bubbled economy (1991)	* The strong yen rate (2014) / + The recovered economy (2013) / + Strong economic growth (the bubbled economy) (early 80s - 1990)
			Prices / Consumer price tendency		
			Stock prices / Exchange market		
	Social	Population movements	Change over the years		
			Trend on the aging society with fewer children		
		Social Capital (infrastructure)	Improvement of transportation system		* The Hokkaido Shinkansen (2016) / + Increase of international flights in Hokkaido (2015) / + Increase of inbound tourists from China (2013) / + New services in the Doto-expressway (2012) / + New entry of airlines (SKYMARK) in service (2006) / + Entry of AIRDO in service (1998) / + Increase of domestic direct-flights (1995, 1996, 1997) / + Aomori-Hokodate tunnel (1988)
			Changes in way of life (income, welfare, healthcare, leisure time, etc.)		
	Social Situation	Serious accidents/ Conflicts/Infectious diseases	- The flu epidemic (2009) / - Avoid the Toya summit (2008) / - Terrorist attack in US Sep.11 (2001)		
	Techno-logical	Information-oriented society	Innovation of information technology		
		Technological Innovation	Patent / Innovation of Tourism Industry Management		
	Natural Phenomena	Natural Environment Resource	Conservation of the natural environment		* Registration of Shiretoko as World Nature Heritage (2005)
			Natural disasters (Earthquake, eruption, typhoon, etc.)	- Higashi-Nippon Earthquake (2011) / - Eruption of Mt. Usu in Hokkaido (1977, 2000) / - Earthquake in Okushiri island and Southwest offshore (1993)	
			Unusual/unsettled weather / Ideal weather for traveling	- Cool summer / - unsettled weather (1981, 1983, 1993, 1995, 1996, 1999, 2002-2004, 2007, 2009)	* Blessed with good weather (1994, 2014) / + Hot summer in Honshu (1997)
	Sense of value/ Norm consciousness		Items		
		Tourists' Needs / Wants	Changes in preferences on destinations for domestic tourists		
Changes in preferences on destinations for inbound tourists				* Increase of inbound tourism from Asia (2002)	
	Diversification of tourists' sense of value	Creation of new-typed tourism		+ Film location site tourism (1999)	
		Development/ Rediscovery of tourism resources	+ Asahiyama Zoo with popularity (2007) / + Steam Locomotive services (1999)		
	Effect of Tourism Marketing Strategies	PR/ Campaign / Promotion / Branding for Hokkaido tourism		* Aomori Hokodate Destination Campaign (2016) / + Hokkaido tourism campaign (1994, 1995, 1999, 2012)	
Micro-Environment Factors					
	Micro-environment	Market environment of tourism industry (supply side)			
		Competitors, Distributors, Competing products	- Marine EXPO 75 in Okinawa	* The National Athletic Meet in Hamanasu (1988)	
	Inbound tourism environment	Micro-environment of Tourism market in Asia			

Figure 6 shows the trend regarding the number of visitors to Hokkaido by access mode. The figure indicates that the overall trend depends on the number of visitors who arrive via airlines. Furthermore, it is notable that the fluctuation in the number of airline visitors has dominated the trend during the last thirty years, which corresponds to the 1986 to 2016 period.

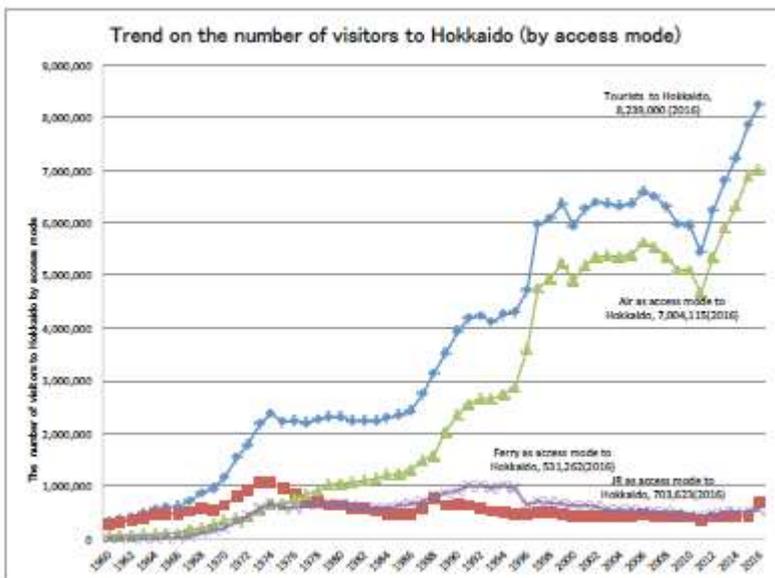


Figure 6 Trend regarding the number of visitors to Hokkaido (by access mode)

The trend regarding the number of visitors to Noboribetsu onsen-tourism destinations is introduced herein, with Figure 7 revealing the TALC in Noboribetsu compared with that in Hokkaido from 1960 to 2016.

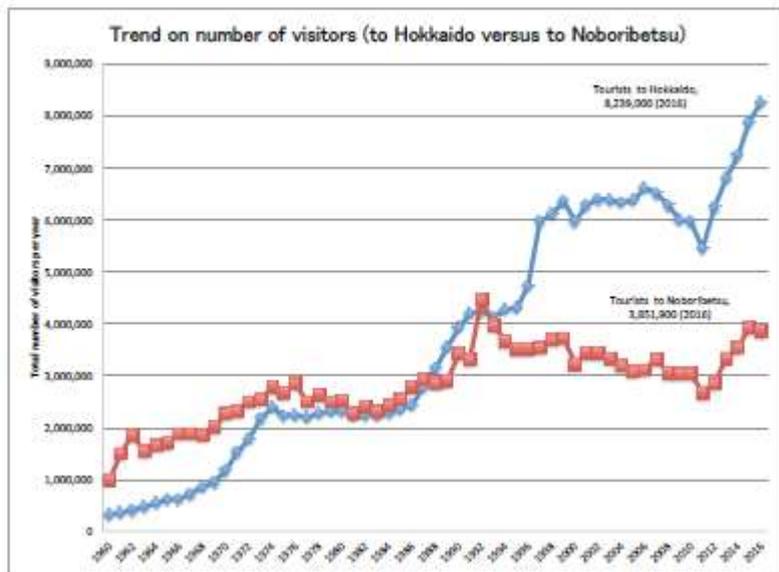


Figure7 Trend regarding the number of visitors to Hokkaido versus those to Noboribetsu)

This figure indicates that the TALC in Noboribetsu differs from that in Hokkaido. Considering that the Noboribetsu area is a traditional onsen tourism destination of Hokkaido with more than a one-hundred year history, the stage of consolidation started in the beginning of the 1960s, whereas the stagnation stage began in the mid-1970s. Thus, it is noted that before the mid-1980s, the number of visitors to Noboribetsu exceeded the number of visitors to Hokkaido.

Figure 8 reveals the trend regarding the number of tourists to Noboribetsu compared to those outside/inside of Hokkaido. With respect to the Noboribetsu tourism areas, the number of tourists from outside of Hokkaido was far below that of tourists from inside Hokkaido prior to 1971, even during the consolidation stage. After entering the stage of stagnation, however, there was only minimal fluctuation until 2011, albeit the drop in 2000, which was the result of the eruption of Mt. Usu in Hokkaido, is regarded as an exceptional year. Since the Higashi-Nippon earthquake in 2011, the number of visitors to Noboribetsu from both outside and inside Hokkaido has been smoothly increasing, although the number of visits to Noboribetsu from inside Hokkaido has fluctuated rather substantially.

As indicated in **Figure 9**, it is notable that the fluctuating pattern in Noboribetsu since 2012, i.e., after the Higashi-Nippon earthquake, is similar to that of other major onsen tourism destinations, such as Beppu in Oita and Atami in Shizuoka. These patterns are characterized by their unstable and undulating fluctuations.

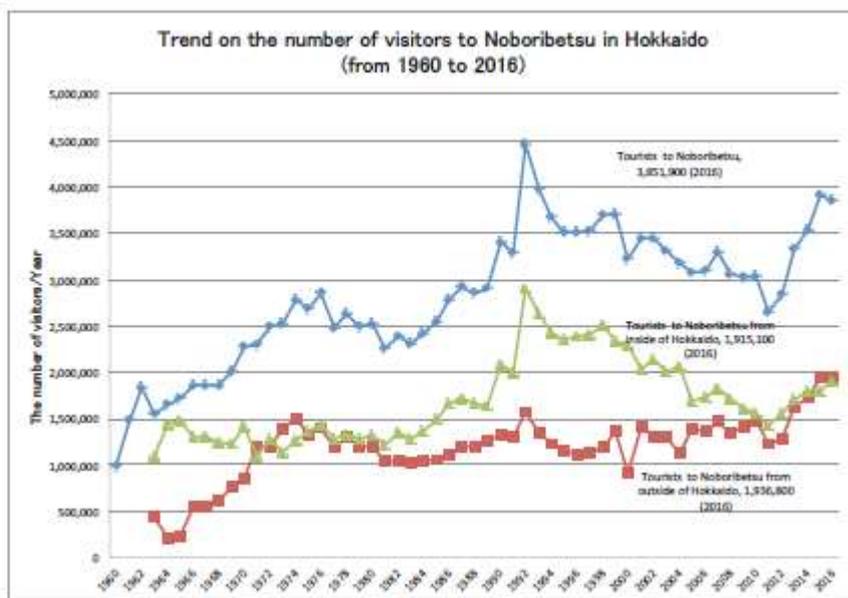


Figure 8 Trends regarding the number of visitors to Noboribetsu (from inside/outside of Hokkaido)

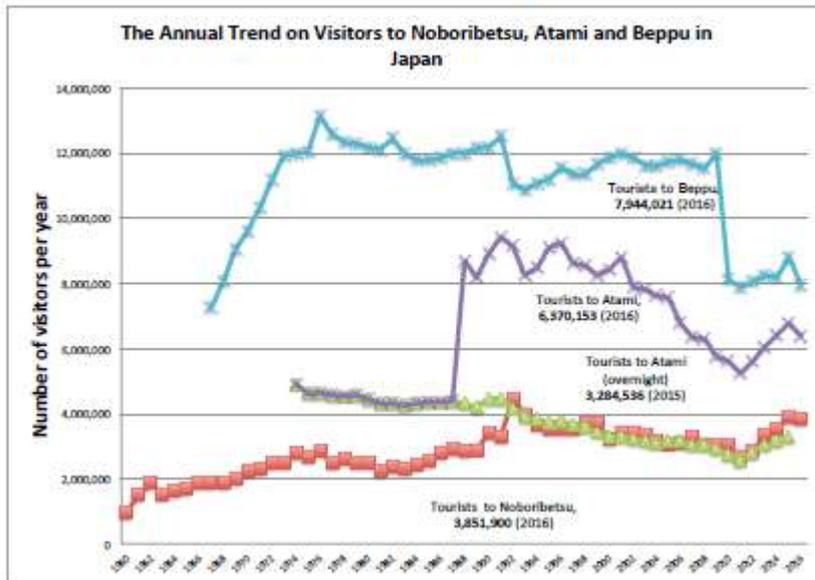


Figure 9 Comparison of the number of visitors to Noboribetsu, Atami and Beppu

DISCUSSION

This paper identifies basic issues regarding the managing of tourism destinations in relation to urban and regional planning from the perspective of the AMMA. After introducing the concept of area management in the AMMA, we identify two essential prerequisites for the area management in the ADIT. The first is to clarify the importance of the role of tourism destination planning with respect to the long-term management of the areas. This emphasizes that area management in the ADIT should be consistent with the long-term tourism destination planning. Accordingly, a comprehensive system of the process composed of long-term tourism planning, marketing and management that includes the continued monitoring and evaluating of the outcomes of tourism destination policies and measures must be developed. The second prerequisite is to explicitly consider the TALC in managing tourism destinations. It is assumed herein that the TALC significantly influences strategic destination management, which incorporates destination planning as well as destination marketing. The trend regarding the number of visitors to Noboribetsu in Hokkaido was empirically analyzed with a focus on the macro-environmental factors that determine various types of external events that occur over time.

Hence, it is evident that the challenges facing the Destination Management/Marketing Organization (DMO) in onsen-tourism destination based on the empirical results of the TALC in Noboribetsu are important. Especially, based on the results obtained from the TALC analyses, it is necessary to garner relevant information when discussing how to organize the DMO and when identifying the missions and roles of the DMO with respect to each of the stages of the TALC in Noboribetsu.

The factors that determine the trend regarding the number of visitors to Noboribetsu are confirmed, which is further defined under the condition that the spatial level is within the targeted areas. As presented in **Table 3**, the factors are divided into four categories, namely, those related to the environmental aspects of tourism destination, the core services, the supplementary services and the area management strategies.

Table 3 Factors determining the trend of the number of visitors to the onsen-tourism destination (Noboribetsu)

Spatial level	Environmental Factors / Categories / Items		
Within the targeted areas (Noboribetsu)	The Environment Factors Surrounding The Areas		
	New entry / Competitor in surrounding wellness tourism destinations		
	Partnership/ Cooperating with the surrounding wellness tourism destinations		
	Core services	Spa/Resort services	Spa/Resort service facilities (quantitative)
			Spa/Resort service facilities (qualitative)
	Supplementary services	Lodging services	Lodging service facilities (quantitative)
			Lodging service facilities (qualitative)
		Eating & drinking /Amusement services	Eating & drinking/Amusement service facilities (quantitative)
			Eating & drinking/Amusement service facilities (qualitative)
		Secondary transport services	Level of services of transport for access
Level of services of transport for local excursion			
Information & communication services	Level of services of ICT in tourists' decision making in their excursion behaviors and related activities		
Area Management (by the DMOs)	Tourism destinations marketing	Promotion/ PR / Campaign/ Branding / marketing-mix strategies	
	Tourism destinations management	Sustainable area-development strategies	

The DMOs clearly play an important role in managing tourism destinations while also determining the fluctuating pattern during the stage of stagnation in the TALC.

Hori et al. (2016)19) conducted a comparative analysis of Beppu, Noboribetsu and Atami by focusing on how to cooperate and co-product among the local governments (city office), tourism-related organizations (tourism association, chamber of commerce and NPO) and private sectors (store/private business owner communities) and on how they have developed and promoted their activities in the DMOs in Noboribetsu.

Table 4 presents an overview of the DMOs in Noboribetsu as well as their activities during the last twenty years. The definition of a DMO in Noboribetsu is not the same as that of the DMO in general (defined by the UNWTO and the DCG (Morrison(2013)) because the DMOs in Noboribetsu are organizations created primarily by the Noboribetsu city office. These existing DMOs in Noboribetsu are characterized by an initiative in which the city can exercise leadership in the decision-making process as it relates to destination planning. The diversified situations in the reorientation period of the TALC in Noboribetsu, however, remain to be understood. Such diversification covers a broad range of situations from decline to stability to rejuvenation. That said, the outcomes from destination management strategies also vary from case to case depending on the circumstances specific to the targeted area(s).

Accordingly, one of the important challenges is to identify how these strategies can be combined to achieve effective rejuvenation in Noboribetsu. Hence, it is essential that the DMO expand into a broader-based organization that enables cooperation and collaboration with the surrounding areas and involves a variety of stakeholders in Noboribetsu. This requires the identification of the imagined future vision of the spatial spread of the onsen-tourism destinations as attractive area. As previously mentioned, the AMMA is expected to be beneficial given that the comprehensive framework has the capability of integrating the area-formation issue with that of the sustainable area-development.

Considering such a broad-based DMO, the development of tourism plans and policies is regarded as important. Mason (2016) 20) introduces Richie and Crouch (2003)'s view, 'it is an intellectual process that uses information to create macro-level decision making to develop the type of destination that is viewed as desirable.' It is evident that the Noboribetsu city office and the partners play major leadership roles in creating their own master plans and policies for the ADIT within each city-based

DMO. Following and consistent with the destination planning process, these DMOs have specific missions with respect to tourism destination management, as presented in **Figure 3**. Mason (2016) indicates, 'destination management is more of a micro-level process, in which all stakeholders carry out organizational activities, on a day-to-day basis, in a macro-level vision contained within the policy and planning.' In addition, when focusing on sustainable area development during the period of stagnation in the TALC in Noboribetsu, one of the challenges was to have the analytical ability to develop both the destination marketing and management policies necessary to shift the stage of the TALC toward rejuvenation.

Table 4 Overview of the DMOs in Noboribetsu and their activities (From 1995 to 2015)

Name(Type) of the DMOs	Year	Content	Outcome	
Noboribetsu Tourism Association	Since 1995	PR & Promotion for Ttourists from Eastsouth Asia	Increase of foreign tourists in 1996 and its acceleration	
Noboribetsu-Shiraioi Tourism Liaison Council	Established in 2002	These DMOs cover the broader tourism destinations to PR & Promotion for both domestic and international visitors to Hokkaido	The effect of PR & promotion strategies is effective for foreign tourists	
Noboribetsu-Toya Broad Tourism Areas Council	Established in 2009			
Meeting for Hokkaido Shinkansen xNittan Region Strategies	Established in 2013			
Noboribetsu city (Department of Tourism and Economy)	Settled in 1996	Noboribetsu Grand Design over 50 Years Ahead	As a comprehensive grand design for land use patterns, the area getting close to nature for green-tourism (forest therapy) & marine-tourism, Tourism & recreation area for convention tourism and natural resources area as eco-tourism	
	Settled in 2006	The second Master Plan in Noboribetsu 2006-2016		The numerical target of he number of visitors to Noboribetsu in 2016 was achieved: The target is 4.0 millions in 2016 from 3.2 millions in 2004 and the result in 2015 was 3.91 millions.
		•To differentiate the attractiveness of tourism with that in other tourism destinations • To bulid up the complex industrial bases resolving around the toursim industry		
Muroran Technology Center (owned by Noboribetsu, Muroran and Date cities)	Started in 2003	Projects for promoting new creation of manufacturing	Support for development of tourism-related products and improvement of package design	
Noboribetsu city (Department of Agriculture, Forest and Fishery)	Started in 2008	The improvement project of farm-stay typed recreation activities	The project originally intended to commercialize a dairy farmer experience. But, because of anxiety of foot-and-mouth disease, its purpose is to establish the sixth industrial sector.	

Noboribetsu Branding Promotion Council (Noboribetsu Commerce Group+Tourism Association+the Chamber of Commerce in Noboribetsu and the NPO in Noboribetsu)	Settled in 2009	Established the recommendation system of the Noboribetsu branded products and commercialization of local products	
Store-owners' Community in front of the Noboribetsu station	Started in 2010	Tourist Information Office called 'Oni-navigational station in Noboribetsu'	Tourist information guidance and Sales promotion of products from Hokkaido
NPO: MOMONGA-CLUB	Established in 2002 and Conversion into a corporation in 2005	•Operation of Nature Center Forest Mining • Projects for promoting the area-development •Support projects for nature-based tourism • Children care and human resources development	
Noboribetsu Active Guide Association B-NAG	Started in 2005	Nature tour as an eco-tourism	A trial of the autonomic coproduction typed management
The Local Economy Promotion Conference for Small and Medium-sized Companies	Settled in 2013	•How to live a self-sufficient life •The flow patterns of visitors to Noboribetsu •The returning of the profits of tourism industry to other industries	

Note: The DMOs and the contents are summarized by the author with referring to the description of Hori (2016)'s paper.

REFERENCES

- Nishii, K: Basic issues on area marketing & area management approach (AMMA) in tourism destination, Proc. of Infrastructure Planning, No. 50, (in Japanese), 2014.
- Nishii, K: Conclusive remark, in "Toward development of more attractive tourist areas" in JSCE Symposium, (in Japanese), 2009.
- Nishii, K., K. Kondo, M. Emori, and K. Yokoyama: The long-term strategic points of view for tourism area development policy: In case of TDM measures for the anniversary event in Ise-Shrine, (in Japanese), 2013.
- Umekawa, T: Where area-development involving tourism will head for? City Planning, [Special Issue]; Tourism and Interaction & Area Blanding, Vol.61, No.1, 295, 7-11, 2012.
- Butler, R.W. : The concept of the tourism area life-cycle of evolution, implications for management of resources, Canadian Geographer, 24(1), 5-12, 1980.
- Butler, R.W. (edited): *The Tourism Area Life Cycle, Vol.1 and Vol. 2*, Aspects of Tourism 28, CHANNEL VIEW PUBLICATIONS, 385p and 327p, 2006.
- Butler, R.W. : *Tourism Area Life Cycle*, CTR(Contemporary Tourism Reviews), edited by C. Cooper, GOODFELLOW PUBLISHERS LIMITED, 2011.
- Morrison, A.M.: *Marketing and Managing Tourism Destinations*, ROUTLEDGE, (Chapter 4, pp.111-153), 596p, 2013.
- Nishii, K. and K. Goulias: Area Marketing and Management Approach (AMMA) in urban and region tourism – The conceptual framework and challenges, a paper presented at The 56th ERSA Congress in Vienna, 2016.
- Nishii, K: Some Challenges in Marketing Tourism Destinations Based on Area Marketing and Management Approach (AMMA), Papers of University of Marketing and Distribution Sciences - Economics, Informatics and Policy Studies-, Vol. 25, No.2, pp1-12, 2017 (in Japanese).
- Nishii, K., H. Furuya and J. Romao: On prerequisites of managing tourism destinations: From viewpoints of Area Marketing and Management Approach (AMMA), Proceedings of the 32nd JITR Annual Conference, pp81-84, (in Japanese), 2017.
- Zmysolny, P: Application Of The Destination Life Cycle Concept In Managing Urban Tourism: Case Of Poznan, Poland, Proceedings of the International Conference on Tourism (ICOT 2011): TOURISM IN AN ERA OF UNCERTAINTY, Rhodes Island, Greece, pp867-878, 2011.
- Urry, J : *TOURIST'S GAZES*, 1990 (revised in 1995).
- Martin, B. S., and M. Uysal : An Examination of the Relationship Between Carrying Capacity and the Tourism Lifecycle: Management and Policy Implications, *Journal of Environmental Management*, 31, 327-333, 1990.
- Pornphol, P. and G. M. McGrath: Implementation of The Tourism Area Life Cycle Model As An Advisory Decision Support System, Proceedings of Pacific Asia Conference of Information Systems, PACIS 2010 in Taipei, Taiwan, pp1743-1750, 2010.
- Lumsdon, L: *TOURISM MARKETING*, International Thomson Business Press, 1997..
- Romao, J., K. Machino and P. Nijkamp: Integrative diversification of wellness tourism services in rural areas – An operational framework model applied to East Hokkaido (Japan), 2017.
- Johnston, S.: The ontological foundation of the TALC, Chapter 1, pp7-28, *The Tourism Area Life Cycle, Vol. 2*, edited by Butler, R.W., Aspects of Tourism 28, CHANNEL VIEW PUBLICATIONS, 2006.
- Hori, K., Y. Sato, T. Murayama and S. Nishizawa: Cooperation between Mass and New Tourism in Tourism-based Community Development of Hot Spring Destinations – From Comparative Analysis of Beppu, Noboribetsu and Atami, *Journal of JITR, The Tourism Studies*, pp.69-82, Vol. 28/No. 1, 2016.
- Mason, P.: *Tourism Impacts, Planning and Management*, (Third Edition), ROUTLEDGE, Chapter 14, pp.164-178, 2016.

1446 CENTRALIZED VS DECENTRALIZED TOURISM POLICIES: A SPATIAL INTERACTION MODEL FRAMEWORK

ABSTRACT

The choice of centralizing tourism policies at the national level or, on the contrary, of decentralizing them at the local level is widely discussed in the literature, which highlights the related pros and cons. In fact, the simultaneous role of originator and attractor of tourism of each spatial unit may imply a range of complex and competing interests at various geographical scales. In particular, in a framework of regional competition, a central (national) policy may be necessary to offset or coordinate the clashing regional interests. We stress that more profound insights into the problems and challenges of (de)centralized tourism policies can be gained by examining the national-regional choice, and in particular by using as a modelling framework, the 'normative' spatial interaction model.

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1318 CARTOGRAPHIC SOLUTION FOR PROMOTING MOUNTAIN TOURISM IN INDIA

ABSTRACT

The diversified topography alongwith mesmerizing beauty, mystery and serenity of mountain environment attract tourists to experience thrilling adventure, spiritual well being within natural and socio-cultural environment thereby generating 15-20% of annual global tourism. Mountains of India are of no exception which not only rejuvenating pleasure respite and relief from sultry tropical monsoon climate but also bloomed with adventure, spiritual and eco-tourism. Whatever the nature or destination, tourists need some guiding solutions to find out their point of interest, available infrastructure facilities, topographic information in an unfamiliar destination. Map is one such cartographic solutions that help the tourists as useful reference to explore the destinations with a proper overview encompassing an idea of the destination and its neighbourhood. NATMO, being a pioneer mapping organisation is continuously working in this field with the help of advanced technologies like high resolution images, GPS, GIS etc. and come up with several publications like Adventure tourism, Trekking and Tourism, Environment and Tourism - Northern India, Tourism Infrastructure-Northern India, Tourist Guide Book along with DPMS, GMS and tourist maps of different places which are of great demand among the tourists. In this paper two different Mountain environment in the Himalayan Mountain Region have been selected with a brief overview of two different tourists attractions. Sikkim, being a part of the North-Eastern hilly states of India lies in Eastern Himalaya and always attracts tourists for adventure and natural beauty. In 2016, total 740763 domestic tourists and 66012 foreign tourists visited Sikkim. Kedarnath in Uttarakhand State of India lies in the Western Himalaya region well known for pilgrimage or spiritual site. Every year nearly 3 lakh tourists visit this place for its spiritual and natural attraction. However the devastating flood of 2013 reduces the number of tourist to 40000 by 2014. Afterwards Government initiation like infrastructure facilities and introduction of helicopter services further increased the number of tourists to more than 3 lakhs by 2016. The new route via Rambara and Linchauli is now a major trek route to reach Kedarnath which will start from Gaurikund with a total length of 19 km. NATMO has prepared a new map showing new route to Kedarnath aligned with the Govt initiatives to bring back resilience in Mountain tourism as well as Uttarakhand State tourism. Key Words : Adventure Tourism, Pilgrimage Tourism, Sikkim and Kedarnath

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1262 IS ICT IMPROVING ACCESS TO ACTIVITIES? A CASE STUDY OF MUMBAI, INDIA

ABSTRACT

Overall wellbeing and quality of life of individuals living in an urban area depends on the freedom they get to participate in society, by allocating time in different activities that fulfill both their production needs (activities such as work, education etc.) and consumption needs (activities such as shopping, leisure activities etc.). Institutional lack of access to opportunities created as a result of various social exclusion factors such as transport disadvantage, poor housing conditions, illiteracy, unemployment, and income poverty curbs this aforementioned freedom. However, the current rise in the use of information and communication technologies (ICT) among the urban populace has the potential to make a number of activities more accessible with minimum rise in cost. Keeping this trend in mind, this study aims to analyze the effects of ICT on social exclusion by investigating its impact on activity participation behaviour. A time use study was conducted in the city of Mumbai (Municipal Corporation of Greater Mumbai-MCGM area), collecting 1205 samples representative of Mumbai's social disparities. 46.6% of all the samples were from informal housing settlements (such as slums or chawls). Activity participation and time allocation behaviour of individuals were observed for two days (entire 24 hours) i.e. one weekday and one weekend day along with details on travel and ICT usage. The interrelationships between ICT usage and various socio-economic parameters, along with its impact on different activity types were tested using structural equation modelling (SEM). SEM are a set of simultaneous equations which are ideal for the objectives of this study as it combines factor analysis with regression and path analysis to provide confirmatory results. The SEM analysis aided in the testing of interrelationships between different factors (such as 'access to ICT', 'reduced mobility, 'physical access') and various socio-economic parameters (such as income poverty, poor housing conditions). It was observed that 'access to ICT' had a significant negative relationship with income poverty and physical access. Meanwhile, staying in informal housing settlements related positively with access to ICT. This finding substantiated the optimism surrounding ICT usage and its potential to cut across certain disparate segments. In addition, the effect of these factors were tested on activity participation behaviour. The effect of ICT was observed to be most prominent in case of leisure activities with significant substitution in leisure trips, whereas the effects were not significant in case of mandatory activities. The findings of this study indicate towards the physical space dependent nature of mandatory activities and the scope of improving access to leisure opportunities through ICT based policy interventions. Moreover, the study was helpful in identifying exclusion in different types of activities and how various segments of population have varying levels of exclusion. The same could be used for targeted and focused policy interventions.

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SS11.4. The Future of Leisure: Tourism, Mobility and Transportation

1644 SPATIAL ACCESSIBILITY TO AIRPORTS IN TURKEY: EVALUATING THE CHANGES OVER TIME

ABSTRACT

There certainly is a relation between spatial accessibility and transportation infrastructure, so it is critical to investigate the changes in spatial accessibility caused by the changes in transport infrastructure (especially airports, highways, metro lines and high-speed railways) over time. How the policy changes in air transport and new airport investments effect spatial accessibility, and consequently travel behavior is the main drive for this study. The nature of air transportation in Turkey changed after 2001 with two important amendments. Firstly, the airlines were entitled to determine the ticket prices for domestic flights in 2001. Secondly, all obstacles for private airline companies were removed in 2003, and the domestic flight market has been completely liberalized. As a result of this, the number of air passengers and the rate of air transport passengers in interurban travel passengers dramatically increased. In addition, the number of active airports went up from 25 to 52 within twelve years. These developments brought the airport transportation into prominence, so accessibility to airports. The aim of this study is to investigate the changes in accessibility to airports between the years of 2000 and 2014 for each district in Turkey. Within this scope, firstly we will determine the boundaries and estimate the population of catchment areas of each airport in the years of 2000, 2007 and 2014 according to maximum covered travel time using ArcGIS Network Analyst program. Secondly we will reveal districts accessible from at least an airport within 30, 60 and 120 minutes travel time, and districts that inaccessible within two hours in the years of 2000,2007 and 2014. So, we will trace the effects of newly activated or built airports on the catchment areas of the other airports and accessibility to these airports. After that, we will estimate the regionalization index of each airport comparing the catchment area population with the number of domestic passengers by the years of 2000, 2007 and 2014. Finally, we will use a location-based method including gravity-based formula to measure the spatial accessibility of each district to the airports within the catchment area of two hours travel time. The main findings of the study give clues about the future policy directions. Despite the fact that last airport openings reduced maximum covered distance especially in the northeastern part of Turkey, and consequently have shrunk the catchment population of the airports, the regionalisation indexes of airports located in regional centers and hub cities increased because of increase in the number of air passengers in the given time period. Airports located nearby the main hubs could not achieve to increase air passengers and regionalisation indexes although some of them have big catchment populations. Airports located in sparsely populated areas have similarly low regionalisation indexes. This also affects the accessibility degrees of districts, which are in the catchment areas of these airports. As a conclusion, distance to main hubs and the total catchment population of airports have combined effects on the number of air passengers and accessibility degrees of districts in Turkey.

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1355 HIGH-SPEED RAIL IN DEVELOPING COUNTRIES: WHICH USE IN TERMS OF TOURISM MOBILITY?

ABSTRACT

In January 2017, there were 37,343 km of high-speed lines (HSLs) in the world, with a further 15,884 km under construction; almost 36,000 km were planned worldwide for completion by 2050 (UIC, 2017). By favouring mobility, these lines are used to develop exchanges between cities and sometimes with other countries, in the case of transnational lines, and more broadly to foster economic development. It is the case in terms of tourism. But the potential indirect effects (or wider impacts) of high-speed rail (HSR) on tourism are difficult to assess and not automatic (Albalade et al., 2015, Bazin et Delaplace, 2013, Delaplace and Bazin, 2017 for a review). But this is an issue that needs to be re-examined, as 21st-century rail has so far been characterized by network extensions in developing or emerging countries (China, Turkey) and by projects in many others (India, Brazil, Morocco, Malaysia, Egypt, etc.). These high-speed lines take shape in very different socio-economic contexts from those of developed countries. Income inequalities are higher than they are in developed countries (World Bank, 2016). Indeed, as shown by Kuznets in 1955, during the take-off period, growth is highly unequal because only a small percentage of the population benefits from the growth of national income induced by this industrialization. Moreover, income inequalities are linked to spatial inequalities that increase with growth and development (Kim, 2009, Kanbur and Venables, 2005). What are the consequences in terms of tourism? Can the issue of potential increases in tourism mobility be addressed in the same way in both sets of countries? In developing countries in particular, two key issues are to know who is using these lines. Does everybody have access to high-speed rail in developing countries? Are its uses and clients the same as in developed countries in terms of tourism mobility? Is tourism equally developed in developing country as in developed countries, especially concerning domestic tourism? Do factors such as low income and greater inequalities, which characterize these developing countries, influence the way transport infrastructure is used for tourism mobility? The aim of this article is to show that in terms of tourism mobility high-speed rail could induce more inequalities in developing countries than in developed ones, not least because its uses differ spatially, economically and socially. This article suggests analysing a less-developed issue concerning the effects of high-speed rail, namely the issue of spatial, social and economic inequalities linked to high-speed lines. Our analysis will be illustrated by the cases of different countries and their willingness to develop tourism (Turkey, China) and some investigations concerning the future line in Morocco.

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SS11.5. The Future of Leisure: Tourism, Mobility and Transportation

1285 PERCEPTION OF NATIVE JAPANESE TO PROMOTE HALAL FOOD BUSINESS IN JAPAN, A CASE STUDY ON KUSATSU CITY, SHIGA PREFECTURE

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ABSTRACT

Though the concept of Halal is generally concerned with the values of Muslim consumers, it has regarded a fast-growing brand over the world. Consequently, halal food business nowadays has immense potentiality in capturing non-Muslim as target market because of two distinctive reasons – safety and health aspects of halal foods and rapid acceptance of halal within the global population through the process of acculturation. Although perceptions of Muslim consumers are studied in a few research studies but there is shortfall of research works regarding perceptions of Japanese non-Muslims towards halal food retailing in countryside areas of Japan. Therefore, the main purpose of this study was to understand the views of Japanese consumers to promote halal food stuffs in Kusatsu city, Shiga prefecture. This research also focused on to know the challenges for retailing halal food products in this rural area of Japan. The data were collected from Japanese citizens of Kusatsu city of Shiga, Japan through interview survey. However, five key themes had been emerged after analyzing the contents of interview survey such as – knowledge about halal food, need of halal certification, quality of existing halal food, willingness to know about halal food and prospects of halal food. In addition, it was found that majority of respondents showed positive attitudes towards halal food products when they are asked about health benefits of halal foods. This study also identified considering halal as a religious custom is the main reason to show little interest of local consumers towards halal food. In addition, this research identified that the biggest challenge for willingness of local people to adapt with halal food in Japan is dearth of awareness and limited information on what is halal and how to prepare halal food. It was also found that description of products' ingredients only in Japanese language which is a key challenge for Muslim travelers in this area to find Muslim-friendly foods in retail shops. In this term, using international language beside local language can be a good solution for promoting Muslim-friendly foods in such countryside areas of Japan. Therefore, it can be conceived from the overall study that non-conventional strategy can be a suitable approach for food retailers in this rural area for promoting halal food stuffs among Muslim and non-Muslim consumers. For instances, food marketers can promote the health benefits of halal food stuffs for human being which can be called halal science and economic aspects of halal food retailing such as – contribution of halal food stuffs in local tourism value chain which can further play an immense role in the development of rural economy of Japan. In addition, this research keenly intends to propose halal food products as an alternative food for native Japanese which can further contribute to attract inbound tourist specially from middle east and international students from Muslim countries.

Key word: Halal Food, Halal accreditation, Value chain, Halal science

JEL Classification: L66, L83

1. INTRODUCTION

1.1: Background of the Study

Halal is an Arabic word which means permissible or lawful for human being. Though the concept of halal generally adopted by most of the food industries in Islamic countries, many of the food companies in non-Muslim countries have also adopted this in their business practices because of the elevated attribute of Halal concept (Haque, et. al., 2015). However, the halal has become the World's fastest growing brand mainly because of two reasons: first, Halal food is considered as cleaner, healthier and tastier (Alam and Sayuti, 2011); and second due to the tremendous acceptance of halal within the global population through the process of acculturation and assimilation (Ayyub, 2015).

Japan is still lagged the development of effective Halal food value chain comparing with other east Asian nations mainly because of its homogeneous ethnocentrism as an insular country (Eto, 2016). In this regard, Japanese food retailers should have a close eye on promoting halal food stuffs that can contribute in enriching halal tourism and attracting Muslim travelers in Japan. Nevertheless, the participation of Japanese companies in this sector is still very low compared to other global players because of some drawbacks, but the reasons behind these drawbacks are yet unrevealed which is the basic motivation of this research. This is a primary research which is aimed to expand step by step following different empirical approaches in the life-time career of author. Therefore, the fundamental objective of this study is to understand the views of native Japanese consumer to promote halal food products in countryside areas of Japan such as Kusatsu city of Shiga prefecture. Thus, the objective of this study can be met by answering following questions:

RQ1: what is the perception of Japanese consumers towards promoting halal food stuffs in Kusatsu, Shiga.

RQ2: what are the drawbacks for promoting halal food products in this countryside area of Japan?

1.2: Why is Japan

Important dietary changes have emerged over the World during last few decades. Besides, millions of Muslims are travelling and settling to non-Muslim industrialized countries in quest of labor or work and are living among communities with dissimilar dietary habits (Rahman 2014). The aforesaid global turns are also observed in one of economic superpower – Japan. Also, Japan is thriving towards the development of effective tourism value chain. Tourism sector of Japan has contributed 7.4% of total GDP in 2016. The performance of this sector can be enhanced sharply in the Japanese

economy by creating and adding more values. But the unique food culture of Japan is one of reasons to become unattractive destination for travelers including Muslims. In this regard, developing an effective halal food value chain might be a strong operative mean to increase the influx of visitors from foreign countries including Muslims. Sakurai (2003) cited that immigrants from neighboring country such as Korea, China, and the Philippines, along with those from Muslim countries such as Pakistan, Iran, and Bangladesh, came to Japan in considerable numbers in the 1980s. However, Japan represents a non-Muslim country with a significant Halal industry development (Adidaya, 2016), but the development of Halal food value chain is still lagged in Japan compared to other East Asian countries due to reluctance of Japanese society in religion.

1.3: Motivation of this Study

It is observed that recently halal food stuffs are available in some shopping malls of Kusatsu city which is unusual comparing with other rural areas of Japan. Also, Kusatsu International Friendship Association (KIFA), a sister concern of Kusatsu City Government Office, has included halal foods in its international cultural exchange programs. Consequently, such movements of food retailers to promote halal food products locally and initiative of local government of Kusatsu city have created awareness among ordinary citizens about halal foods and some of them are keenly interested to know more about halal. For this reason, this research is aimed to understand the perceptions of native Japanese to promote halal foods more extensively in this rural area which can work as the guideline for local food retailers for their regional strategic plan.

2: HALAL FOOD BUSINESS IN JAPAN

Japan represents a non-Muslim country with a significant Halal industry development (Adidaya, 2016). Now there are 97 Halal shops throughout 31 out of 48 prefectures in Japan where only 66 shops are recorded by Islamic Center Japan and author took help from some halal shopkeepers in Tokyo for counting rest of shops whereas this number was only 55 throughout 27 out of 48 prefectures in 2014 (Yusof and Shutto, 2014). It is also indicated in the website of Islamic Center Japan that 64 halal restaurants and 9 halal certified organizations are working over the country. But compared to other East Asian countries, Japan is late in addressing the Halal market due to less interest in religion in Japanese society (Halal Challenge Project, 2013). Muslim often find it is difficult to travel or line in Japan while keeping their belief and consuming only Halal foods, though Muslims represents only 0.18 percent of the Japanese total population (Adidaya, 2016). In this regard, Japan Food Industry Center (2009) pointed out that Halal is a sensitive issue as it is associated with religion. In addition, Japan and Islam are not closely related compared to other religions such as Buddhism and Christianity. Japanese may see Halal as part of Islamic requirements; hence it becomes too complex to be associated with. It is perhaps complexities and sensitivity in Islamic rules that have been shying the Japanese food companies away from venturing into this sector. Besides, the concept of Halal does not apply only to the product and process, but also throughout the firm's value chain. This will require a major overhaul for the firm to coordinate, standardize and control its value chain. On the contrary, countries of high certainty avoidance cultures such as Japan tend to avoid risk and ambiguity and prefer incremental innovations, where each step is small and ambiguity is more easily kept under control (Hofstede, 2001).

However, a consumer survey results suggested that most Japanese consumers have not heard about Halal and are not interested in learning about Halal (Shazlinda, 2008). But it is reality that nowadays concept of halal food is mushrooming in Japan. Halal is becoming a new trending topic, and it covers not only food and drinks but is more widely applied to other aspects such as tourism, pharmaceuticals and cosmetics. Therefore, it is very promising that Japan will be able to create effective value chain of halal food since local government, academicians and other stakeholders of Japan are working relentlessly to conceptualize the importance of the development of halal food value chain which can play further prospective role to build competitive advantage of Japanese tourism business.

3. METHODOLOGY

A qualitative method, i.e. interview survey was used to achieve the objectives of this study. This research mainly focused on primary data that had been collected through a semi-structured questionnaire. All the items in the questionnaire primarily focused on understanding the perception of Japanese consumers towards halal foodstuffs in Kusatsu city of Shiga, Japan. Kusatsu city is selected as study area for this research since halal food is increasing more and more in the local shopping malls and native Japanese of this area is becoming interested to hunt knowledge about halal. Data was collected from the ordinary Japanese shoppers. In this perspective, evening time was selected to reach customers easily since most of Japanese shoppers visit shopping malls after their official work. For this study 25 native Japanese shoppers were interviewed randomly who belonged to the resident of Kusatsu city. Finally, contents of interview were coded, categorized and summerized. Authors conducted interview in two sessions where in first session authors represent religious view of halal food products which results were quite general and similar with some previous studies such as findings of Ayyub (2015). On the other hand, focusing on health and economic view of halal food stuffs produced different results from similar research studies.

4. RESULTS AND ANALYSIS

Five key themes were emerged after abstracting the feedback of informants such as knowledge about halal food, importance of halal certification, quality of existing halal food, willingness to know about halal food and prospects of halal food in local vicinity of Kusatsu. Hereafter, some essential variables are categorized under emerged themes to propose recommendations for food traders in this area of Japan. The outcomes of systematic analysis of field survey data are briefly discussed one by one as follows.

4.1: knowledge about halal food

There were number of observations provided by the respondents that could exhibit their thought-provoking perceptions regarding Halal foods. It is found that most of the respondents (n= 31) are familiar with the taste of halal food and they have positive approach about halal food stuffs though they don't have literal knowledge about Halal which is very common as non-Muslim.

For instance, Kimiko, one of Japanese housewives, responded about the "taste" of halal foods:

"I don't know what is halal and recently I have been familiar with the concept of halal. The taste of foods which I consumed before was delicious and I want to eat it again. However, I think Halal food is spicy and sometime sweet."

Rie mentioned that *"I only know the name of halal. I didn't have opportunity to consume halal dishes. However, I taste some snacks with halal logo from Lamu (a local shopping Mall) which does not give me different experience from non-Halal snacks, but the taste was good."*

Takaba, an employee of a private organization, talked about "availability" of halal foods in locality - *"I have some knowledge about halal and I often visit some shops near me where halal food products are sold. Taste of halal is little different from non-Halal foods since it comes from different culture. However, availability of halal foods in Japan can ensure perfectness for Muslims residents and it can attract more tourists for enjoy sightseeing in Japan."*

It can be said from aforesaid opinions that majority of respondents are unaware about the term "Halal" which is quite general, but this countryside Japanese citizens have complete positive impression about taste of halal food. In addition, most of respondents perceive halal food promotion in this rural area as an effective tool for attracting Muslim travelers. Indeed, optimism of local respondents towards developing halal food value chain is an obvious indication of cultural diversity in such a countryside area of Japan.

4.2: Awareness about quality of existing halal food

Halal food is recognized as a global brand for its distinct quality and safety in modern business era. In this regard, Said et. al., (2014) cited that halal food stuffs certainly confirm the protection of human beings and any foods or drinks which may cause harm to the human body and health is forbidden even if there is no prohibiting legal evidence. Consumers now are seriously conscious in their food selection and physical health concerns. Many studies (Sawari, et al., 2015; Azeez, 2013; Techathuvanan, et. al., 2010; Ayyub, 2015) worked on quality of Halal foods and health concerns of consumers. It is noticed from this study that most of respondents (n = 33) are intensely concern about food quality though they could not distinguish the quality of halal food and non-halal food thoroughly whereas few consumers (n=6) consumers gave references that they are well informed about the quality of halal food and they are interested to see halal Japanese foods in future.

Hidetomo mentioned about "freshness and cleanliness" of halal foods:

".... I am not informed about the cleanliness of Halal meat or other Halal foods. Even I am not aware about the health impacts of pork or alcohol and I don't want to be concerned about it since I don't have any allergy regarding those foods. But, I don't think Halal food is really healthier than conventional food."

Takahiro commented on "attribute" of halal meat which is *"..... no, I don't know about the quality of halal food and even halal meat. But I have heard that halal meat does not contain any blood and it is more fresher and cleaner. I am interested to know more about it. If I found the truth about its superiority regarding quality, it is also better for me to live healthier."*

Michihito, described the "shelve life" of halal foods as follows

"I have little experience about halal food and the quality of it since I attended in some halal programs in Kyoto and Osaka apart from Kusatsu city. I am aware about the cleanliness and safety issue of halal food and meat which can be preserved for long time than conventional meat. Also, I don't want to think about the negative impact of non-Halal meats, specially-pork and alcohol, because sometimes it gives me amazing taste. In a word, I don't want to miss it, but surely I will taste halal food."

However, Daichi explained his observation the "usefulness" of halal food for human body in the following way:

"I was first inspired by one of my Muslim friend to eat halal foods and noticed very good taste of those foods. After that I was self-motivated to know more about halal culture and read some articles about it. Now, I do believe it is not a matter of religious activity. But acute halal food is good for sound health since it is scientifically proved that actual halal foods don't contain any harmful ingredients of human body."

So, it can be summarized from the field study that many respondents (n=15) have knowledge about the quality of halal foods and meat though they are non-Muslim. It is also noticed that most of respondents are interested to know more about the quality of halal and they want to learn the scientific approach of halal meat though the comprehensive reasons behind their interest is unrevealed. On the other hand, few informants have very good concept about the quality of Halal food. Some previous studies also support that non-Muslim consumers are also aware about the quality of halal foods, for example – research conducted on halal food in UK context by Ayyub (2015).

4.3: Willingness to know about halal food

The process of adaptability with new culture is simply called acculturation. More specifically, acculturation is the process of one cultural group adopting the beliefs and behaviors of another group. However, Wibowo and Ahmed (2016) traced

acculturations as one of the key factors to emerge halal food value chain among non-Muslim consumers. As a result, acculturation of halal food among different cultures increases the acceptability of halal food stuffs among non-Muslims (Ayyub, 2015) which ultimately can work as a by-product of halal tourism value chain. So, this study also intends to understand the willingness of Japanese people towards acceptability of halal food stuffs in rural area. The following responses are evident about how Japanese non-Muslims are being acculturated with halal-culture successively.

Nakano commented on “availability” of halal food in his neighborhood as *“Halal foods are rarely found in my area. But I have experience to taste it which gave me the taste of different culture. However, if I got chance in future I want to have more experience of Muslim foods and also want to refer my friends to introduce with this food culture.”*

Minoru reacted about “the religious” aspect of halal food as follows – *“I don’t have idea about halal. But, I do believe consumption of halal food is perfectly the reflection of Muslim culture which I don’t like and I don’t want to recommend any of my friends about it. However, if halal food contributes in our economy, then necessary agents can think to promote this culture.”*

Mariko is a community leader who work and deal with foreign people also replied about “availability” of halal foods in local market from her own career experiences as *“Food stuffs in Muslim family and restaurants are spicy which is quite different from Japanese food. But as I have heard many Japanese foods also can be in the form of Halal food which is an utmost prospective mean to have a new trend of our economic development. I had opportunity to enjoy halal foods several times and in my sense ... foods were delicious though some were not. So, I think number of Halal restaurants in our locality must be extended for the convenience of Muslim travelers. However, I want to recommend halal food products not only my friends but also local government to create an effective chain for halal food business.”*

It was evident from the aforesaid responses that most of the informants are familiar with halal culture and they are immensely cordial to welcome halal culture in their vicinity. In addition, ongoing acculturation process of halal foods in this countryside locality can be a strong driving force for acceptability of halal culture among Japanese consumers in near future. However, effective and timeous campaign about ongoing acculturation process towards halal foods can increase the awareness about halal food stuffs among non-Muslims and sufficient awareness about halal concept can encourage local food retailers of Kusatsu city to develop effective value chain of halal food.

4.4. Importance of halal certification

Halal accreditation is necessarily required for manufacturers to satisfy the need of customers and authentic halal certification in this regard contains paramount value for customers. Author noticed from the local shopping malls and online halal shops, as a regular halal product consumer, that Japan has different halal certification bodies whose standards differ from one to another. In this context, Elsrag (2016) pointed out that there is ongoing confusion about halal standards because of different national and international halal accreditation bodies over the world and the majority of halal food is being produced in non-Muslim majority countries and these foods are certified by independent halal certification bodies that operate with little regulatory oversight. Therefore, halal certification is one of prime challenges towards the trustworthiness of brand loyalty of halal. However, this issue had been brought up by the following responses.

Kyoko, a staff of Japan post office, mentioned about “diverse logo” of existing halal foods as *“I don’t have knowledge about Halal certification. uuuummm.... I saw many products with halal logo but logos are different which is bit confusing to me. I don’t know whether these products have different taste or different standards. [...] want to taste one by one.”*

Junko commented on “halal accreditation body” of a neighboring city as follows *“I have heard about one Halal authorization body in Kyoto though I don’t have detail idea about functions of this body..... perfect adjustments and standardization need to be made for acute accreditation process.”*

Minako, staff of a shopping mall, responded about “halal brand” as *“Halal is a less promoted brand in this local area. In our shop, many halal products are from Brazil and some are from Malaysia and local manufacturers. But we see halal logo is different even in term of a specific country. So, it seems diverse quality of halal brand.”*

However, it can be concluded from the above responses that the local consumers are conscious about reliable halal accreditation body which should be trusted by both Muslim and non-Muslim consumer. In addition, proper and timely initiatives from government can ensure the reliability of halal certification which can be an effective tool for keeping confidence and trust of consumers towards local halal food stuffs.

4.5. Prospects of halal foods in local market of Kusatsu

Halal culture is not a new phenomenon in Japan though the concept of halal is booming gradually over the country (Yusof and Shutto, 2014). However, Adidaya (2016) mentioned that Japan represents a non-Muslim country with a significant halal industry development, but the development of halal food value chain is still lagged in Japan compared to other East Asian countries due to reluctance of Japanese society in religion. In this study, most of the respondents were optimistic to see the halal boom in this local area of Japan for the sake of developing competitive tourism industry and creating advantageous environment for immigrants. Explanation of some respondents are given below.

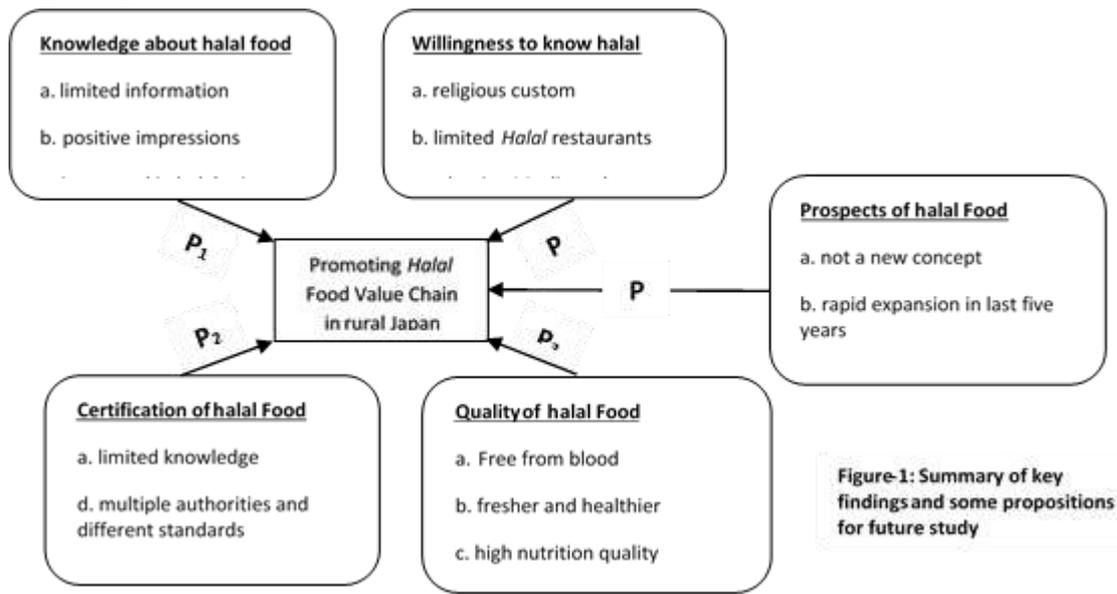
Sugimachi, staff of KIFA, mentioned the “economic” prospects of local halal foods as *“May be.... Japan has prospects to develop halal food business. It would be auspicious for local economy if the purpose to attract tourists from Islamic countries, but for Japanese consumes it would not be suitable.”*

Kimiko, housewife, explained that *“I cannot figure out the future of halal business in Japan since I cannot conceptualize the real purpose and benefit of halal food business in Japan. As far I know it is useful for Muslim residents... that’s it*”

Murakami opined about the prospective contribution of halal foods in *“local tourism”* as follows *“I hope developing effective chain for halal food can be useful for tourists in Japan including Muslims. But I think Muslims and Japanese have different concept about food safety and standard. So, this contradiction about purification and cleanliness among Japanese and Muslim people can be a threat for developing effective value for Halal food in Japan.”*

Therefore, it was found from the field survey that majority of respondents are in favor of developing halal food chain in the selected rural area of Japan and local people is interested to be aware about both upstream and downstream perspectives of halal food supply chain. And, effective halal food chain in such a country side area can be a long-awaited phenomenon for travelers in Japan.

The following framework represents the key findings after abstracting the key themes of this study which can be empirically examined in future:



5. CONCLUSION AND IMPLICATIONS

It is noticed during field survey that when authors represent religious view of halal foods, then respondents did not show much interest on halal food which is very general aspect as non-Muslim consumer. However, respondents felt fascination to participate in halal discussion when authors focus on health and economic view of halal food stuffs. This study revealed some essential results in perspective of its predefined objectives. However, this research uncovered five emerging themes which influencing the perceptions of Japanese non-Muslims towards promoting halal foods in the local market of Kusatsu city such as knowledge about halal food, importance of halal certification, awareness about the quality of existing halal food, willingness to know halal and prospects of halal food in local market of Kusatsu. In this regard, first, this study identified that Japanese consumers still cannot make decision about consumption of halal food because of limited information and reluctance to know about halal as a religious aspect. Proper awareness programs about halal food can remove the negativity about halal foods. Thus, knowledge of halal directly affects the purchasing decision of Japanese non-Muslims in this rural area of Japan which is consistent with the findings of Aziz and Chok (2013). Second, it is found that native Japanese consumers in this area are highly conscious about the quality of food products but they cannot make difference between the quality of halal food stuffs and Japanese traditional foods since the term *‘Halal’* is less promoted and ordinarily popular among local people which is relevant with the findings of Adidaya (2016). But, it is evident that halal foods are fresher and healthier than non-halal foods (Verbeke et al., 2013). However, it is revealed from the field study that halal restaurant of Kusatsu and online shops of halal food in Japan is keeping non-halal foods and beverage in restaurant and uncertified halal foods in online halal shops which is completely contradictory with the standard of acute concept of halal. It is also found that there is no unique halal certified foods in local shopping malls and most halal products are imported from Brazil, Malaysia, Thailand and local food manufactured which is the indication of quality variation. Consequently, this situation is creating confusion among both Muslim and non-Muslim consumers in Japan.

However, it can be conceptualized from this study that non-conventional strategy can be best method for food retailers in this rural area to attract both Muslim and non-Muslim consumers towards halal food stuffs. For instances, food marketers can promote the health benefits of halal food stuffs for human being which can be called halal science and economic aspects of halal food retailing such as – contribution of halal food stuffs in local tourism value chain which can further play an immense role in the development of rural economy of Japan. In addition, local food promoters can try to apply the concept of halal in Japanese traditional foods such as Ramen, Sushi, Miso soup etc. with special savory taste of Japan like – umami (Gabriel et. al., 2018 and Kawai et al., 2012). Furthermore, local food retailers can produce Muslim – friendly foods and every food stuffs also should have English version of food ingredients beside Japanese version since creating unique halal certification body in Japan is one of major challenges for promoting halal food stuffs domestically

and internationally which creates always confusion about the authenticity of halal. Therefore, continuous study on value chain analysis of halal food business can be an effective tool for local food marketers to create competitive advantages for prevailed halal food stuffs and for onward development of halal food value chain in Kusatsu city of Japan.

6. LIMITATIONS AND FURTHER STUDY

This is a primary research study on promoting halal food business in a rural area of Japan and outcomes of this study is one of life-time career goals of author. As a result, further research is essentially needed for its gradual expansion which can be implemented by empirical tests of five emerged themes and their contribution on creating competitive halal food value chain in such a rural area of Japan. Due to time constraints, research had to follow nonprobability sampling and only managed small samples for in-depth interview. Further research can be expanded following an effective tool of probability sampling and covering a large sample size. Also, this research is confined within the responses of native Japanese consumers in a rural area of Japan. But, further research can include immigrant non-Muslims in Japan beside native Japanese to avoid biasness which can further produce more attracting and interesting results for learners in value chain analysis of halal food business.

REFERENCES

- Adidaya, A. Y., "Halal in Japan: History, Issues and Problems," *Department of Culture Studies and Oriental Languages*, University of Oslo, 2016.
- Alam, S.S., and Sayuti, N.M., "Applying the theory of planned behavior (TPB) in halal food purchasing," *International Journal of Commerce and Management*, Vol.21, No.1, 2011, pp. 8-20.
- Ayyub, R. M., "Exploring perceptions of non-Muslims towards Halal foods in UK", *British Food Journal*, Vol. 117 No. 9, 2015, pp.2328-2343, <https://doi.org/10.1108/BFJ-07-2014-0257>.
- Azeez, W., "The halal dietary system as a recipe for good health", *IOSR Journal of Humanities And Social Science*, Vol. 7, No. 4, 2013, pp. 28-34.
- Aziz, Y.A. and Chok, N.V., "The role of halal awareness, halal certification, and marketing components in determining halal purchase intention among non-Muslims in Malaysia: a structural equation modeling approach", *Journal of International Food & Agribusiness Marketing*, Vol. 25 No. 1, 2013, pp. 1-23.
- Elasrag, H., "Halal Industry: Key Challenges and Opportunities," *Munich Personal RePEc Archive*, No. 69631, 2016. <https://mpra.ub.uni-muenchen.de/69631/>
- Eto, Y., "Japan is becoming a more multiracial and multiethnic society" *Sanyo volunteer*, Vol. 23, 2016, pp. 23-36.
- Gabriel, A. S., Ninomiya, K., and Uneyama, H., "The role of the Japanese traditional diet in healthy and sustainable dietary patterns around the World", *Nutrients*, Vol. 10, No. 173, 2018, pp. 1-15. doi:10.3390/nu10020173
- Halal Challenge Project, "harāru māketto ga yoku wakaru hon," *Tokyo: Shogo Horei Publishing*, 2013.
- Haque, A., Sarwar, A., Yasmin, F., Tarofder, A.K., and Hossain, M.A., "Non-Muslim consumers' perception toward purchasing halal food products in Malaysia," *Journal of Islamic Marketing*, Vol. 6 No. 1, 2015, pp.133-147.
- Hofstede, G., "Culture's consequences, comparing values, behaviors, institutions and organizations across nations," Second Edition, *Sage*, London, Thousand Oaks, 2001.
- Japan Food Industrial Center, "Mareishia halal seido no gaiyou: nourinsuisanshou sougou shokuryoukyoku hojou jigyou," 2009. Available at <http://www.shokusan-sien.jp/sys/upload/166pdf7.pdf>
- Kawai, M., Hirota, M., Uneyama, H., "Umami Taste in Japanese Traditional Miso Soup for the Elderly", *Nutrition and Food Sciences*, Vol. 10, No. 05, 2012, pp. 1-4. doi:10.4172/2155-9600.S10-005
- Rahman, M.M., Khatun, M.M., Rahman M.H. and Ansary, N.P., "Food safety issues in Islam", *Health, Safety and Environment*, Vol. 2, No. 6, 2014, pp. 132-145.
- Said, M., Hassan, F., Musa, R., and Rahman, N.A., "Assessing consumers' perception, knowledge and religiosity on Malaysia's Halal food products," *Social and Behavioral Sciences Procedia*, Vol.130, 2014, pp. 120-128.
- Sakurai, K., "Nihon no musurimu shakai", *Tokyo: Chikuma Shinsho*, 2003.
- Sawari, S.S.M., Ghazali, M.A.I., Ibrahim, M.B., and Mustapha, N.I., "Evidence based review on the effect of Islamic dietary law towards human development." *Mediterranean Journal of Social Sciences*, Vol. 6, No. 3 (S2), 2015, pp.136-141.
- Shazlinda, M.Y., "The emergence of global halal food sector: finding a lifeline in Malaysia for Japanese food companies." *Master's Thesis, Kyushu University Business School*, Japan, 2008.
- Techathuvanan, C., Draughon, F.A., and D'Souza, D.H., "Loop-Mediated Isothermal Amplification (LAMP) for the rapid and sensitive detection of salmonella typhimurium from pork," *Journal of Food Science (Electronic Version)*, Institute of Food Technologists, Chicago, Vol. 75, No. 3, 2010, pp. 165-172.
- Verbeke, W., Rutsaert, P., Bonne, K. and Vermeir, I., "Credence quality coordination and consumer's willingness to pay for certified halal labelled meat", *Meat Science*, Vol.95, No.4, 2013, pp. 790-797.
- Wibowo, M.W., and Ahmad, F.S., "Non-Muslim consumers' halal food product acceptance model." *Procedia Economic and Financial*, Vol. 37, 2016, pp. 276-283.
- Yusof, S. M., and Shutto, N., "The development of halal food market in Japan: An exploratory study" *Procedia - Social and Behavioral Sciences*, Vol. 121, 2014, pp. 253-261.

1030 GASTRONOMY: WOULD IT BE A LOCAL ECONOMIC DEVELOPMENT TOOL IN TURKEY?

ABSTRACT

Gastronomy has gained distinctive attention as a tourist destination, and it has become one of the substantial parts of the tourism. Local authorities benefit from gastronomy as a tourism development tool to energise the local economy. Gastronomy enables cities and regions to increase their competitive economic edge, and it represents significant opportunities for cities and regions to expand economic growth and job creation as well as being essential to reduce economic imbalances among regions. The policies on gastronomy tourism should not be considered as isolation from geographical indication as there is a vivid relationship between geographical indications and gastronomy tourism. Today, Turkey has more than one hundred geographical indications in products and hosts many national/international food festivals. So far, there is no any gastronomy tourism strategy that prompts the potential. Although Turkey has an excellent gastronomy culture, it is unable to convert its potential into opportunity. There may be various reasons behind Turkey's failure to exploit gastronomy tourism as a development means. The most prominent of these is that there is no organisation structure, which would bring related stakeholders around one table, lack or insufficiency of regional and national strategies as well as promotions. This situation sabotages the ability to use the resources efficiently. This study is aimed to draw a roadmap basing on Turkey's inefficacy to utilize gastronomy as a local economic development tool. Accordingly, interviews with institutions, development agencies, municipalities, chefs, culinary schools, and researchers, the ministry of culture and tourism and researchers that have relation with the topic are conducted. The primary advantage regarding gastronomy is the fact that Turkey hosts a wide range of products and techniques thanks to its multicultural background. Both the differences between regions and the authenticity of local cuisines demonstrate that this potential persists. Besides, the existence of over 100 geographical indications proves to be an additional potential for the culinary culture. It is also a major weakness is the common perception that gastronomy tourism is only about "dining". In order to reduce regional disparities in Turkey and to ensure economic sustainability, it is necessary to improve projects and set targets in gastronomy tourism, and to implement these projects and targets effectively.

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1326 FOOD SUPPLY NETWORK IN A TOURISM REGION

ABSTRACT

As one of the leading service sector many developing countries take advantage of the economic gains of tourism, make efforts for the development of the sector. Apart from the direct economic contributions through wages, tourism positively affects the local and regional economy through the demand on other sectors. Supply networks which is mentioned as backward linkages in literature, are studied within the scope of secondary economic effects. Accordingly, tourism facilities demand products and services in order to maintain their core services, thus they create economic opportunities for suppliers. The local involvement in tourism sector is explained by supply relations between tourism and local entrepreneurs which provide various goods and services to tourism facilities. Furthermore it is also observed positive effects on human capital with factors such as the development of entrepreneurship, the acquisition of knowledge and experience, the development of institutional relations and the increase of trust between actors. The supply network of products and services is created by backward linkages within the cluster, whereas many tourism clusters have strong linkages with related sectors such as agriculture and textile. Hospitality firms are the main actors of tourism clusters, which demand products and services and creates economic opportunities for supplier firms, both in and outside of the region. In this context, the costs of products and services in hospitality sector are highest in food and beverage departments, so the analysis of the supply network of the hotels can provide critical findings in terms of regional relations. Aim of this study is to identify the fresh fruit and vegetables supply network of tourism and to explore the effects on the agricultural sector through their supplier relations in the scope of secondary economic impacts. Research questions are as follows: Who are the actors in the tourism-agriculture linkages and what kind of network occurs in terms of geographical extension? What are the effects of tourism on the supplier firms? A cluster of tourism and agricultural linkages that formed by fresh fruits and vegetables distribution is identified and the effects of hospitality sector on the development of agricultural distributors (middleman) is discussed within the framework of local development literature. Moreover, the geographical distribution of agricultural suppliers would provide to explore spatial dimension of networks. The research is conducted in Alanya, which is one of the most important destinations of Turkey, owing to its natural attraction, accommodation capacity and long season period. Data is collected through semi-structured interviews with the suppliers and middleman of fresh fruit and vegetables. 47 out of 63 firms participated in the study. Mixed method is applied for in-depth understanding of the tourism-agricultural linkages. Effects of tourism on agricultural sector is analyzed by non-parametric tests and elaborated with the interviews. Results show that hotels are important customers for supplier firm or middleman of fresh fruit and vegetables, and tourism generates strong linkages and enhances the supply of agricultural production within and outside of tourism region.

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1498 RELIGIOUS PROXIMITY AS A FACTOR FOR OUTBOUND TOURIST CHOICE DESTINATION

ABSTRACT

This paper engages with religion, as a classical measure of culture, and its impact on tourist choice destination. The first objective of the paper is to test whether religious distance outperforms alternative types of cultural and geographical proximity in determining the short term movement of people in a gravity model. At a next step, our second objective is to cross-check how this relationship between tourist flows and religion relates to flows in migration and trade. On one side, we want to examine how religious distance affects economic growth in the Balassa-Samuelson setting of difference in prices across countries. On the other side, we want to see how religious gravity predicts the longer-term movement of people towards countries. To perform our research, we collected a unique dataset for the period 1995 – 2015 for all countries in the world, available from the United Nations World Tourist Organization and World Development Indicators from the World Bank. To quantify religious distance, we employ a specialized index, elaborated by Dow et al. (2016). We use panel data methods and Granger causality test to triangulate the analysis on the direction of the examined effects. In this process, we check if tourism is a channel for cultural (religious) distance effect on migration and trade flows. The implications from our research come to highlight that the warning posed by both Balassa and Samuelson that tourism is a major source of price differences across countries holds today in the framework of increased movement of people. And in both processes, religious distance might be a major and classical but so far neglected factor in understanding tourist destination choice with importance for other economic effects.

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SS12.1. Transforming Metropolitan Regions: Ideas and Examples

1306 TRANS-SCALAR AND MULTI-DIMENSIONAL APPROACHES IN URBAN PROJECTS: AN OVERVIEW FROM LISBON METROPOLITAN AREA

ABSTRACT

Particularly after Expo 98 large scale urban regeneration project, in which a former industrial area gave way not only for the 1998 world exhibition, but also to a new lively mixed-use urban district at Lisbon’s waterfront, new expectations arose regarding public space quality, establishing a new benchmark level. Resorting to various follow- up urban and environmental regeneration programmes, mostly funded by European Union, other Portuguese cities developed various projects aimed at improving urban environment and mobility. A selection of such projects in Lisbon’s Metropolitan Area (LMA) is to be presented in the paper, highlighting their role in driving a trans-scalar and multi-dimensional rationale within a clear metropolitan framework. Since 1998, a stage of transition in Lisbon’s metropolitan infrastructural strata can be acknowledged. After considerable efforts in delivering large scale motorway, railway and transit/subway systems, a new generation of urban projects is helping introduce a softer realm of public space and urban amenities in both central districts and peripheral areas. This stage resulted in the layering of what can be called a connective fabric (Santos, 2012). This fabric is established through: 1) the trans-scalar recombination of various mobility, supply and communications networks; 2) the development of well- connected patches of urban development bridging or regenerating spatial and functional gaps in the metropolitan fabric; and 3) the introduction of landscape and intermodal interfacialities in nodal spaces. Municipalities are the key players in setting up programs targeted at urban heritage districts, environmental qualification and promotion of soft mobility. Some address mostly spatial quality issues, other include economic regeneration goals, others relate both existing and new streets as part of a complex urban reconfiguration process. The paper outlines a selection of recent urban projects in LMA, identifying and discussing a number of criteria related to trans-scalar and multidimensional approaches. Preliminary results point out to common trends, shared by the various projects, which can be the basis for further discussion and comparison with international cases, namely: - a diversification of locational criteria, acknowledging the need to provide spatial quality in more recently developed territories; - the laying of coherent linear spaces, either through metropolitan roads or blue and green corridors and their intertwined combination; - the reconfiguration of arterial circulation systems at various scales, including publictransport nodes and road re-networking; - the development of increasingly compatible and shared spaces between pedestrians and cars; - a predominant strategy to concentrate public resources mostly on public space and public facilities, acting as a driver of subsequent private-led investment.

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1290 AN INVESTIGATION TO DETERMINE THE IMPACT OF THE REGULATORY FRAMEWORK ON THE SUPPLY OF THE AFFORDABLE HOUSING IN PUNE CITY*Chinmay Satbhai***ABSTRACT**

The supply of affordable housing (AH) is influenced by the existing regulatory framework. Planning regulations seldom impose costs on the housing, decreasing its affordability to the majority of the populace, particularly in developing country like India. As AH shortage continues to grows, there exists a greater need to investigate the impact of various regulations on its supply. Regulatory framework includes the urban land planning regulations (land use distributions and zoning, land subdivision, etc.) and the building and site planning regulations (FSI, ground coverage, height restrictions, minimum parking and open space stipulations, etc.), as well as, which act together impacting the optimum use of the urban land leading to consequences on the housing supply. The study develops a two level spatial analysis methodology to investigate the impacts of regulations on the AH supply and to determine the critical factors which have cost embellishments on the overall housing price. In the macro level, a neighborhood in Pune is analyzed for the regulatory impacts on AH supply, while the impact on the cost and the quantity of AH is investigated, in the micro level analysis, by analyzing the AH situation in Pune. As a part of micro level analysis, the comparative scenario analysis is performed by generating two alternative layouts for the same site - one with the existing regulations and another by proposing modifications in the regulations. The study demonstrates that the cost of AH dwelling unit can be reduced by 26.17% and the overall supply of AH could be increased by 79.15%, if the regulatory framework is revised based on the insights from the study. It is suggested that the regulations must be critically scrutinized for their appropriateness in the local contexts of individual cities. The empirical evidence provided by such studies, aspire to be instrumental in paving way for the timely regulatory reforms, creating enabling environment for an increased AH supply in our cities.

Keywords – Affordable housing shortage, regulations, multi-level spatial analysis

1 INTRODUCTION

Provision of shelter and security, in the form of housing, has always been the objective of any civilized society. Adequate provision of housing is directly linked to the economic and social development in the country. Strong forward and backward linkages across more than 250 ancillary industries have been associated with the housing sector in India (National Housing Bank 2014). Reports suggest housing and real estate sectors being second largest employment generation in India. In spite of studies establishing the importance of the provision of housing, many developing economies (incl. India) struggle to fulfill this task. The urban housing scenario in India is characterized by a large number of low-income group populations who correspondingly have low levels of housing affordability (the EMI usually considered as not more than 30% to 40% of monthly income). Contrastingly, this large segment of the society is catered minimally by the formal housing market creating a large deficit of affordable housing (AH) for lower income populations. Multiple factors play a crucial part in the situation, but many studies agree on the role of regulatory framework influencing the supply of AH (Kim 2010). The study provides evidence of the extent of the impact of the regulations on the supply of AH in Pune. The paper starts by discussing the AH scenario in India, followed by brief discussions on the regulatory constraints in its provision in section one. The second section discusses the selection of the case of Pune city followed by the third section providing a brief review of the past studies in this domain. The fourth section discusses the research methodology adopted and the performed multi-level spatial analysis is discussed in the fifth section. The sixth and the final section concludes discussing the suggestions to improve AH supply in Indian cities.

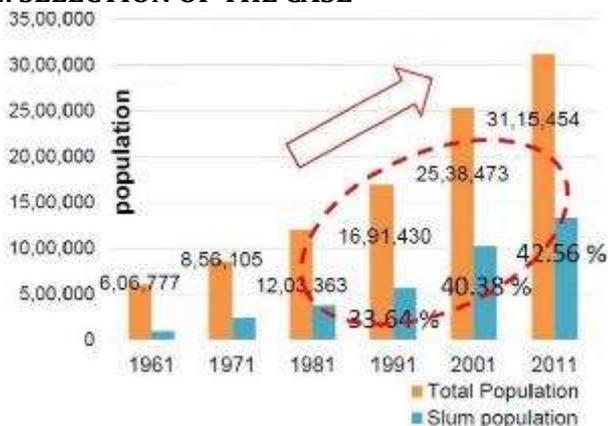
1.1 AH Scenario in India

The rise of the urban population has been unprecedented and we have more than half of the world population living in the urban areas (United Nations 2014). The scenario in India has also witnessed a huge population growth and transformation with regard to rural to urban population in the past couple of decades. The country today is poised at 31.16% and 68.84% with regards to its 1.21 billion population distributed in urban and rural areas respectively (Census of India 2011). Efforts in India to tackle the provision of housing throughout the five-year plans (1951 – 2017) have been extensively documented (National Housing Bank 2005). During all these years and efforts, the role of government evolved from being the provider to the promoter, then to the facilitator and finally being the enabler. But these efforts still proves to be inadequate particularly in the light of the urban housing shortage figures in India. The urban housing shortage in the year of 2012 was estimated to be 18.78 million dwelling units with almost 96% in the EWS and LIG categories, i.e. affordable housing (AH) segment (NBO (TG-12) 2012). Many factors (demand side as well as supply side factors) play a crucial role in the rise of the housing shortage in India. Large immigration to the urban areas, rapid nucleation of families and the changing demographic structure of the urban society, and aspiration for an urban lifestyle, etc. bolster the demand for AH in our cities. But, contrary to the rising demand, supply constraints limit the provisions of AH. Rising land and construction costs, labour costs, accessibility to housing finance and credit facilities, unavailability of appropriately located urban land, lack of appropriate infrastructure, and regulatory barriers in our cities are attributed as major supply-side constraints in the provision of AH (PSN Rao 2012; Jones Lang LaSalle 2012; Gopalan & Venkataraman 2015; Patel et al. 2017). The regulatory constraints in the provision of AH are the main focus of this paper.

1.2 Regulatory constraints in the provision of AH

The regulatory framework is the tool for the implementation of the urban policy. These are exercised primarily for ensuring the basic standard and quality of living, in order to maintain safety and security in the neighborhoods and to recognize the existing local externalities (Quigley & Rosenthal 2005). Regulatory frameworks include the land use regulations, the infrastructure standards and finally the building regulations (Bertaud 1988). The land use regulations include the subdivision of the urban land, the width of the access roads, the densities to be achieved, etc. The infrastructure standards are primarily to set the benchmark for service provisions (water supply, sewerage networks, drainage networks, etc.), the minimum levels of quality for the type of materials and construction standards. The building standards are principally attributed to the design guidelines, the height restrictions for the building, the ground coverage, and marginal open spaces standards, the minimum necessary standards for the sanitary and electrical fixtures, etc. In the recent years, newer regulations are introduced to attain the sustainability goals like the rainwater harvesting, encouraging the renewable sources of energy, appropriate construction technology, etc. (Patel et al. 2017). In this way, regulations are also utilized as tools for mainstreaming the newer and appropriate necessary techniques and methods. Regulations although exercised with the best of intentions for the betterment of the overall comfort, health, and safety of the neighborhoods, also triggers the limiting supply of urban land and its inefficient use. The widespread effects generally result into the rise in the cost of both, the land as well as the built property on it (Sivam 2002; Bertaud 2010; Clarke Annez et al. 2010; Gandhi 2012; Patel et al. 2017). This increased cost of the residential properties has a direct consequence on the supply of AH in the urban areas, both due to actual cost rises and in terms of induced effects resulting in the overall value appreciation of the residential neighborhoods. Apart from this many of the regulations are also ‘remnants’ of the archaic British system, which calls for a critical evaluation in contemporary times (Mehta et al. 1989).

2. SELECTION OF THE CASE



Source: Draft DP Pune 2007-2027, Housing survey in 2010 - MASHAL

Figure 120 Total population of city along with slum population (Pune)

One of the major cities in western India, the city of Pune ranks seventh in India and second in Maharashtra with regard to its population. The municipal limit of the city boundary encapsulates an area of 244 sq km and has an overall density of 4300 persons per hectare (pph). The city has witnessed an alarming and rapid growth of slums in the past few decades, with an estimated 42.56% of the total populations being slum dwellers in the year 2011. The case study area of Pune city was selected based on three prime criteria. These are a large AH requirement, the presence of a robust real estate market and current phase of undergoing regulatory reforms in the city. These will be discussed in brief in the following text.

Alarming and rapid increase in the slum population is the striking reality of urbanization in Pune. The population of the city rose from 16.91 lacs in 1991 to 31.15 lacs in the year 2011. Correspondingly the slum population rose from 33.64% to 42.56% of the total population during the same period (See **Erro! A origem da referência não foi encontrada.**) (DP 013). There exist a total of 564 slums in Pune city which are home to more than 2.2 lacs of households. There exist a strong possibility that the slum population might grow further and reach a stage where half of the city’s household reside in the slums (Lall et al. 2008; Shekhar 2012).

Secondly, Pune city has the presence of a robust real estate market. Strong market demand is one of the primary determinants of housing prices (Nelson et al. 2002). Thus the existence of a strong demand is quintessential for such study. Also equally important is the presence of a large number of suppliers, negotiating this strong demand to create a healthy housing market scenario. Since the past two decades, Pune city has witnessed a strong economic growth and upsurge in the housing demand owing to its IT, manufacturing and educational infrastructure (Joshi 2014; Krishnamurthy et al. 2016). Due to these reasons, Pune’s real estate market is characterized by a diverse, strong and robust supply (Krishnamurthy et al. 2016).

Finally, the city of Pune is currently undergoing the phase of regulatory reforms making new modifications to the current rules and regulations (Khape 2017). Political will and the current positive environment in this regard makes the study an appropriate, relevant and timely contribution to the ongoing narrative.

3. LITERATURE REVIEW

The literature review which would be presented in the following texts predominantly forms the part of contemporary theories and studies linking the role of regulations and the supply of AH. The formal modes of AH supply range broadly

in the three domains, developed by the public or government agencies, the non-market AH segments or cooperatives, and the AH developed by the private developers (Ram & Needham 2016). The AH developed by the government or those subsidized by the public agencies includes the transitional housing, assisted self-help housing, social housing and other institutional practices. In the cooperative and the privately developed formal housing market segments, rental AH and the ownership AH are the sub-types. Studies, as well as the existing shortage figures, suggest the inadequacy of the government subsidized AH segment as well as the non-market or the cooperative modes of the AH supply, pointing towards reinforcing the efforts for removing constraints in the AH supply by the private developers.

As history suggests, many countries deliberately set high regulatory standards in order to discourage large rural to urban migration (Thomas 2002). Studies also direct the origins of the Indian regulatory systems in the spacious British standards, which were set in different times and had a very different purpose than those which are required for AH in the contemporary times for Indian cities (Mehta et al. 1989). Many unrealistic standards have caused the rampant spread of slums in our cities. A study from the African country of Tanzania clearly demonstrates that by having generous planning standards and regulations only 3900 lots of AH were permissible which when appropriately modified resulted in having around 15000 AH lots (Lusugga Kironde 2006). Suggestions to modify the restrictive regulatory practices which trigger the unauthorized residential formations must be prioritized, and private sector must be enabled to participate in the AH delivery (Ogu & Ogbuozobe 2001). Similar opinions regarding higher roles for private players in urban land management, assembly, along with the construction and delivery are also recommended by the Indian studies (Sivam et al. 2001).

Regulations very often influence the supply of AH in Indian cities. This AH supply has to comply with range of regulations which includes ownership and land title issues, the time and the complex procedures for the conversion of agriculture land use to the urban developable land use, zoning and regulations related to the land subdivision, variety of site planning regulations which prescribes the minimum road widths, the minimum lot sizes, the marginal setback, the overall densities (FSI), minimum parking stipulations, and so on (Patel, B., & Phatak 2014). Studies also remark about the direct influence of the regulations in the increased cost of AH within the formal AH supply mode (Annez et al. 2012; Patel et al. 2017). Only a smaller quantum of the AH requirements is catered by the formal markets due to these hindrances, and the remaining demand remains out of the formal supply. This encourages the informal supply to hold ground and forces the large AH requirement to live in the slums and squatters. Studies also link the formation of slums with the existing regulatory framework which limits the AH supply, across different cities of the world (Lall et al. 2006; Lusugga Kironde 2006). In order to gain the urban citizenship, better educational facilities, better employment opportunities, triggered by their aspirations, the poor sections of the society compromise on their health and living standards (Cardoso 2002). The failure of the formal system which is fenced by the regulatory constraints results in the formation of slums and the city fails to absorb its residents within its formal AH supply mechanism. A large section of the society being forced to live in the slums, most often also results in the encroachments over the significant and fragile environmental lands, for e.g. the riverbanks, the hill slopes and the lake shores, etc.

Many studies argue for the revision of the regulations which cause the inflationary effect particularly in the provisions of the AH. Modifying and providing relaxations in the regulatory frameworks increases the efforts to enable the access to the needy sections of the society in the formal AH supply (Mehta et al. 1989; Payne 2005; Arnott 2009; Annez et al. 2010; Bertaud 2010; Kala Seetharam Sridhar 2010). Adverse impacts of the regulations on the AH supply results in two manners. Firstly, the time required for the cumbersome regulatory processes, and stipulation of minimum standards cause the price of the AH to rise (Malpezzi & Mayo 1997). Price elasticity of AH supply is reduced due to regulations, which results in the lower steady-state construction levels and reduces the market responsiveness to demand shocks (Mayer & Somerville 2000). Studies also demonstrate and quantify the possibility of an increase in the AH supply, if regulations are modified appropriately, without compromising on the safety and quality of life parameter (Bertaud 1988; Patel et al. 2017).

The major inferences drawn from the study above are presented in the following texts. Regulations impact the AH supply (both quantity and their price) across different economic geographies. Secondly, there exists a greater need for empirical evidence due to the heterogeneous nature of housing studies, and characteristically local and distinct nature of regulations of each place. The market AH supply, primarily developed by the private developers must be mainstreamed and constraints in its provision of AH should be removed. Finally, it can be inferred that planning regulations impact the AH supply on various spatial levels and multi-level spatial methodology for such studies should be adopted.



Source – Prepared by *author*, Pune Draft DP (2007-27)

Figure 121 Macro level area delineation (neighborhood layout) in Kothrud

4 RESEARCH METHODOLOGY

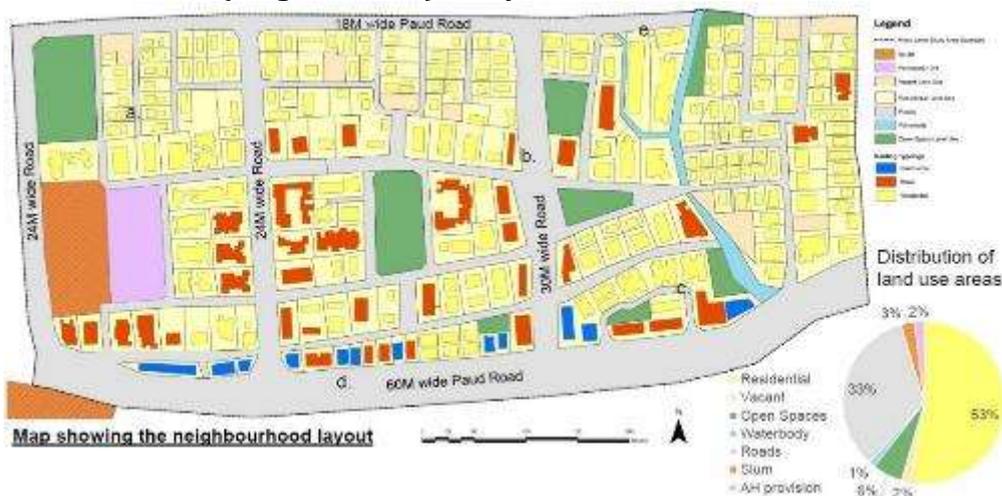
The presented literature review clearly establishes the fact that regulations have a causal link with regard to the AH shortage. But many consider it more than a factor of restricted serviced land supply or low FSI provisions (Bertaud 1988; Glaeser & Gyourko 2003; Bertaud & Brueckner 2005; Brueckner & Sridhar 2012; Patel et al. 2017). Taking a cue, from these researchers, the study embarks on to provide empirical evidence from the Pune city in investigating the impacts of regulations on AH supply by employing multi-level spatial analysis methodology. The study aims to find the extent to which the AH supply is impacted by the regulatory framework in Pune city.

5 MULTI-LEVEL SPATIAL ANALYSIS

The multi-level spatial analysis includes the macro (neighborhood) level analysis and a micro (project design) level analysis. The macro area was delineated based upon certain criteria. These criteria for the delineation of the macro spatial area were three in number. The first and the foremost criterion was the location of the neighborhood to be in the ward where there exist more requirement for the AH than what is being supplied as the AH provisions by the Draft Development Plan (2007-27). Kothrud ward was identified as one such ward within the city which have more requirement for AH than what is supplied in the ward by the city DP. The second criterion was to select the neighborhood in the zone which consist major lower income group (EWS and LIG) population. As per the ‘Socio-economic census’ of Pune, the wards were shortlisted which had relatively higher percentages of the lower income group population. The third criterion was that the neighborhood has to have predominantly residential land use. Based upon the qualification in all the three criteria, a residential neighborhood in Kothrud area of Pune was selected as the macro level area for the multi-level spatial analysis (See Source – Prepared by *author*, Pune Draft DP (2007-27)

Figure 121). For the micro-level analysis, a typical AH scenario was generated for housing a population of 3000 households, based upon the existing regulations of DCR-2013 Pune. Then an alternative scenario is generated after modifying certain regulations in order to perform a comparative analysis of the areas, costs, and the regulations. Suggestions for modifications in the regulatory framework are suggested based upon the insights of the study.

5.1 Macro-level (Neighborhood) Analysis



Source – Prepared by *author*

Figure 122 Map showing the neighborhood layout (macro level analysis) along with land use distribution

The residential neighborhood in Kothrud is the area selected for performing investigations of impacts of regulations on AH supply in the neighborhood. After the primary survey verification, a spatial map of the neighborhood was prepared and investigated for its composition of land uses (See Source – Prepared by author

Figure 122). The various land uses which exist in the layout are residential (53%), road network (33%), open spaces (6%), slums (3%), AH provisions (2%), vacant (2%), and waterbody (1%). It can be inferred that the area under the road networks is considerably higher than that prescribed in the URDPFI guidelines (MoUD 2014). The guidelines prescribe the road area percentages to be 12-14% in the case of large cities, and 15-18% in the case of metro cities. Within the layout of the neighborhood, the supply of the residential land is constrained due to large areas under roads. The building uses within the neighborhood were also investigated by undertaking field visits and verifications. Among all the building uses, the exclusively residential building use category was observed to be maximum (81.2%), followed by the mixed building use category (14.3%), and minimum presence of the exclusively commercial building use category (4.5%).



Source – Prepared by author

Figure 123 Distribution of the residential supply within the neighborhood

The residential supply in the neighborhood was analyzed by first classifying it under two categories, the organized residential supply (multi-family dwelling apartments) and the individual residential supply (usually single or extended family dwelling) (See Source – Prepared by author

Figure 123). Organized residential supply utilizes 58% of the total available residential area in the neighborhood and individual residential supply utilizes the remaining 42% of the available residential area. It could also be noticed that the organized residential supply contributes to around 80% of the total floor supply while the individual residential supply contributes to only around 20% of the total floor supply (See Table 55). Thus, it can be inferred that the organized residential supply fare better in terms of the delivering more floor area by utilizing the lesser land area. In other words, the organized residential supply is more efficient in FSI utilization than the individual residential supply.

Also, the organized residential supply is observed to be developed upon bigger plots, compared to individual residential supply which utilizes smaller plots (See Source – Prepared by author

Figure 124). The study infers that if the plots are bigger in size, they offer a greater chance of being developed as organized residential supply, and better consume the permissible FSI. In the neighborhood analysis, it has

been observed that the permissible FSI for the entire neighborhood is one, which implies that equal floor area could be provided as of the total plot area. But contrary to the permissible FSI, certain plots having the residential land use, are observed to consume lesser FSI than the permissible one. This can be spatially illustrated as a map of FSI consumption (See Source – Prepared by author

Figure 126). The study super-imposes the classified organized residential supply, the building heights and individual residential supply along with the FSI consumption map, to infer that the organized residential supply is more probable of being developed on the bigger plots, of consuming the permissible FSI and they achieve so by building more number of stories (See Source – Prepared by author Figure 126).

Table 55 Utilization of the land area and floor areas among the organized and individual residential supply

Utilization of land and floor areas		
Particulars	Organised supply	Individual supply
No. of premises	97	157
Land area (Ha)	8.33 (58%)	6.06 (42%)
Floor area (Ha)	12.02 (80%)	3.09 (20%)

Land area, Individual supply, 42%

Land area, Organised supply, 58%

Floor area, Individual supply, 20%

Floor area, Organised supply, 80%

■ Organised supply
■ Individual supply

Source – Prepared by author



Source - Prepared by author
 Figure 124 Map showing the average range of sizes of residential plots along with the type of residential supply

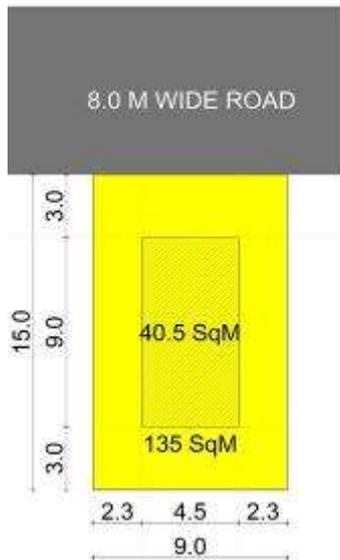


Source - Prepared by author
 Figure 125 Map showing the FSI utilization of the residential supply along with the building height

The study further poses an important question for self-exploration. ‘Why are the smaller plots not being able to consume the entire permissible FSI?’ One of the important observation in their defense is the fact that most of these smaller sized plots have individual residential supply developed upon them. Hence a prominent reason for not consuming the permissible FSI is owing to the resident's preferences and/or choice and their socio-economic status. But this constraint in the complete utilization of the permissible FSI can also be attributed to an impact of the existing regulations.

5.1.1 Demonstration – The collective impact of regulations

A simple demonstration is illustrated which clearly indicates the collective operation of the regulations which makes it impossible to consume the full permissible FSI. This is true in the case of smaller plot sizes and could be one of the reasons for low FSI utilization of the individual residential supply category (See Source – Prepared by author Figure 126). To demonstrate this fact, a smaller plot of 9m width and 15m depth is considered which is accessed from an 8m wide road. As per the DCR-2013 for Pune city (PMC 2013), the permissible FSI, the front, side and rear setbacks, and the building height is regulated if the plot is accessed by a road having a particular width and the area of the plot falls under a certain category. Thus in our case demonstration, the plot comes under the following categories. Access road width < 12m width, plot size is in between 125 sq.m. to 250 sq.m. For these, the setbacks to be left are, 3m in front and rear and 2.25m in the side. The permissible maximum FSI is one, permissible maximum ground coverage is 50% and the permissible maximum height of the building is 10m (PMC 2013). If these conditions are met, the ground coverage achieved is 30%, the area of single floor plate is 40.5 sq.m, and only three stories could be constructed (due to the building height restrictions). Hence the resultant FSI consumed is only 0.7 as against the maximum permissible FSI of 1. Thus it could be inferred that the collective impact of regulations pertaining to the access road widths and height restrictions on the building, and the marginal open space regulations do not allow the building (particularly on smaller plots having a size range between 125 to 250sq.m.) to consume complete permissible FSI.



Source – Prepared by author

Figure 126 Demonstration of the collective impact of regulations on FSI utilization

5.2 Micro-level (Project Design) Analysis

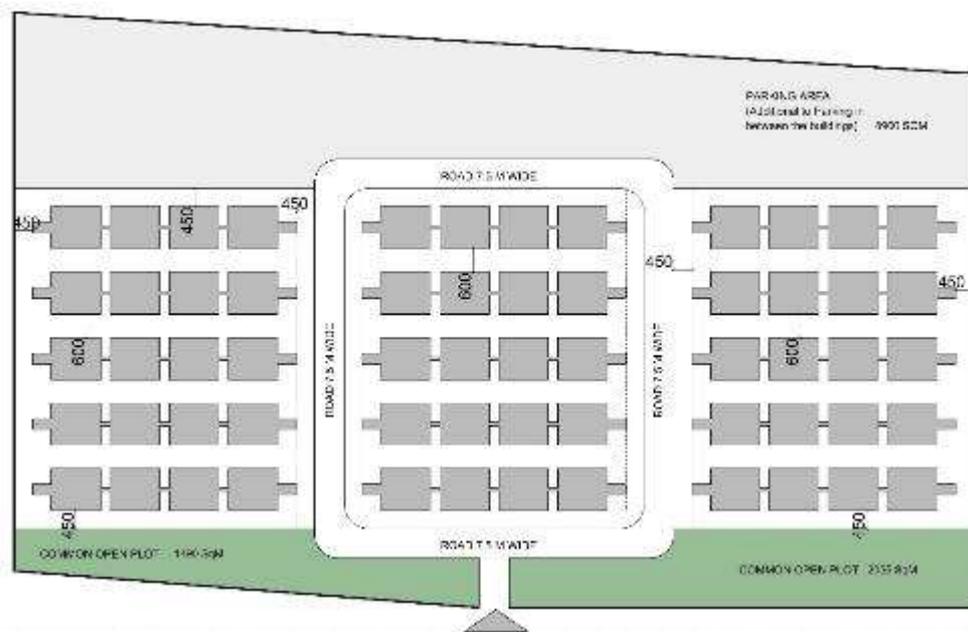
Generation of typical and alternative scenarios and performing the subsequent comparative analysis is often a method adopted in such studies (Bertaud 1988; Patel et al. 2017). Following the same methodology, the micro-level (project design) analysis was performed. Here, site visits to AH projects were undertaken in order to comprehend the site planning, building layouts, and residence designs. Also, the lifestyle of the user group (EWS and LIG) were studied upon. Based on the primary observations, typical and alternative scenarios for an AH project were generated based on the existing (DCR 2013) and the modified regulations, respectively. The two AH layouts are then compared for the provision of total dwelling units, the cost of a single dwelling unit in both the layouts and finally with regard to the regulations which are responsible for the change.

5.2.1 Scenario generation (typical and alternative) and major considerations

As mentioned above the two layouts were generated, first is the typical layout generated in accordance with the DCR 2013, and the second generated after modifying some critical identified regulations. These two are represented in the following figures (See Source – Prepared by author

Figure 127, Source – Prepared by author

Figure 128).



Source – Prepared by author

Figure 127 Original layout design of AH generated in accordance with prevalent regulations



Source – Prepared by author

Figure 128 Alternative layout design of AH generated after modifying regulations

The alternative layout is generated by employing an iterative process to achieve the low cost, high-value solution, essential for the feasibility of the AH projects (Woetzel et al. 2014), without compromising on the safety and appropriate quality of life parameters.

The major important considerations are listed below, based upon which the two layouts were compared.

The total number of tenements – In the typical AH layout, which is generated in accordance with the DCR 2013 (existing regulations), 960 tenements are accommodated which are distributed in 60 buildings of four stories each. In the alternative layout designed after modifying and relaxing certain byelaws, 1720 tenements could be accommodated which are distributed in 86 buildings of five stories each. By employing much more compact layout and increasing the story of each building, the alternative AH layout utilizes the site area prudently.

Road width – The regulations stipulate the minimum width of the roads as 6m for the running length of 75m. Beyond the length of 75m up to 150m, the regulations stipulate the width to be increased to 7.5m. The basic premise behind this considers the appropriate volume to capacity ratio of the roads and correspondingly increases the widths to increase its carrying capacity. But the primary investigation in such AH projects, as well as documented studies (Patel et al. 2017), clearly indicates the low purchasing powers of the target groups cannot afford and do not possess vehicles for which the increased width of the roads is a thoughtful consideration. Hence the alternative layout keeps the road widths as 6m up to the length of 150m acknowledging the low vehicle possession in AH projects. Also, this increases the setbacks from the roads to 5.25m in the alternative layout, from the initial 4.5m in the original layout. This added space adds on to the off-street parking space for the two-wheelers and occasional three-wheeler the users possess.

Recreational open space – It is mandatory to provide 10% of the total site area as recreational open space as per the DCR 2013 of Pune city. As much as possible, the regulation suggests this ROP be provided in a single location. But the regulation also states that for the site area more than 5000 sq.m, this recreational open space can be provided in more than two places. One such place must accommodate 50% of the total mandatory recreational open space (PMC 2013). The minimum area of this recreational open space is to be 300 sq.m. In the alternative layout, the minimum dimension and size requirements are relaxed. Also, the total area of recreational open space is distributed, so that these areas generate greater social interaction among neighbors and creates more utility to the households (See Source – Prepared by author

Figure 128).

The parking provisions – The regulations stipulate provision of one parking space (comprising of one car, six scooters, and four bicycles), for every two AH households. Area required for these is 28.5 sq.m. Also, the DCR states that it is mandatory to provide extra space for 5% of the total parking space required as visitor's parking space. Thus the total parking area demanded as per the original layout is 13608 sq.m. After accommodating parking requirements in the 6 meters wide spaces between the buildings as well as the on-street parking, 8900 sq.m. of the additional parking space is provided (See Source – Prepared by author Figure 128). Primary survey verifications performed shows presence of two-wheelers, some three-wheelers and no or rare presence of cars in AH projects. In the alternative layout generated the required parking can be parked in the spaces around the apartments. Stipulating minimum parking requirements in the AH projects in such form is inappropriate and these AH projects have different needs pertaining to parking, which must be provided for (for an e.g. rickshaw, tempos, etc.).

Building height and access road width – The regulation of Pune city makes a restriction on the building height to be 10m for the buildings which have their access road widths less than 12m (PMC 2013). In the alternative layout, the access road widths for the residential buildings are 6m. Hence, it becomes imperative to restrict the building height to three stories high, if 3m of clear habitable room height is to be maintained. The alternative layout creates buildings with five

stories. The total height of the building thus reaches to 15.5m. Walk up apartment typology of design has been utilized in the layout to achieve a low-cost high-value solution as the regulations make it mandatory to install lifts (adding the costs of AH development) beyond the building height of 16m.

Floor space index (FSI) – In the original layout generated according to the regulations of Pune, several contributing regulations briefly discussed above, come together and makes the consumption of the FSI to 0.85, not even achieving the maximum permissible limits of 1. In the alternative layout after relaxing some key regulations as briefly discussed above, and by building more quantity of the dwelling units, the FSI consumed is 1.5.

5.2.2 Comparative analysis

The particulars of comparisons are represented in the table below (See Table 56). The area comparisons consider the FSI consumed on the site of AH, the average land consumed, the recreational open space (ROP) achieved, etc. Compared to the original layout, land consumed by each tenement in the alternative layout is reduced by 44.20%. In the alternative layout, the total built-up area on the same site is increased by 77.55% compared to the original layout. It was possible to build intensely on the site after modifying the key FSI regulation to 1.5 from existing 1 in order to achieve 1720 tenements against 960 tenements (79.16% increase) as per the original layout. Similarly, after modifications in the regulations of recreational open space (ROP), it is observed that an increase in the quantity of ROP by 75.3% could be achieved. As mentioned above, this also improves the quality of these spaces and these utility value to the households.

Table 56 Area comparisons

Particulars	Layout in accordance with DCR 2013, Pune	Layout in accordance with modified regulations	Change (%)
Total plot area (sq.m.)	34055	34055	
Total built-up area (sq.m.)	33917.4	60221.5	77.55
FSI consumed on site	0.85	1.5	76.47
No. of floors	G+3	G+4	25
Total tenements	960	1720	79.16
Tenement areas			
a) Carpet area (sq.m.)	27.6	27.6	
b) Built-up area (sq.m.)	30.87	30.62	-0.8
c) Gross built-up area (sq.m.)	35.33	35.01	-0.91
Average land area consumed by each tenement (sq.m.)	35.47	19.79	-44.20
Ground coverage utilized	24%	35%	45.83
Recreational open plot (ROP)	10%	17.53%	75.3
Percentage of land under a dedicated parking	26.13%	0%	
<i>Source – Prepared by the author</i>			

Then followed are the cost comparisons considering the land costs, the construction costs, soft costs (registration and stamp duty), to finally arrive at the total cost per tenement in both the AH scenarios (See Table 57). Total costs for both the layouts are estimated and compared. The costs compared includes the land costs, the construction costs including developer’s profit, and the soft costs which include the registration and stamp duty. Land cost component per tenement comes to Rs. 5.32 lacs in the original layout (960 tenements), which is reduced by 44.18% to Rs. 2.96 lacs per tenement in the alternative layout (1720 tenements). Transaction charges add an additional 6% in the state of Maharashtra. The state government of Maharashtra charges stamp duty at the rate of 5% and sale deed registration at the rate of 1% of total cost. Transaction cost component per tenement comes to Rs. 53,124 in the original layout, which is reduced by 26.91% to Rs. 38,825 per tenement in the alternative layout. Overall the total cost component for a single tenement in the original layout is estimated to be Rs. 9.38 lacs and Rs 6.85 lacs in the alternative layout designed after modifying certain regulations. The overall cost for every tenement is reduced by 26.91%, from original to alternative layout.

Table 57 Cost comparisons

Particulars of cost comparisons	Layout in accordance with DCR 2013, Pune	Layout in accordance with modified regulations	Change (%)
General Details			
Built up area each tenement (sq.m.)	30.87	30.62	-0.8
Total built-up area (sq.m.)	33917.4	60221.5	77.55
Total no. of tenements	960	1720	79.16
Gross built up area per tenement	35.33	35.01	-0.91
Land cost (a)			
Total plot area (sq.m.)	34055	34055	
Land cost per unit area (Rs/sq. m.)	15000	15000	
Total land cost for the entire plot	5108.25 lacs	5108.25 lacs	
Land cost per unit area of built space (Rs./sq. m.)	15061	8483	-43.67
Subtotal a: Land cost per tenement	5.32 lacs	2.96 lacs	-44.18
Construction cost including profits (b)			
Construction cost per sq. m. of gross built-up area	10000	10000	

(Rs./sq. m.)			
Subtotal b: Construction cost per tenement	3.53 lacs	3.50 lacs	-0.91
Transaction (stamp duty and registration) charges(c)			
Stamp duty @ 5% of land and construction cost (a + b)	44270	32354	-26.91
Registration charges @ 1% of land and construction cost (a + b)	8854	6471	-26.91
Subtotal c: Total charges per tenement	53124	38825	-26.91
Total cost per tenement incl. land, construction, and transaction charges (a+b+c)	9.38 lacs	6.85 lacs	-26.91
<i>All costs are in Indian Rupees (Rs.).</i>			
<i>Source – Prepared by the author</i>			

Based upon the discussion above, the study recommends modifying key regulations, exclusively in an AH project, pertaining to the provision of the recreational open spaces (ROP), the quantity of parking, the building height and finally the permissible FSI. The alternative layout which improves the supply of AH does not change the existing marginal open space or setback regulations and the amenity space regulation and these are not modified. The comparison of the regulations (DCR 2013 and the suggested modified regulations) can be summarized in the table below (See Table 58).

Table 58 Comparison of regulations

Comparison of regulations		
Regulation	DCR 2013	Modified regulations
Maximum allowable FSI	1	1.35
Minimum area of recreational open plot (ROP)	10%	15%
Criteria	1 place with min. 50% of the total ROP	Not specified
Minimum size of ROP (sq.m.)	300	Not specified
Internal road widths for road length (75 m upto 150 m)	7.5	6
Height restrictions for Road<12M wide	10	15
Amenity Space	15%	15%
MOS (F-S-R)	As per DCR	As per DCR
Parking	1 parking space per 2 tenements = 28.5 sq.m. / 2 tenements	Appropriately specified (for e.g. - 1 parking space per 3 tenements)

Source – Prepared by author

6 CONCLUSIONS

Regulatory framework does influence the overall quantity of AH supply as well as has an inflationary effect on the price of AH. The study demonstrates by performing a multi-level spatial analysis, the phenomenon of multiple regulations restricting the possibilities of consuming complete permissible FSI. The macro-level analysis of the neighborhood clearly illustrated these inabilities of consuming complete permissible FSI, particularly of the smaller plot (< 250 sq.m) which are accessed from lower width roads (<12m wide). The micro-level analysis demonstrates the existence of the possibility of increasing the supply of AH in Pune city, provided regulations are appropriately modified. The key regulations which the study identifies are pertaining to the road widths, the building height restrictions, the recreational open space stipulations, the parking requirements, and finally the overall FSI limitations. Care has been taken throughout the alternative scenario generation to not compromise on the safety and quality of life parameter. The study reveals the possibility of cost savings of about 26.91% per tenement could be achieved and an overall supply of AH could rise by 79.16% if the regulations suggested are appropriately modified. In doing so, the study also clearly indicates that building more intensely on the site does not necessarily compromises the living quality and encroaches upon the open spaces. On the contrary, an increase in the recreational open spaces to the tune of 75.3% could be achieved if designed appropriately. Most of the cities across India, are grappling with the issue of AH shortage and are simultaneously also in possession of such restrictive regulations. In the given situation where the AH shortage problems seem to get bigger and stronger by every passing year, such regulation must be critically scrutinized and evaluated for their appropriateness in the local context of individual cities. The empirical evidence provided by such studies, aspire to be instrumental in paving way for the timely regulatory reforms, creating an enabling environment for an increased AH supply in our cities.

REFERENCES

- Annez, P., Buckley, R. & Kalarickal, J., 2010. African urbanization as flight? Some policy implications of geography. *Urban Forum*, 21(3), pp.221–234.
- Annez, P.C. et al., 2012. *Ahmedabad More but Different Government for “ Slum Free ” and Livable Cities*,
- Arnott, R., 2009. Housing Policy in Developing Countries The Importance of the Informal Economy. In *Urbanization and growth*. pp. 167–196.
- Bertaud, A., 2010. Land Markets, Government Interventions, and Housing Affordability. *Working Paper 18: Wolfensohn Center for Development*, (May), pp.1–55.
- Bertaud, A., 1988. THE WORLD BANK Efficiency in Land Use and Infrastructure Design An Application of the Bertaud Model. *The World Bank, Policy Planning and Research Staff - Infrastructure and Urban Development Department*, INU-17(May).

- Bertaud, A. & Brueckner, J.K., 2005. Analyzing building-height restrictions: Predicted impacts and welfare costs. *Regional Science and Urban Economics*, 35(2), pp.109–125.
- Brueckner, J.K. & Sridhar, K.S., 2012. Measuring welfare gains from relaxation of land-use restrictions: The case of India's building-height limits. *Regional Science and Urban Economics*, 42(6), pp.1061–1067.
- Cardoso, A.C., 2002. Life chances and modern poverty. *Urban Design International*, 7(3–4), pp.223–236.
- Census of India, 2011. Census of India -Pune, 2011. Available at: <http://www.census2011.co.in/census/district/359-une.html> [Accessed April 18, 2018].
- Clarke Annez, P. et al., 2010. *Working with the Market. Approach to Reducing Urban Slums in India*, DP, P.M.C., 2013. DRAFT DEVELOPMENT PLAN Pune Municipal Corporation -2013 Report for Preparation of Development Plan of Old City Limit. , 26(1).
- Gandhi, S., 2012. Economics of Affordable Housing in Indian Cities: The Case of Mumbai. *Environment and Urbanization Asia*, 3(1), pp.221–235.
- Glaeser, E.L. & Gyourko, J., 2003. The Impact of Building Restrictions on Housing Affordability. *FRBNY Policy Review*, (June), pp.21–39.
- Gopalan, K. & Venkataraman, M., 2015. Affordable housing: Policy and practice in India. *IIMB Management Review*, 27(2), pp.129–140.
- Hilber, C.A.L. & Robert-Nicoud, F., 2013. On the origins of land use regulations: Theory and evidence from US metro areas. *Journal of Urban Economics*, 75(1), pp.29–43.
- Jones Lang LaSalle, 2012. Affordable Housing in India: An inclusive Approach to Sheltering the Bottom of the Pyramid. *On Point*, pp.1–20.
- Joshi, H., 2014. Pune real estate market hopes for turnaround in 2015. *Business Standard*.
- Kala Seetharam Sridhar, 2010. Impact of Land Use Regulations: Evidence from India's Cities. *Urban Studies*, 47(7), pp.1541–1569.
- Khape, A., 2017. FSI hiked to 4, New DC Rules to make way for more housing, high rise buildings. *The Indian Express*.
- Kim, J.H., 2010. Linking Land Use Planning and Regulation to Economic Development: A Literature Review. *Journal of Planning Literature*, 26(1), pp.35–47.
- Krishnamurthy, R., Mishra, R. & Desouza, K.C., 2016. City profile: Pune, India. *Cities*, 53, pp.98–109.
- Lall, S. V., Lundberg, M.K.A. & Shalizi, Z., 2008. Implications of alternate policies on welfare of slum dwellers: Evidence from Pune, India. *Journal of Urban Economics*, 63(1), pp.56–73.
- Lall, S. V, Wang, H.G. & Da Mata, D., 2006. Do Urban Land Regulations Influence Slum Formation? Evidence from Brazilian Cities. *World Bank*, pp.1–46.
- Lusugga Kironde, J.M., 2006. The regulatory framework, unplanned development and urban poverty: Findings from Dar es Salaam, Tanzania. *Land Use Policy*, 23(4), pp.460–472.
- Malpezzi, S. & Mayo, S.K., 1997. Getting Housing Incentives Right: A Case Study of the Effects of Regulation, Taxes, and Subsidies on Housing Supply in Malaysia. *Land Economics*, 73(3), pp.372–391.
- Mayer, C.J. & Somerville, C.T., 2000. Land use regulation and new construction. *Regional Science and Urban Economics*, 30(6), pp.639–662.
- Mehta, B., Mitra, B.C. & Nientied, P., 1989. Building regulation and low-income housing. A case study from India. *Cities*, 6(1), pp.50–58.
- MoUD, 2014. *Urban and Regional Development Plans Formulation & Implementation Guidelines, 2014*,
- National Housing Bank, 2014. Report on Trend and Progress of Housing in India. *Report, NHB*.
- National Housing Bank, 2005. Urban Housing Housing under Five year Plans. *NHB, Urban Housing*, pp.5–6.
- NBO (TG-12), 2012. Report of the technical group on urban housing shortage (TG-12) 2012 - 2017. *National Building Organization, Ministry of Housing and Urban Poverty Alleviation, Government of India*, p.112.
- Nelson, A.C. et al., 2002. The Link Between Growth Management and Housing Affordability: The Academic Evidence. *and Affordable Housing*, (February), pp.1–56.
- Ogu, V.I. & Ogbuozobe, J.E., 2001. Housing policy in Nigeria: Towards enablement of private housing development. *Habitat International*, 25(4), pp.473–492.
- Patel, B., & Phatak, V., 2014. Integrating redevelopment of slums in city planning. In & M. P. K. Ahluwalia. I. J. , Kanbur. R., ed. *Urbanization in India: Challenges, opportunities and the way forward*. New Delhi: Sage Publications.
- Patel, B., Byahut, S. & Bhatha, B., 2017. Building regulations are a barrier to affordable housing in Indian cities: the case of Ahmedabad. *Journal of Housing and the Built Environment*, pp.1–21.
- Payne, G., 2005. Getting ahead of the game: A twin-track approach to improving existing slums and reducing the need for future slums. *Environment and Urbanization*, 17(1), pp.135–146.
- PMC, 2013. *Draft Development Control Regulations for Development Plan Pune*,
- PSN Rao, 2012. Role of Real Estate Developers in Affordable Housing and Climate Change.
- Quigley, J.M. & Rosenthal, L.A., 2005. The Effects of Land Use Regulation on the Price of Housing: What Do We Know? What Can We Learn? *Cityscape*, 8(1), pp.69–137.
- Ram, P. & Needham, B., 2016. The provision of affordable housing in India: Are commercial developers interested? *Habitat International*, 55, pp.100–108.
- Shekhar, S., 2012. Detecting Slums From Quick Bird Data in Pune Using an Object Oriented Approach. *ISPRS - International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, XXXIX-B8(September), pp.519–524.
- Sivam, A. et al., 2001. An approach to improved housing delivery in large cities of less developed countries. *Habitat International*, 25(1), pp.99–113.
- Sivam, A., 2002. Constraints affecting the efficiency of the urban residential land market in developing countries: A case study of India. *Habitat International*, 26(4), pp.523–537.
- Thomas, J., 2002. Hernando de Soto, The mystery of capital: Why capitalism triumphs in the West and fails everywhere else. *Journal of Latin American Studies*, 34(1), pp.165–218.
- United Nations, 2014. UN News - More than half of world's population now living in urban areas, UN survey finds. *Department of Economic and Social Affairs*, pp.2014–2016.
- Woetzel, J. et al., 2014. A blueprint for addressing the global affordable housing challenge. *McKinsey Global Institute*, (October), p.212.

1481 COMMUTATION OF SCHOOL CHILDREN IN CONTEXT TO GEOGRAPHICAL SPACE OF URBAN SCHOOLS AND NEOLIBERAL REFORM IN THE CITIES

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ABSTRACT

Due to the urbanisation and the irrational manner in which space has been appropriated in the city, the possibilities for unequal and biased distributions of schools within big cities clearly exists. If schools are so located that they are not within negotiable walking distance from the place of habitation, they cannot effectively serve the population they are meant for. Urban reform not only ceases public hands rather also redefine the geographical space and distribution of public services and its accessibility at large. This paper explores the distribution of schools in Bangalore and its availability to children. And resulting commuting pattern of school children. The distribution is depicted using School Report Card 2014-15 data. The commuting pattern has been analysed in terms of distance, mode of travel and time taken from home to school and is based on primary survey in two localities in Bangalore comprising data of 130 school going children. The study concluded that commuting is more passive in nature and least cases of active commuting observed. The demand for international schools is the main factor leading to the commutation of school children to far off places which is inferred from the flow diagram.

Keywords: Commutation, Urban Schools, Travel mode, Geographical space, Neoliberal reform

CONCEPTUALISING URBAN REFORM AND URBAN SCHOOLING

Cities (including their suburban peripheries) have become increasingly important geographical targets and institutional laboratories for a variety of neoliberal policy experiment. (Lipman, 2011). Urban reform in cities usually follow the neoliberal path, which in a way, ceases the hand of public sectors and provokes the private sectors in regulating public services such as infrastructure, health and education etc. As schools play a pivotal role in sustaining the new global economy (Marie & August, 2005), privatisation of education has become the vehicle which further moves on the path of neoliberal ideology. Urban education has become more a trade-off commodity where corporate school reform is more evident. Like the city, urban schools have undergone neoliberal revolution also referred as corporate school reform. Neoliberalism is a kind of new configuration of capital and state power where market values and corporate and financial interests have come to dominate all aspects of state governance and social life. The ultimate aim of the corporate school reform is to dismantle public school in cities all across the country and create a corporatized for-profit system. (Means, 2014). Thus, investment on schooling by private corporate in private schools is selective to the high branded and reputed schools of ICSE boards which demand an extremely high school fee.

In neoliberal processes, privatisation is making strong place in urban education where corporate invest their money on private schools and argue that public schools lack resources and competition in market. This is how neo-liberalism has come to describe a new configuration of capital and state power, whereby market values and corporate and financial interests have come to dominate all aspects of state governance and social life. (Marie & August, 2005) The neoliberal development of the city is followed by differential development of the territory within the city at different pace.

Public Schools are becoming 'warehouses' and 'dumping grounds' for the students with the greatest needs, from the most disadvantaged backgrounds. (Means, 2014). Public schools and idea of neighbourhood schools are disappearing in the process of urban reform. It reconfigured the geographical distribution as well as management of the schools. Now the accessibility gets defined both on locational as well as socio-economic grounds. So, the idea governing that who gets what where and how is complete mess in urban scenario. The private schools are mushrooming in strategic locations of the city and their demand is high where parents are sending their children to far off places. Commutation of school children in cities and related issues are common in cities.

SCHOOL LOCATION AND ACCESSIBILITY

Accessibility of schools is considered as the first option which acts as the determining factor for the children to attend school without any barrier. Location of schools comprises several factors. Socio-political factors, size of the area, and economic opportunity in an area in urban space attract the location of schools as per the demand of the majority in particular area. If schools are so located that they are not within negotiable walking distance from the place of habitation, they cannot effectively serve the population they are meant for. This is the outcome of unequally funded urban public schools in cities which creates inequality. Accessibility involves movement in space and thus implies the relative ease, or difficulty, in negotiating the distance between the two given points. In terms of schooling to impart education to children, the attributes of accessibility flow directly from the decision of locating school vis a vis the residential location of the population to be served. Thus, Geography of distribution in space or among territories defines as '*who gets what and where*' and how the spatial inequality penetrates into geographical pattern of distribution of different population group in different areas. In this way the schools' location are strategically planned and segregated in nature. As Coleman (1966) pointed "inequalities are justified only if they provide advantage to the unprivileged in society or if they benefit all".

The idea of neighbourhood school has been incorporated in Right to Education ACT, which demarcates limits of neighbourhood in distance norms as 1 km for children in class I-V and 3 Km for children in VI-VIII. It is yet far in translating these concepts into practice. A good quality school is often compensated by commuting distances by children.

There are also cases where there are no state-run schools in the vicinity of the neighbourhood. These kinds of situation lead to the commutation of school children to far off places every day. This is how the idea of common /neighbourhood school system has been circumvented by ruling political elites in an eminently hostile environment. (Velaskar, 2010).

STUDY AREA AND METHODOLOGY

Bangalore has emerged as a 'Silicon Valley' and 'city of the future' in the last five decades; where this small town has metamorphosed into an internationally known city. Bangalore is becoming a multiply divided city where both social and geographical barriers are reinforced. There are large numbers of international schools which are coming up while on the other hand educational opportunity in poverty areas raises a central question to its availability and their functioning (LER, NIAS, 2002). According to a survey by IBM, commuter pain index that ranks the emotional and economic toll of commuting in cities worldwide has revealed that Bangalore stand 6th in the index all over the world and 1st in India. (IBM 2011). Traffic and congestion is very high in this city which creates problems for general commuters as well as children too. With the establishment of IT sector and development to reach global level, the city has transformed largely over the last three decades. And it has given way for neoliberal agenda to work in all spheres including education.

The paper dealt in two sections. First is geographical distribution analysis through maps using data of School Report Card 2014-15. Second part is based on primary survey which has been conducted in the city of Bangalore. The survey has been conducted in two different localities i.e. Indraprastha colony in Gottigere (Locality 1) ward and Wellington Paradise in Singasandra ward (Locality 2).

Plate 1: Location of Study Area



Source: Google Earth___ Localities

The sampling was mostly of snowball character and had selected only those households which comprises school going children. A total of 101 households have been surveyed which consists of information of 130 school children. A structured questionnaire has been prepared and parents were targeted to answer these questions. Further, the data has been analysed in SPSS and also flow diagram has been depicted through GIS.

FINDINGS AND ANALYSIS

The distribution of these schools shows a geographical variation which shows location specific biasness. There is a divide between core and periphery. High concentrations of schools are in central core areas while the peripheral areas have thinner distribution of schools.

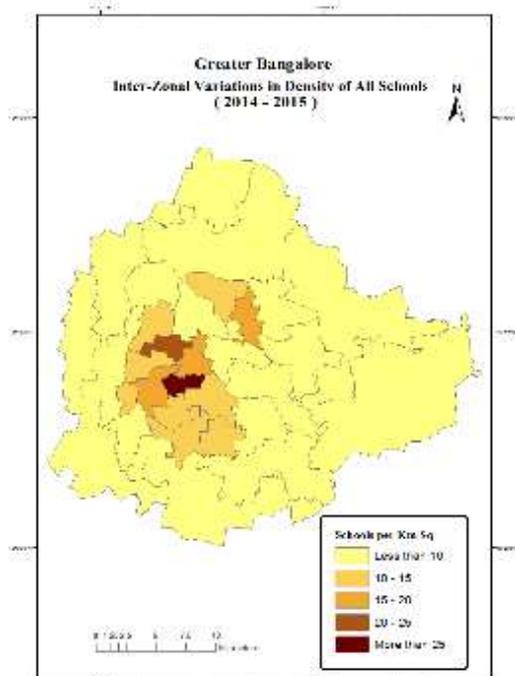
Although the cluster level distribution of schools is difficult to show in maps, but it is observed from data that out of 140 clusters 25 clusters have only 5 or less than 5 schools and 32 clusters have less than 10 schools. 54 clusters have 20 to 40 schools in each cluster and 29 clusters consist of more than 40 schools in each cluster. So, there is a huge gap in the distribution of schools at local level.

As the base unit of the study is carried out at inter-zonal level which is constituency level comprising wards within its boundaries; the distribution of schools at city-zonal level and the school availability has been analysed. The study at inter-zonal level enables to evaluate the distribution and its access to the population.

The Greater Bangalore has a whole of 5.96 schools per sq km. The density of all schools shows there is complete segregation between the core and the peripheral areas. The phenomena are very similar to other cities also, where the high concentration is found in centre of the city which disperses towards the edge of the city. Dhanpal (1981)⁴⁶⁸ also found similar distribution pattern of schools in Delhi. Thus, it is observed that centrality in a city is important factor for allocating schools. The distribution is not for the goodness or to benefit the clients but it is guided by the legitimacy of the decision process or the fairness of the allocation system in the city. The rising value of markets in the central city also attracts schools in large numbers. In cities, economy has been liberalised and welfare has not, Nicholas (2005), and thus distribution is also justified based on economic rationality not on equity principles. Competitiveness of attracting schools is higher in central part of the city than the peripheral city zone.

⁴⁶⁸ Unpublished Document, CSRD, JNU.

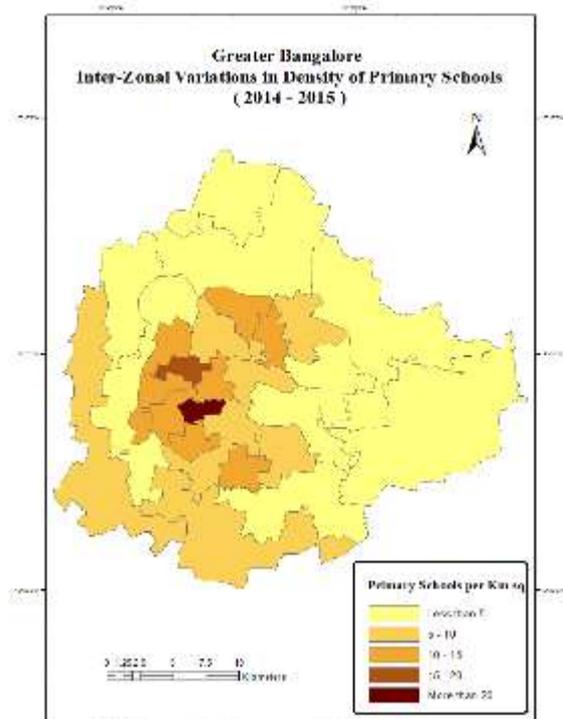
Figure 129



In 2 and 3, it is evident that the distribution of primary schools is better than the distribution of upper primary schools. In both cases of primary and upper primary school density, higher density is found in the core of the city and lowest in the peripheries. The Upper primary schools are very less in all the zones it means there is limited scope of upper mobility from primary to upper primary schools. As, it is observed that, peripheral areas have low density in upper primary schools, it means commutation of school children in peripheral areas to central city zones may increase. It is very true that independent upper primary schools not preferred by both parents and teachers and so integrated primary and upper primary schools are important providers of elementary education. Varghese and Mehta (1998).

In figure 4, The central part of the city has high density for both private and government schools; while peripheral zones show low density in both types of schools. This also creates a situation of commutation of school children. Since children do more prefer private schools, so they are travelling far off places towards the centre of the city from low density peripheral zones.

Figure 130



This creates biasness in the school location in the city. The central part of the city has better supply of schools. The school providers are economically driven and choose the central part of the city for marketing purpose. It drives children from central as well as peripheral areas.

Figure 3

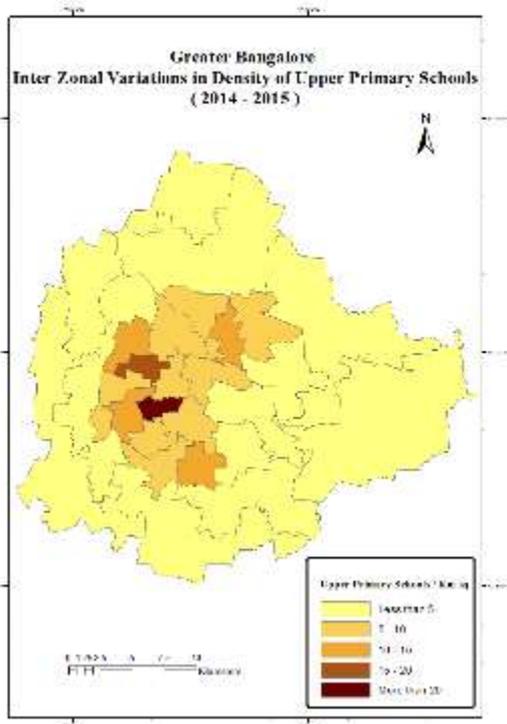
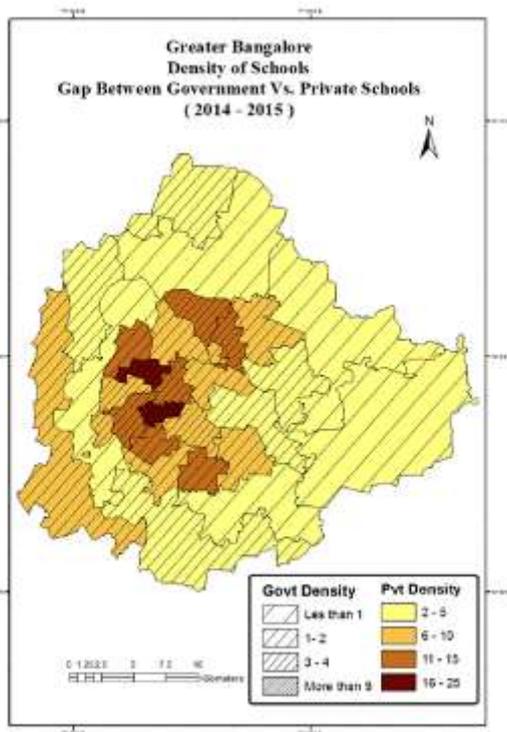


Figure 4



COMMUTING OF SCHOOL CHILDREN IN BENGALURU: ANALYSIS AND FINDINGS FROM SURVEYED DATA IN TWO LOCALITIES.

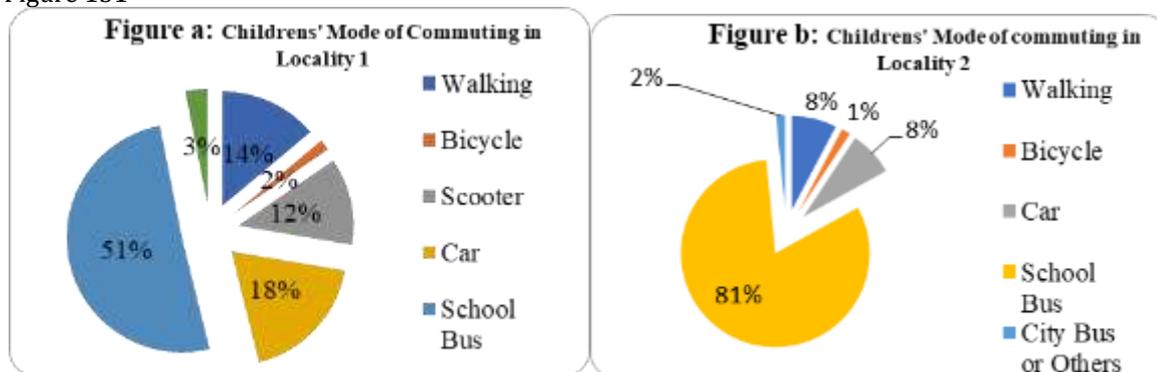
In both the localities, majority of the school children goes to private schools. Here private schools include all types of private schools like low fee private schools, private aided schools and private unaided schools. The categorisation of all these types of schools is not possible since the respondents have not that much idea about the schools. In Gottigere locality, 92% children attend private schools and 8% goes to Government schools in nearby localities. In Singasandra region, the preferences for private schooling is more; where 95% children goes to private schools and rest only 5% children prefer government schools. This connotes various level of deprivation in the city. Since there are no good government schools in the vicinity of the locality, parents prefer to send their children to private schools in nearby areas or also accept to compensate good education with far distances. Whole Bangalore South Region has no Central

Government schools like Kendriya Vidyalaya, or good public school which are performing better. The Government schools are in vernacular medium, which has no second or third language in English medium. Cities are melting pot, where more immigrants are coming to the city from different areas; they want their children to learn and communicate in English. The vernacular medium especially for migrants as well as local from kannada people also prefer good communication skill in English medium for their children. All the government and private schools promote Hindi as a language subject. Medium of instruction, thus play important role in the selection of schools in south Indian cities with various types of language mix and difficulty in comprehending other regional (vernacular) language by some other groups. The present era of liberalisation and globalisation, where English language is considered as main communicating skill demanded highly in the market; and thus, people prefer ICSE Board of schools for their children especially by the affluent group of the society. The State Board is the least preferred board in the city. Since the state board consists of huge syllabus and also contains language as a bar for them, so very few children go to state board schools. While survey, many of the parents proposes arguments against state board syllabus that their syllabus is lengthy as well as very outdated and does not match with contemporary syllabus and skills which are highly demanded in market.

COMMUTING PATTERN

As above it was observed that the type of school and boarding of school is inclining more towards the private school and ICSE schools. These schools are rarely located in the vicinity as government schools. People are promoting intentionally or unintentionally the market driven schooling system. Instead of realising the deprivation of good public schools in the vicinity, parents' 'school choice' demands school of high status and send their children to far distances. There are different modes of travel to school by children, which ranges from private or self-mode to private school buses and public transport system.

Figure 131



Active mode of travel to school has a very depressing picture in both the locality. This could be due to changes in urban form and parents' notion of safety which hinders more bicycling as mode of travel to school for children. This contrasts sharply with the neighbourhood school vision and expectation of letting children attend schools close to homes and encourage walking and bicycling to school. (Badri, 2013) Majorities of children travel to school by school buses in both the locality. It is the most commonly used modes of transportation of school children in the city. Since majority of the schools (private) provide school buses, which are responsible for escorting children to and from school, parents prefer school buses as safest mode of commuting for their school going children. Self-mode like scooter and car are less preferred mode in the city because it again adds extra work load for parents. This could also be due to mismatch between route to work for parents and route to school for children. The difficulty of coordinating work and school schedules likely explains the mode shifting to private buses. (Mcdonald & Aalborg, 2009). Also, it could be attributed to the early start of schools which may not match working hours of offices. Some parents who send their children to school by car put their arguments against school buses that they charge high fees for school buses which are not affordable to them. There are also proportions of children who travel to school by public transport like city buses and auto rickshaws, which contribute together 3% and 2% in Gottigere and Singasandra respectively. It further claims the high school fees together with bus fees becomes a burden on parents and thus affects mode of commuting of children belonging to different types of society. This is the way where school fees get tightened and government provide subsidy to the school buses up to Rs. 12000 per year.⁴⁶⁹

Distances of school from home is also a critical factor governing the mode of transportation for children as perceived by parents. (Mcmillan, 2007). There is a capacity limit to walk and bike to some distances for children, which determine or influence the mode of commuting. As the distances increase, the mode of transportation Of children shifts from 'active commuting' to school bus or car. The distances travelled by children also depend on the path followed, and since it was not possible to know the path through parents and also inability to take information about route to school, the distances used in this study is taken from the survey data as parents responded and also cross checking it with Google maps.

Children travelling time to and from school also depends on mode of travelling and vice versa. But in cities travelling time has not been much important since bus became the choice of travel for majority of the children. On the one hand, longer distances could be easily travelled in less time; on the other hand, route to school also results in longer time of travel even for shorter distances.

⁴⁶⁹ As informed by the school bus driver in the locality which is valid for the whole city for private school buses.

Commuting Pattern of children in Singasandra locality is also similar in nature where a very low proportion of children are going to government school like GHPS located in the locality. Schools like Lawrence High School and Cambridge Public School located towards the centre near HSR residential Layout are perceived as big schools for affluent class.

More than 10 to 15% children from the locality are going to these schools. Also, Chaitanya Techno School and Christ academy are the most reputed schools, where children and parents are proud to be a part of these schools. Schools located in Electronic city are also more in demand. Although there is Delhi Public School located where children and parents are proud to be a part of these schools.

Table 1 Distance Wise Mode of Commuting Among School Children taken to travel. It has been further categorised to different mode based on distances and time.

Gottigere		Walking	Bicycle	Car	Scooter	School Bus	City Bus or Others
	1 km or less	50.0%	0.0%	0.0%	25.0%	25.0%	0.0%
	1 - 3 km	17.2%	3.4%	17.2%	17.2%	44.8%	0.0%
	3 - 5 km	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%
	5 - 10 km	0.0%	0.0%	33.3%	4.8%	57.1%	4.8%
	15 - 25 km	0.0%	0.0%	0.0%	0.0%	66.7%	33.3%
Singasandra							
	1 km or less	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	1 - 3 km	0.0%	10.0%	0.0%	0.0%	80.0%	10.0%
	3 - 5 km	13.3%	0.0%	13.3%	0.0%	73.3%	0.0%
	5 - 10 km	0.0%	0.0%	10.7%	0.0%	89.3%	0.0%
	10 - 15 km	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%

where children and parents are proud to be a part of these schools. Schools located in Electronic city are also more in demand. Although there is Delhi Public School located at 8 to 9 km, but very less proportion of children goes to this school. It may be due to strict admission criteria in these schools.

Active mode is not promoted by the parents because there are no sidewalks or path constructed in the city for walking and bicycling and also lack neighbourhood aesthetics as proposed by others. (Badri, 2013). Not only this, little awareness about road guidelines among children also contribute to the fact strongly. The culture of active commuting is negligible in the city since metropolitan city (public) rarely or do not care for the children while children are crossing the roads, this affects parents decision on allowing their children for active commuting to school. (Badri, 2013). The walkers together with the children going to school by car and scooter are escorted with their parents. Most of the respondents informed that parents accompany their children in catching the bus and also take their children to the bus stand or the area where bus stops to collect all the children of the locality if there is less space for stopping bus to their door step.

Table 2 a: Grade wise Mode of Commuting - Gottigere

Grades	Walking	Bicycle	Car	Scooter	School Bus	City Bus or Others
Primary (I - V)	13.7%	2.0%	21.6%	15.7%	47.1%	0.0%
Upper Primary (VI - VIII)	11.1%	0.0%	11.1%	0.0%	77.8%	0.0%
Secondary (IX - X)	20.0%	0.0%	0.0%	0.0%	40.0%	40.0%

Source: Primary Survey Data

Table 2 b: Grade wise Mode of Commuting - Singasandra

Grades	Walking	Bicycle	Car	School Bus	City Bus or Others
Primary (I - V)	9.1%	0.0%	5.5%	83.6%	1.8%
Upper Primary (VI - VIII)	0.0%	0.0%	25.0%	75.0%	0.0%
Secondary (IX - X)	0.0%	16.7%	16.7%	66.7%	0.0%

Source: Primary Survey Data

In Both the localities, School buses are the most preferred mode of transporting children among all grades. The situation is very critical where primary school children are send to school by buses which can lead to exhaustion of child’s energy and which will reduce their physical activity too. It is observed in the survey that if a household has more than one child than younger children will follow to same school and same mode of commuting as the elder one.

As it is defined in Kothari Commission Report that primary school children should attend school located within 1 km distance and Upper Primary children should attend within 3 Km distance. It can be seen from above tabulation 4.6 (a) and 4.6 (b) that there is no such distinction is followed in the city for particular group of children. It means that distances are not the deciding factor as per the neighbourhood school concept denotes it. The parents’ notion of sending children to school of their choices is more important than to the nearby schools as per the distance norm. The busing system in private schools encourage parents to send their children to remote areas schools without considering any other factors of distances travelled by children.

Active commuting is hindered because of National Highways which is very busy and less secure for children to walk and cross the roads. Although, service road and subways are available on the highways, they are very risky for school children.

The parents' notion of sending children to school of their choices is more important than to the nearby schools as per the distance norm. The busing system in private schools encourage parents to send their children to remote areas schools without considering any other factors of distances travelled by children.

It can be said that, distances are being violated to greater extent in cities to avail good education. Good education and status are compensated with distances commuted by children. This gives a sorry picture of children belonging to lower income level as they are not able to afford bus fees and thus find difficulty in sending their children to those schools. Parents also have perception that sending children to nearby area is more difficult than distant schools since buses are provided easily to them. The social and economic inequity reinforces schooling inequality among children.

Table 3a: Grade wise distances travelled by children in Gottigere

Grades	1 km or less	1 - 3 km	3 - 5 km	5 - 10 km	15 - 25 km
Primary (I - V)	9.8%	47.1%	5.9%	37.3%	0.0%
Upper Primary (VI - VIII)	33.3%	33.3%	11.1%	0.0%	22.2%
Secondary (IX - X)	0.0%	40.0%	0.0%	40.0%	20.0%

Source: Primary Survey Data

Table 3 b: Grade wise distances travelled by children in Singasandra

Grades	1 km or less	1 - 3 km	3 - 5 km	5 - 10 km	10 - 15 km
Primary (I - V)	5.5%	12.7%	27.3%	41.8%	12.7%
Upper Primary (VI - VIII)	0.0%	50.0%	0.0%	25.0%	25.0%
Secondary (IX - X)	0.0%	16.7%	0.0%	66.7%	16.7%

Source: Primary Survey Data

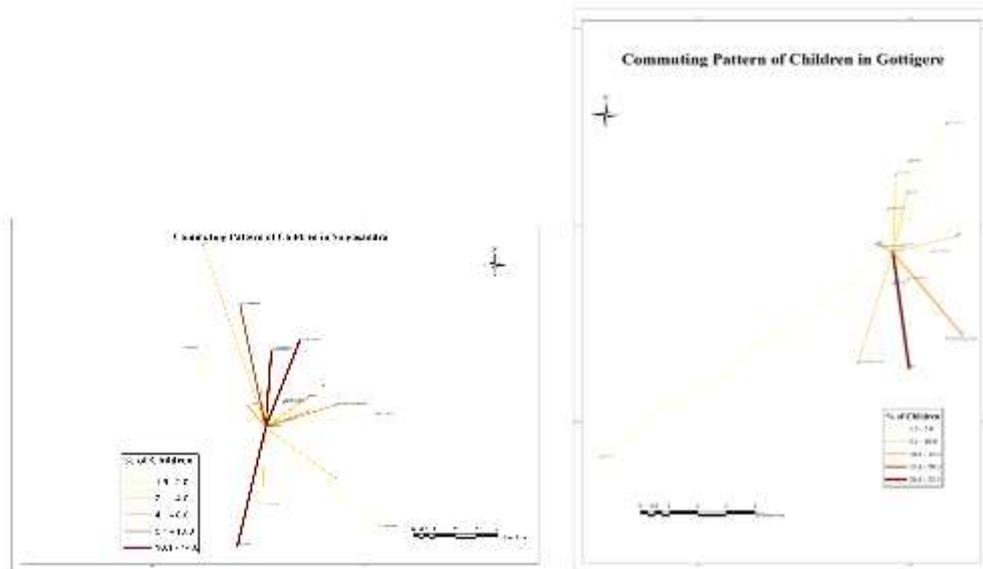
COMMUTING PATTERN OF CHILDREN FROM LOCALITY TO DIFFERENT TYPES OF SCHOOLS

Commuting pattern in Gottigere represents both the direction of flow of children and also the strength of children attending different types of school. Government school in this map is named as GHPS, which we can see that it is located within the locality of 1km. But the children flow to that school is very less i.e. 6.2% only. While at the same distance a private CBSE school is located where about 12.2 % children from the locality are attending that school, most of them go to that school by walking under the supervision of their parents. ICSE schools like Podar international school and Ryan international schools attract a good proportion of children about 12.3% and 7.7% children respectively to each of them. The highest demand is seen in PSBB international school, which is again an ICSE English medium school; about 23% children are attending that school. All the children going to PSBB are from elite class and their parents take pride in sending their children to a school which is reputed as number one school in the locality. This school is located within 7 km on an average from this locality and all children are going to this school via school bus paying a fare of Rs. 12000 per year. These ICSE schools are located at such locations which are easily accessible via Banerghatta road and also Nice road in less than 30 minutes. There are also various schools located in the centre of the city and are calling good proportion of children.

Commuting Pattern of children in Singasandra locality is also similar in nature where a very low proportion of children are going to government school like GHPS located in the locality. Schools like Lawrence High School and Cambridge Public School located towards the centre near HSR residential Layout are perceived as big schools for affluent class. More than 10 to 15% children from the locality are going to these schools. Also Chaitanya Techno School and Christ academy are the most reputed schools, where children and parents are proud to be a part of these schools. Schools located in Electronic city are also more in demand. Although there is Delhi Public School located at 8 to 9 km, but very less proportion of children goes to this school. It may be due to strict admission criteria in these schools.

Figure 5

Figure 6



CONCLUSION

The inequality in accessibility and availability of schools is very remarkable in geographical space in cities. This inequality can be attributed to the centrality of the zones or the market strategies working among clientele of providers. Both the geographical distributions of schools and availability of schools have been analysed. The results show differential distribution in schools with high concentration in centre of the city and shows thinner distribution in peripheral regions. The disparities in the school provision in terms of school availability are also misleading, as they are not commensurate with the population in that age group. It means there is least concern of school education in the city. School location is strategically planned so that it can create good market to match demand. It has little concern of equity in imparting quality education to all.

The section which analysed commuting pattern among school children contend with the idea of urban reform and changes in the city which does not provide appropriate space for commuting of school children. It is found that active commuting is least preferable even among those travelling to lesser distances. Busing in cities is highly demanded for mode of commuting among school children. The risk factor vis a vis notion of safety among parents is an obstacle, which does not allow children to commute by walking and cycling. The city does not provide safer route to school. Commuting flow diagram highlights the demand of different schools in the locality and distances travelled by children. Most of the children travel to larger distances of 10 to 15 km. The schools located at far off places are reputed international schools.

Distances are not that important factor of commuting among school children. In cities, modes of commuting are available sufficiently and thus have least constraint on commuting longer distances. Good education and status are compensated with distances commuted by children. Good education and status are compensated with distances commuted by children. Children belonging to lower income level find difficulty in sending their children by bus as they cannot afford bus fees. Bus fees are also an extra burden on poor parents. Parents also have perception that sending children to nearby area is more difficult than distant schools since buses are provided easily to them. The social and economic inequity reinforces schooling inequality among children. Commutation of school children poses a question to neighbourhood school. Children are travelling longer distances to attend good schools. The choice of schools by parents here are important factor affecting commutation of school children. It is obvious from the results that it is not the availability of the schools in the vicinity that matters, rather than the parental school choice decides that which school they choose for their children. It may be far from home or may be nearer to home.

So, there is need of urban planning which are children centric too and that children are taken care of in all these aspects.

REFERENCES

- Alexander, L. M., Inchley, J., Todd, J., Currie, D., Cooper, A. R., & Currie, C. (2005) 'The broader impact of walking to school among adolescents : seven day accelerometry based study', *BMJ*, vol. 331(August), 1061-1062.
- Badri, M.A. (2013) 'School Travel Modes: Factors Influencing Parental Choice in Abu Dhabi', *Int. J. Education Economics and Development*, vol. 4, No. 3, pp. 203-213.
- Ball, S. J. (2003) *Class Strategies and the Education Market: The middle classes and social advantage*, Routledge, London
- Ballentine, J.H. and Hammack, F.M. (2009) *The sociology of education-A Systematic Analysis*, Pearson, Prentice Hall, New Jersey
- Bangalore District Gazetteer (1990): Governemnt of Karnakata
- Beteille, A. (2008) 'Access to Education', *Economic and Political Weekly*, Vol. 43, No. 20, 40-48.
- Coleman, J. (1968) 'The Concept of Equality of Educational Opportunity', *Harvard Educational Review*, Vol. 38, No. 1, pp. 1-2
- Coleman, James (1992) 'Some Points on Choice in Education', *Sociology of Education*, pp. 260-262.
- Cooper, A. R., Page, A. S., Foster, L. J., & Qahwaji, D. (2003) 'Commuting to School- Are Children Who Walk More Physically Activ?', *American Journal of Preventive Medicine*, Vol. 25 No. 4, pp. 25-28.
- Farooqi, Amar (1998) 'How the City Devours its Children', *Economic and political weekly*, pp. 328-330
- Faulkner, G. E. J., Buliung, R. N., Flora, P. K., & Fusco, C. (2009) 'Active school transport , physical activity levels and body weight of children and youth : A systematic review', *Preventive Medicine*, Vol. 48 No. 1, pp. 3-8.

- Lipman, P. (2005) 'Metropolitan regions – New Geographies of Inequality in Education: the Chicago Metroregion Case', *Globalisation, Societies and Education*, Vol. 3, No. 2, pp. 144-163.
- Lipman, P. (2011) *The New Political Economy of Urban Education: Neoliberalism, Race, and the Right to the City*, Routledge, New York.
- Lipman, P. (2011) *The New Political Economy of Urban Education-Neoliberalism, Race and the Right to the city*, Routledge, London.
- Lipman, Pauline (2011) 'Contesting the city: neoliberal urbanism and the cultural politics of education reform in Chicago', *Discourse: Studies in the Cultural Politics of Education*, Vol. 32, No. 2, pp. 217-234
- McDonald and Aalborg (2009) 'Why Parents Drive Children to School: Implications for Safe Routes to School Programmes', *Journal of the American Planning Association*, vol. 75. No. 3, pp. 331-342.
- McDonald, N. C. (2007). Active Transportation to School: Trends Among U.S. School Children, 1969-2001', *American Journal of Preventive medicine* Vol. 32 No. 6, pp. 509–516
- McDonald, N. C. (2008) 'Critical Factors for Active Transportation to School Among Low-Income and Minority Students: Evidence from the 2001 National Household Travel Survey', *American Journal of Preventive Medicine*, Vol. 34, No. 4, pp. 341–344.
- McMillan, T. (2007) 'The relative influence of urban form on a child's trip to school', *Transportation Research Part A: Policy and Practice*, vol. 41, No. 1, pp. 69-79.
- McMillan, T. E. (2007) 'The relative influence of urban form on a child's travel mode to school', *Transportation Research*, Vol. 41, pp. 69–79
- Means, Alexander (2014) 'Achieving Flourishing City Schools and Communities - Corporate Reform, Neoliberal Urbanism, and the Right to the City', *Journal of Inquiry & Action in Education*, Vol. 6. NO. 1, pp. 1-17.
- Neil Brenner & Nick Theodore (2005) 'Neoliberalism and the Urban Condition', *City: Analysis of Urban Trends Culture, Theory, Policy, Action*, Vol. 9, No. 1, pp. 101-107
- Nicholas, Walter J. (2005) 'Between Growth and Exclusion in Technopolis: Managing Inequalities in Toulouse, France', *City and Community*, California State University, pp. 3-26. <http://web.csulb.edu/~hmarlowe/nichollspaper.pdf> 22.07.2015
- Schlossberg, M., Greene, J., Pjillips, P., Johnson, B. And Parker, B. (2006) 'Effects of urban form and distance on travel mode', *Journal of American Planning Association*, vol. 72, No. 3, pp. 337 – 346
- Sinha, S. (1988) *Regional Disparities in the Development of the School Education*, Unpublished Document, JNU.
- Smith, D. M. (1977) *Human Geography: A Welfare Approach*, Edward Arnold Publications, London
- Varghese, N.V. and Mehta, Arun C. (1998) 'Upper Primary Education in India: An Analysis of School Facilities and Costs', *NEIPA*, New Delhi. Accessed on 23. 07. 2015 from <http://www.educationforallinindia.com/page12.html>.
- Velaskar, P. (2010) 'Quality and Inequality in Indian Education: some Critical Policy Concerns', *Education Dialogue*, Vol. 17 No. 1, pp. 59-93.
- Zhou, H., Yang, J., Hsu, P. and Chen, S. (2010) 'Factors affecting students' walking/biking rates: initial findings from a safe route to school survey in Florida', *Journal of Transportation Safety & Security*, Vol. 2, pp.14–27

1684 THE PRIMACY OF THE TERRITORY IN TRANSPORT DEMAND MODELING

ABSTRACT

Over the last three or four decades, extensive research work has been conducted worldwide to develop and expand the existing array of modelling methods and techniques to estimate patterns of passenger demand for all types of public transport systems. More recently, particular attention has been paid to the study of passenger demand for metro and light rail systems in urban and metropolitan areas. This paper presents an innovative model, developed on a GIS platform, and designed to estimate, through regression techniques, the average daily passenger demand at each and every stop of the rail network of a metro system. All the empirical work was carried out on the Light Rail System serving the Oporto Metropolitan Area, with a total population close to 1.5 million inhabitants. This 67km long metro system is in operation for 15 years now, and accounts with a comprehensive and detailed statistical database of the evolution of the effective levels of passenger demand in this time period. All the modelling process was based on the understanding and quantification of the complex relationships between the actual demand – we called it, in this case, Structural Demand - at each stop of the railway system and a selection of a restricted number of spatial variables. These are associated with land use patterns of human occupation in the vicinity of each stop, such as residence, employment and major traffic generator activities, as well as with the strategic location of each particular stop within the rail network, measured in terms of access to employment along the line (or lines, in case of a junction), and in both directions, from that same stop. The results produced by this Structural Demand Model were surprisingly accurate when compared against the actual data available to characterise the real levels of demand in the existing rail network. Indeed, given the accuracy of the results produced by the regression model, with a surprisingly high R2 of 0.884, the model was then used to assess the likely levels of demand associated with an investment decision in the expansion of the existing metro system. A number of alternative new lines and possible extensions of existing lines were then assessed. Based on the forecasts of the structural demand levels produced by the model for each alternative, a short list of new lines to be built was selected and subject to political scrutiny and public discussion. The model proved to constitute an important input to the subsequent decision making process. Indeed, a satisfactory balance was reached between all the evidence produced by the application of the Structural Demand Model and the local and metropolitan political objectives and priorities. At moment the expansion project of the Oporto Light Rail System is already at the design stage and the construction works of one new line and the extension of another one are expected to start next year. The total budget is estimated to reach close to 300 million Euros.

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SS12.2. Transforming Metropolitan Regions: Ideas and Examples

1573 OTTOMAN URBAN POLICIES: ISTANBUL EXAMPLE

ABSTRACT

Istanbul had become part of Ottoman Empire in 1453. When Turkish first entered, population of the city had been 50.000. This number rose to 700.000 in a few years by making Istanbul the most crowded city of Europe and West Asia. For centuries it was the capitol of economics, social life and administration of the Empire and then Republic of Turkey, although the last moved to Ankara after republic is established, yet importance of the city did remain. This study aims to elaborate what kind of settlement policies had been carried out in Ottoman cities through Istanbul example. Establishment of social-cultural facilities, guild organizations, repopulation of the city, characteristics of newly constructed neighborhoods and legal regulations will be discussed. In addition to physical characteristics of the settlements how religious and nomad background of Turkish people had affected on urban policies and architecture in these lands will be discussed.

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1678 ESTIMATION OF SELECTED COMPONENTS OF CONGESTION COST ALONG SELECTED STRETCH OF ROAD IN KOLKATA MUNICIPAL CORPORATION

ABSTRACT

The roads of most cities, particularly, metro cities weren't engineered for today's traffic densities and Kolkata too is no exception. Though the growth rate of the city is only 4.1per cent yet Kolkata Municipal Corporation (KMC) records the highest car density (1,421 cars per sq. km. total area of the city) and second highest car ownership (61 cars per 1,000 residents with regard to total population) in India. Compared to the global standard of 30% of designated road space for Tier I cities the road space is only 6-8 per cent for Kolkata. This is what has created a great congestion chaos in way of accommodating a mixed traffic flow ranging from hand pulled rickshaws to trailers. A surprising manifestation of traffic, however, is not always by huge count of cars plying towards their destination rather it's their individual nature of manoeuvring that lowers the vehicular speed of 'others'. It gradually adds up the travel time incurred by commuters and pollution count along the halting points along with ever increasing occurrences of accidents. Thus the objectives of the study is to assess the losses in terms of opportunity cost and operating cost along the selected stretch of road and put forward strategies to reduce such losses to contribute to a city's economic productivity. The methodology adopted has been calculation of value of travel time index, planning time index, lane length duration index, Congestion Index to adjudge the efficiency of the corridors under consideration. As mobility is inversely related to congestion, corridor mobility index further helps to assess the critical nature of the prevalent congestion scenario and based on this the value of opportunity and operating cost is calculated. In order to capture the relationship under consideration the data has been statistically analysed and cartographically represented. Keywords: congestion, opportunity cost, operating cost, congestion index, and travel time

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1053 SPATIAL AND ECONOMIC CHALLENGES OF NEWLY FORMED CAPITAL REGION: A CASE OF ANDHRA PRADESH CAPITAL REGION

Prashanti Rao

Architect and Urban Planner

ABSTRACT

The spatial delineation of Andhra Pradesh Capital Region (APCR) brought new challenges for balanced growth in this region. As per an Andhra Pradesh government proposal, it has been planned to link a 30 mandals in Krishna and 26 mandals in Guntur districts along both sides of the holy Krishna River. This plan reflects the varied economic attributes within the region. Though, the agriculture is the main part of economy in Krishna and Guntur region, there are many other small and large industrial clusters that exist within the region, which also contribute to the economy as a secondary sector. Apart from this, tourism contributes in the tertiary sector with a valuable additional role in economy generation. The physical features of the region like forest, river, hilly region and proximity to sea coast also develop spatial challenges for balanced growth. At the same time the regional connectivity through airways, railways and water ways acts as a catalyst for the development of secondary and tertiary sector. Hence, this paper is focussing on the identification of positive and negative constraints for the balanced growth in the economic sector while it also proposes a few initiatives to strengthen income generation.

Key words: APCR, Balanced growth, Economic sector and Physical features and Spatial challenges

BACKGROUND AND RELEVANCE

The basic principle of formation of capital Regions in India is shifting to linguistic priorities. The formation of capital regions many a times face problems of uneven land distribution, land acquisition, loss of income resources, if not planned and delineated properly. The change in existing administrative boundaries and launching of new schemes and regional development project creates imbalance in growth. Hence it is very essential to identify the growth parameter both physical and fiscal. In order to understand the growth dynamism Andhra Pradesh Capital Region (APCR) has been selected for study concern. As most of the population is dependent on agriculture in Andhra Pradesh. Since the major part of land, which is acquired by the government, is agricultural land, this acquisition of agricultural land leads to loss of livelihood. The Andhra Pradesh Capital Region is the area covering the proposed Andhra Pradesh capital city along with nearby metropolitan areas and small towns around it. On 2nd June 2014, the north-western portion of the state was bifurcated to form a new state of Telangana. The entire region is under the jurisdiction of the AP Capital Region Development Authority (APCRDA). Amaravati is the proposed planned capital city. It is located on the southern banks of the Krishna River in Guntur District, within the Andhra Pradesh Capital Region. The location chosen for the Capital City is in the vicinity of Vijayawada and 20 km from Guntur. It falls in Thullur, Mangalagiri, and Tadepalli mandals of Guntur District with an area of 217.23 sqkm.

Table 59 Demographic Profile of Andhra Pradesh Capital Region

Demographic Profile							
As per census 2011	Area (sqkm)	Population	% of AP Population	Literacy rate /100 population	Sex Ratio/1000 population	Urban Population %	Rural Population %
State							
Andhra Pradesh	160205	49386799	-	67.6	966	14618493 (29.6)	34768306 (70.9)
Krishna District	8727	4529009	9.17	73.7	992	1847835 (40.8)	2681174 (59.2)
Guntur District	11391	4889230	9.90	67.4	1003	1657449 (33.9)	3231781 (66.1)
APCR	8603	5873588	11.89	63.1	1001	2753745 (46.88)	3119843 (53.12)

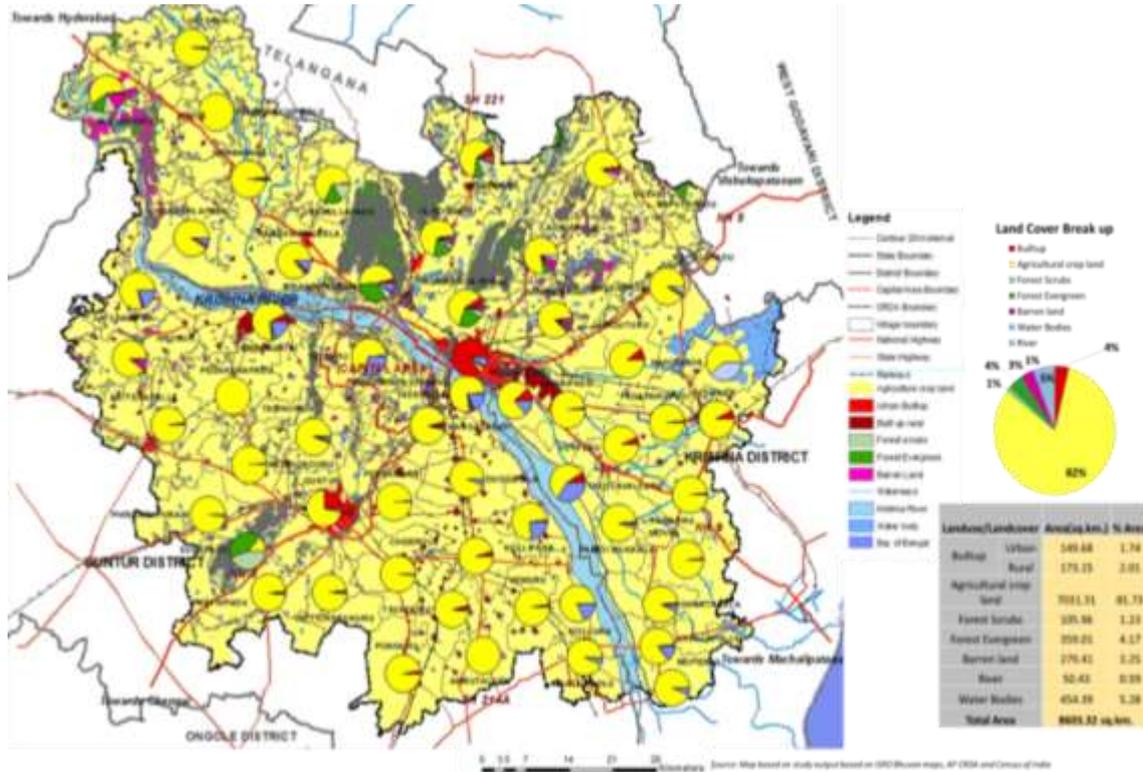
Source: APCRDA

The urban population within APCR has witnessed a rapid increase. The urban population in the year of 1991 was 16,98,224. This population in the course of next 10 years increased to 20,20,560. As per the Census of India 2011, the urban population of APCR was found to be 27,53,745. The population decadal growth rates from 1991–2001 was observed to be 18.98% and the population decadal growth rate from 2001–2011 was observed to be 36.29%, almost double the previous decade. The rural population within APCR has not increased rapidly as compared with the increasing urban population. The rural population in the year of 1991 was 29,99,546. This population in the course of next 10 years increased to 32,24,266. This increase in urban population is the result of people shifting from outer rural areas into the inner urban area. This increase will lead to an enhancement in the requirement of land, income opportunity and other basic infrastructure.

ECONOMIC BASE

Agriculture is the main part of economy in Krishna and Guntur region. Paddy, Grams, Cotton and Chilies are the major crops in both districts. In Krishna district, 10 industrial estates are developed by APIIC and 2 are private estates in Guntur. There are 11 industrial estates, 3 autonagar and 2 shopping complexes. Clusters in Krishna district include industrial,

handloom, handicraft and handloom clusters. Industrial clusters include food processing cluster, pharmaceutical cluster, rice mill clusters, textile cluster, auto component cluster, furniture cluster, burnt lime and lime stone clusters and foundry activities. Handicraft clusters comprises kalamkari printing, toy and puppet making, embroidery, stone carving and brass and bell metal. Land cover map shows that 102.36 sqkm area is agricultural crop land which is 82% of total APCR area. This clearly states that the major population is dependent on agriculture 53.12% population.



Map-1 Landuse Landcover Map of APCR

MAJOR ECONOMIC SECTORS

There are three major sectors within the Economic Sector – they are primary, secondary and tertiary sectors. The sub sector, which comes under these sectors are given in Figure 1. Tertiary sector contributes majorly in the domestic product of the Capital Region. Secondary sector contributes the least in the domestic product of the Capital Region. The domestic product of the secondary sector has increased in 2014 when compared to 2013. The region has potential for various industries. The per capita income in the capital region has increased by 8.8%. When we compare the per capita income of the Capital Region, then we find that it has higher value compared to per capita income of the country (India) and the State (Andhra Pradesh). Vijayawada Urban has highest MDP but a very low PCI.

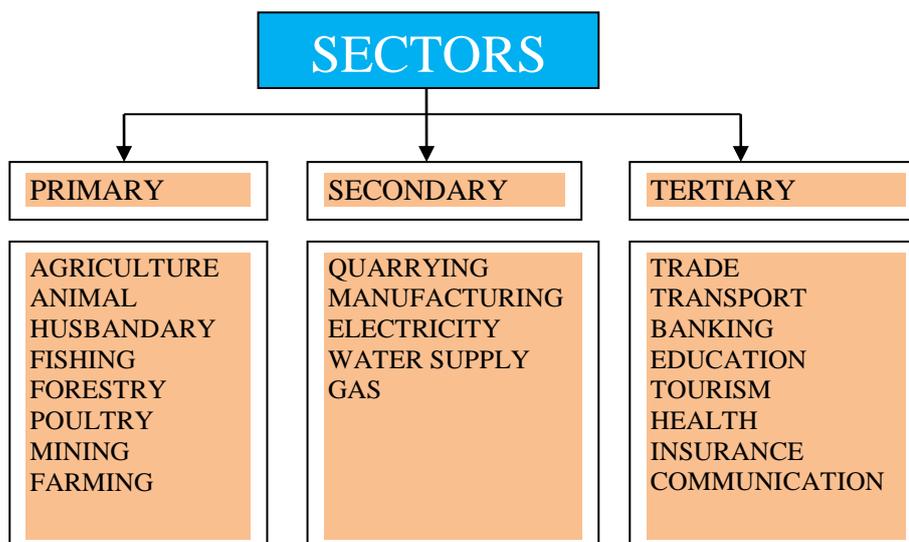
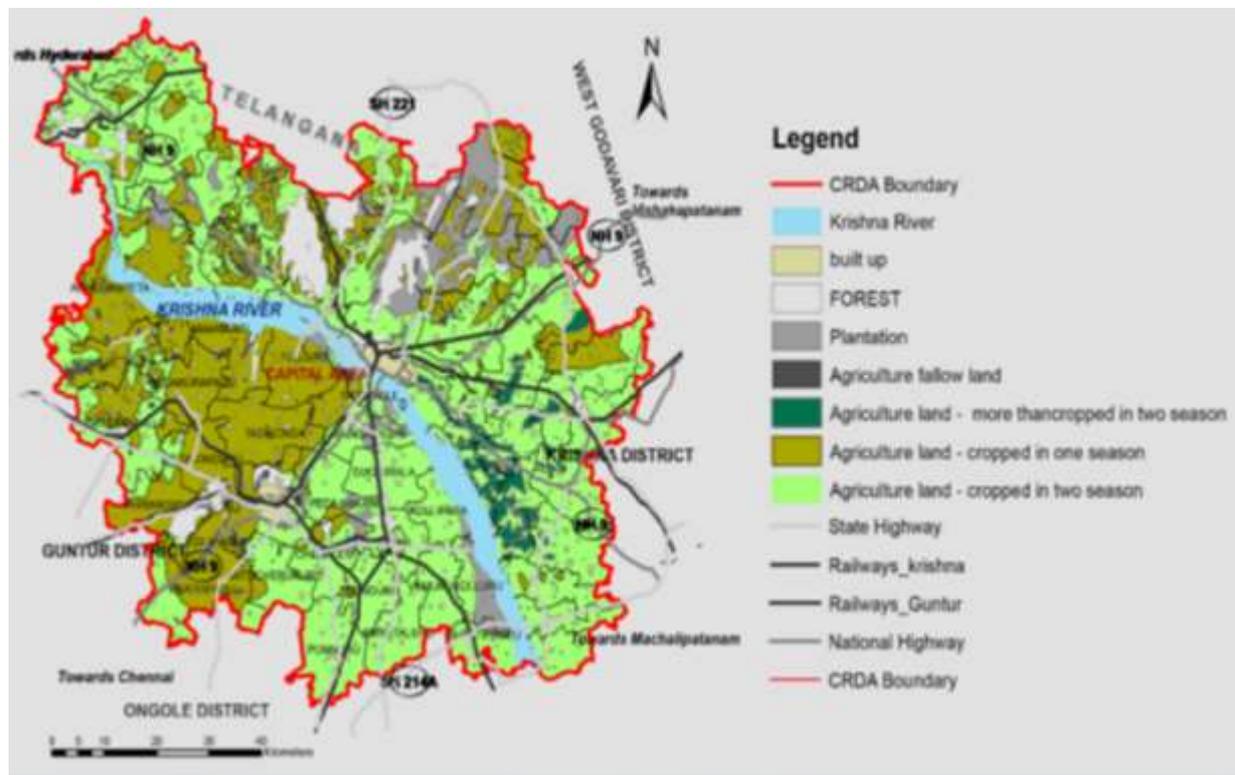


Figure 1 Major Economic Sectors

This is because the population of the mandala is the highest. Similar is the case for the observation of Guntur. Most of the mandalas, which has high MDP, has major share of activity as tertiary. Mandalas which have primary sector as their major activity, has the least MDP. Also these mandalas have lower population, which might be due to the lack of job opportunities, which leads to migration.

I.PRIMARY SECTOR

Andhra Pradesh is predominantly an agricultural state. Nearly two-thirds of the labour force in the state depends on it for their livelihoods. Yet the share of agriculture in the state income dropped below 20%. The state is adversely placed with respect to both soils and rainfall, which are the key resources for agriculture. The agriculture sector is the important sub-sector of the primary sector in Andhra Pradesh. Agriculture has been a way of a life and continues to be the most important livelihood of the masses. Stabilization and augmentation of productivity assume critical importance, given the limited area scope for increasing under cultivation of various crops and the contribution of district towards paddy production was 606135 tons in the year 2013–2014 and area under cultivation was 268072 hectare. Maize is another main crop with a production of 548722 tonnes. Guntur district is famous for the chillies production while the Krishna district is famed for the mango crop.



Map-2 Cropping pattern in APCR

II. SECONDARY SECTOR

The secondary sector consists of five different sub-sectors, according to which the analysis is done in this regional study. These sub-sectors are Mining and Quarrying, Construction, Manufacturing (Registered), Manufacturing (Un-registered) and Electricity, Water Supply and Gas.

The main objectives of this sector are as listed below:

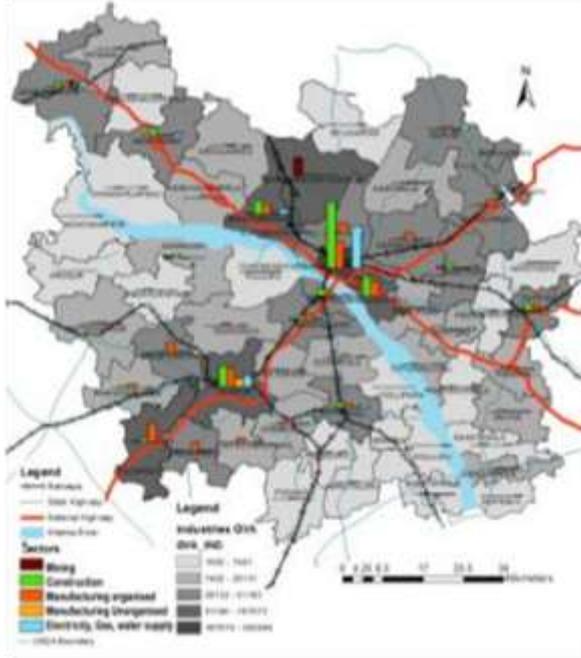
- Understanding the existing scenario, impact and potential of industries in the region.
- Identifying potential and thrust area for the development of the region by utilizing its natural and human resource.
- Preparing strategic plan for the economic development in secondary sector for the region.

The Mandala with the highest Gross Value Added (GVA) contribution in the industries sector is Vijayawada Urban. One of the major urban centres in the region, it has increased developmental activities. This is the likely reason; it has the highest share in the construction industry. The maximum numbers of industries are also located in the same Mandala of Vijayawada Urban. There are a total of 54 large and medium scale industries in the region. The classification of these industries has been done according to global industry classification standard. In both the districts under the APCR it can be seen that most of the industries are situated near the National Highways. This might be due to convenient logistics and transportation facilities. Some of the industries are located near the Krishna River. More number of large and medium scale industries are situated in the developed mandals of Ibrahimpatnam, Edlapadu, Jaggiahpeta. More industries can be observed in the Krishna District as compared to Guntur District. There are a total of 5380 factories registered in the APCRDA region. There are 107405 people employed in these factories. The Ministry of Environment, Forest and Climate Change (MoEFCC) has developed the criteria of categorization of industrial sectors based on the Pollution Index which is a function of the emissions (air pollutants), effluents (water pollutants), hazardous wastes generated and consumption of resources. In Krishna: majorly industries fall into the orange category followed by red, green and very few white.

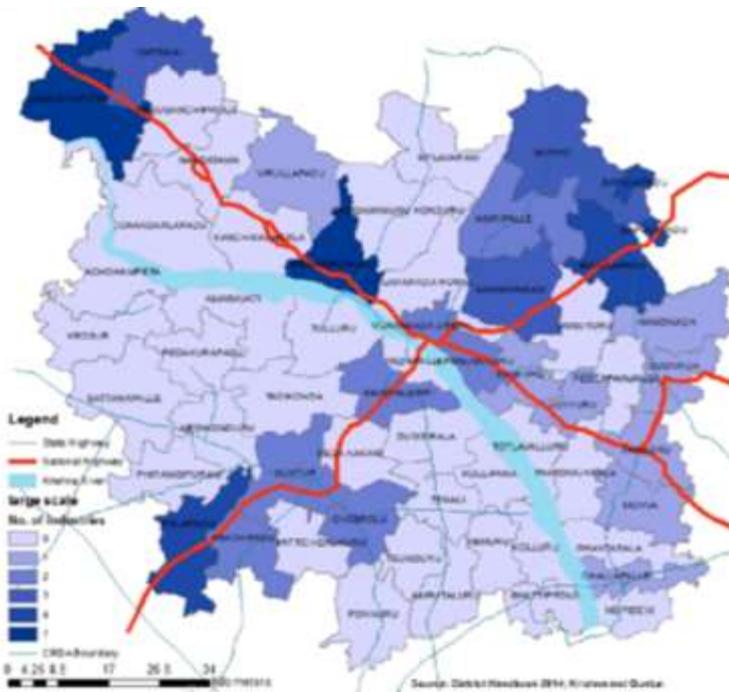
Table-2 Type of industries in Vijayawada and Guntur

Type	Vijayawada	Guntur
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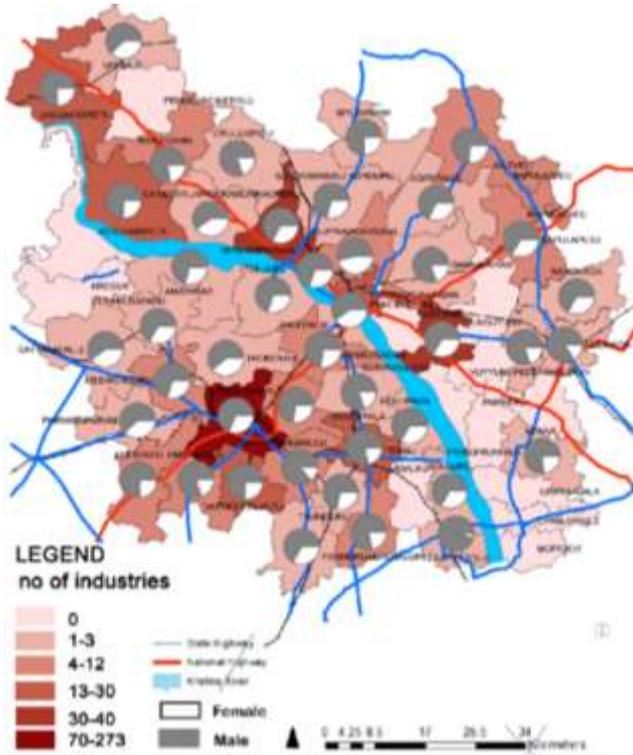
Red	Textile, oils and material industries	Ibrahimpattanam, Jaggayyapeta, & Vijayawada urban mandals	Materials, sugar, power generation	Atchampet, Kolluru, Tadepalli, Kollipara mandals
Orange	Tobacco and beverages	Ibrahimpattanam, Penumuluru, Vijayawada Urban, Vijayawada Rural, G.Konduru, Kanchikacherla.	Cattle & Aqua Feed, Printing of posters, photo offset process, Solvent extracted oil	Medikonduru, Guntur, Edlapadu, Chebrolu mandals
Green	Cotton and agro based	Ibrahimpattanam, Penumuluru, Vijayawada Rural, Gannavaram.	Cotton and Agro based	Guntur, Mangalagiri, Tenali mandalas



Map-3 GVA of Secondary Sector Along With Its Different Categories



Map-4 Small scale Industry of APCR

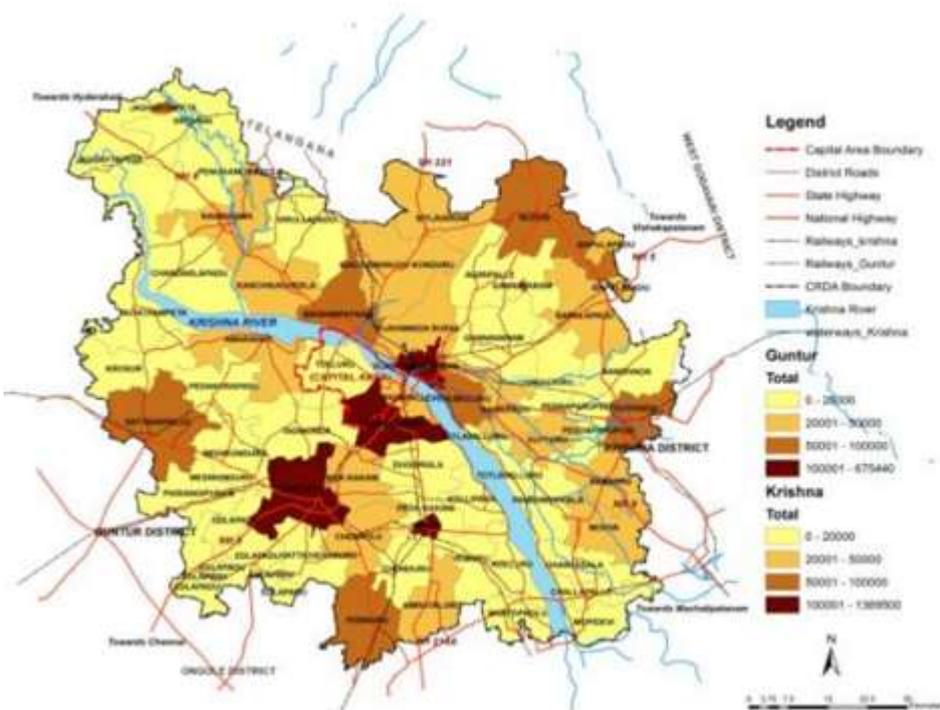


Map-5 Large and Medium Scale Industry of APCR

There are many different kinds of small scale industries in the APCRDA region. The total number of registered SSI units in the region is 610 (2014). The number has increased from 361 in 2012. Out of the 610, Guntur has 384 SSI units and Krishna has 226 SSI units (2014). About 10636 people are employed in the small scale industries out of which 70% is the male population whereas only 30% is the female population working in SSI units.

III. TERTIARY SECTOR

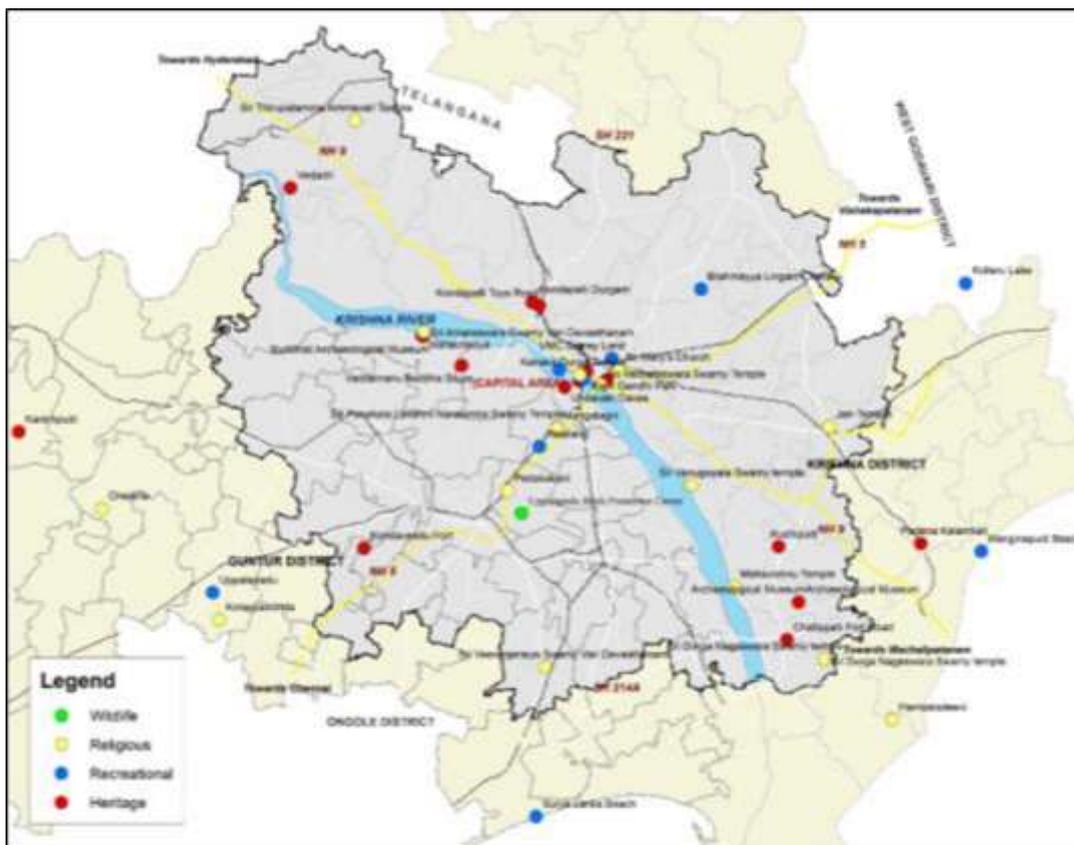
The tertiary industry is one of three industry types in a developed economy, the other two being the primary, or raw materials, and secondary, or goods production, industries. As an economy becomes more developed, it shifts its focus from primary to secondary and tertiary industries. The tertiary sector includes service industry and it holds high importance among all sectors. The tertiary sector of economy involves the provision of services to business as well as final consumers. The sub-sectors of tertiary sector are Trade, Hotel and Restaurant, Railways, Transport by other means & storage, Communications, Banking & Insurance, Real Estate and Professional services, Public administration and Other services: tourism, etc.



MAP-6 Distribution of GVA of Tertiary sector of APCR Mandals

Tourism is the most prominent territory sector. Andhra Pradesh has been one of the highest visited states in the country. In 2012, the consolidated state of AP was the highest visited state by domestic tourists. In 2013, the new state of AP was the 3rd most visited state in the country by domestic tourists accounting for 8.6% share to total domestic arrivals in India. However, in terms of foreign tourist arrivals, AP stands 18th in the country with a share of about 0.35%. The progress brought by tourism industry over the period of time. The growth has been increasing steady from past few years in terms of GSDP.

- Krishna and Guntur districts offer a lot of sites of heritage and cultural significance. The culture of Krishna district is mostly traditional in rural places and moderately modern in Vijayawada. Krishna district has 59% share in the tourism and Guntur district has 41%.
- It is also famous as the birthplace for Indian classical dance named “kuchipudi”.Guntur District has a dams and waterfalls along Krishna River in the end many Buddhist and Hindu temples. Most of these key heritage and cultural destinations fall in the Capital Region.
- Krishna district stands on 2nd position from all 13 districts of AP state for domestic tourists in 2016. Krishna district has increased 94% and 65% in comparison to 2014, while Guntur increased by 52% and 10% in 2015 and 2016 in comparison to 2014.



MAP-7 Tourist spots in APCR

There are 56 mandals in APCR out of 56 mandal tourist locations are in 17 mandals. Out of them **Vijayawada urban** mandal has 7 tourist location, **Amravathi mandal** has 4 tourist locations, **Penamaluru** mandal has 3 and rest 14 mandal has 1 tourist locations each. **Vijayawada urban, Ibrahimpatnam** and **Jaggayapeta** have highest Heritage tourist spots from all mandals. **Penamaluru**, has the highest Religious tourist spots from all mandals. For the Foreign tourist Kanak Durga temple then followed by, Kotappakonda, Mangalagiri are most visited religious tourist locations. **Vijayawada urban** has highest Recreational tourist spots from all mandals.

CHALLENGES

I. POSITIVE CONSTRAINTS

As region is rich in culture and tradition there are lack of traditional industries, for example Kondapalli toy making is prevalent in the area. The growth rate is good only in a few selected mandalas, the developed regions of Guntur and Vijayawada has seen considerable amount of growth as compared to other mandalas, so these areas served as major economic areas and have burden of migrating population and their requirement.

Due to favourable climate, location and topography there is potential of new industries like:

Table 3 List of the potential of new industries

Agro-based Industries	Rice,Poha, Oil Mills, Dairy Products based on Milk, Papad / Pickle, Grinding & Packing of Spices, Mango Jelly and Jam.
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Mineral-based Industries	Quartz grading, Fly Ash bricks, Cement lattices, grills etc., Cement based particle board, Cement concrete pipes, Mosaic flooring tiles.
Livestock based Industries	Egg trays, Poultry feed, Meat processing, animal feed, Buttons from cattle horns, Wool carding and knitting
Fisheries	Feed, Fish oil, Fish meat cubes, Processing, Packaging of fish/shrimp

II. NEGATIVE CONSTRAINTS

- I. Even after having rich culture very meagre textile industries are there. The region is rich in agricultural resources but a very few agro based industries are found in the region. Lack of traditional industries – Kondapalli toy making is prevalent in the area As the region will start developing exactly like capital region there will be no scope of new textile or agro based industry and burden will be increased on other source of income and employment which will lead to imbalanced economy. Mandals in Guntur district contributing less in trade and commerce sector as compared to mandals in Krishna district. Sector burden is more towards Vijayawada urban and Guntur city. It needed to be shift towards other mandalas located at APCR boundary.
- II. The tourist arrivals were reduced in year 2013 due to the bifurcation of the city, as there were many riots and the growth took few years to recover tourist back in state as previously. APTDC is looking for the overall Andhra Pradesh tourism, and district tourism departments only concerned with their respective districts just like Krishna & Guntur tourism department. There is no **Act/Policy** which will mandatory for all Hotels, Travel Agents, Tour Operators, Tourist Guides, Tourist Taxi Operators, water sports operators and Dealers etc. There is no **Act/Policy to protect and maintain** the tourist places from deterioration and **preserve** their tourism potential like to protect Kondapalli Fort, Kondaveedu Fort etc. There is no act/policy/guideline for **watersports activities guidelines** on Krishna river & to reduce water pollution. There is no guidelines for proper signage and everything is written in telegu which is very difficult for other tourists outside from Andhra Pradesh.

CONCLUSION: A WAY FORWARD AND STRATEGIES FOR BALANCED GROWTH OF APCR

Strategies to convergence not only the schemes within the department but also converge the various sectors and the actors who are working to help the farmers in the Andhra Pradesh capital region.

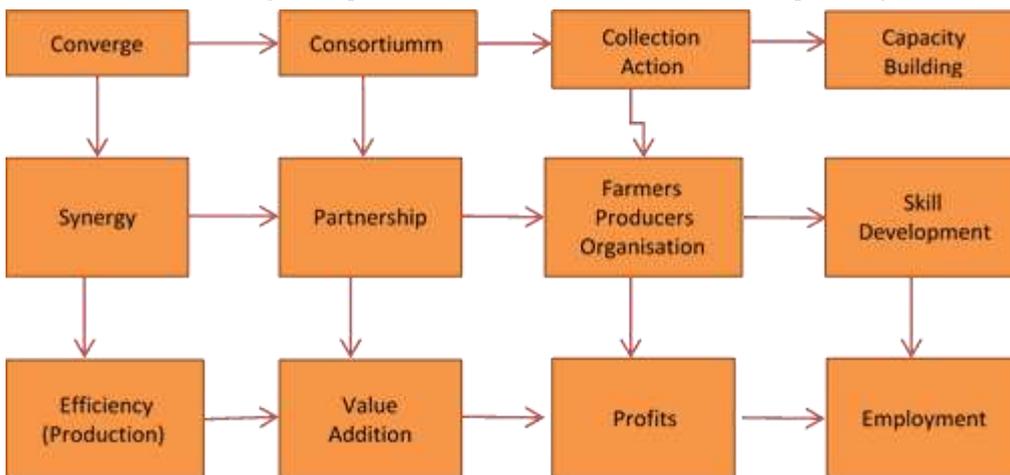


Figure 2 Schematic Strategies for the balanced economic growth

Through convergence, consortium, by building the partnerships including public private partnerships and collective action of the various actors (e.g, farmers’ producer organizations) and improved well being of our farmers through capacity development. The final goal of achieving the increased production through increased efficiency, increased profits, through value addition and enhancing the employment opportunities through skill development will be achieved as depicted in the above Figure. For achieving this growth, the mission will need to innovate the technologies, partnerships, institutions and enabling policies through convergence of schemes, departments/sectors, resources through improved communication and convergence of minds of various actors for enhancing the efficiency through use of ICT, science-led interventions, value addition and market linkages as depicted in the following diagram. The important strategy in addition to the above mentioned components, the mission will target increasing the awareness, ensuring the effective delivery systems for knowledge and inputs; processing by adopting value chains and market linkages and ensuring enabling policies and institutions along with effective and regular monitoring mechanisms at all the levels.

PROPOSED STRATEGIES FOR SECONDARY AND TERTIARY SECTOR

Based upon analysis of both primary and secondary sector two sectors were identified namely agriculture based and mineral based. As the region is rich in agricultural resources (rice, chillies, maize, and cotton) and abundant limestone is found in a part of the region. Related industries based on these such as rice mills, spice parks, textile mills, and cement industries have been proposed.

A. Agro Based Industries:

The region is rich in terms of agriculture-resources and it is historically called the "Rice Bowl of India" and continues to be the largest producer of Rice in the country. The region is also the leading producer of cash crops like Tobacco, Groundnut, Chillies, Turmeric, Sugarcane and Maize. It produces some of the finest varieties of fruit like mango, grape, guava, sapota, papaya and banana.

I. RICE MILL

Rice mills concentrated only in Vijayawada mandal. Rice mills are appropriate for the achieving the objectives as:

Labour intensive work – employment generation

Staple for over half of the world population – huge demand

Issues faced by rice mills industries

Uneven rainfall

Lack of proper storage and warehousing

Lack of adequate agricultural training

Inadequate infrastructural facilities (Roads, Transport, etc.)

Less integrated large and small scale industries

Potential clusters and reasons for selecting the above mandals are as follows:

In Krishna region of APCR :Vuyyuru, Kankipadu, Unguturu, Pedaparupdi

In Guntur region of APCR :Chebrolu, Ponnuru, Amrataluru, Tsunduru

Raw material availability: the mandals where yield of rice is high and has not been utilised to its full extent in the industries.

Availability of supporting services: water availability for the industries is important on daily basis, accessibility for importing and export, power supply. These mandals have sufficient water availability through the already existing water bodies and good railway and roadway connection.

Availability for labour: these mandals have more population of non-workers, the upcoming industries will generate and create employment opportunities for them.

Proximity to urban centres: the mandals have proximity to the markets to sell the products manufactured in the industries and also to the existing warehouses to store the produce.

a) Cluster level benefits:

- Evolution of common infrastructure for all cluster SMEs in the form of common marketing yard, common testing laboratory.
- Creation of a proactive consortium that will continue to add value to the cluster units.
- Various training programmes including a month long growth programme to promote exports.
- Creation of integrated SSI.

II.SPICE PARK

The Regional crop specific Spices Park is a well-conceived approach to have an integrated operation for cultivation, post harvesting, processing for value addition, packaging, storage and exports of spices and spice products. The Spices Park will ensure better pricing for the produce by eliminating intermediaries from the supply chain system currently followed locally for trading of spices. The facilities available in the Spices Park can be utilized by the farming community for selling their produce directly to the exporters by improving the quality of the products. Hence, the farmer community will get premium prices for their produce. The production of chillies is abundant in the southern part of the region. This needs to be exploited, i.e. further developed for suitable activities.

CLUSTER IDENTIFIED

Tsunduru, Amrataluru, Chebrolu, and Tenali These consist of the mandals rich in raw material as well non workers. Also less developed mandals such Tsunduru and Chebrolu.

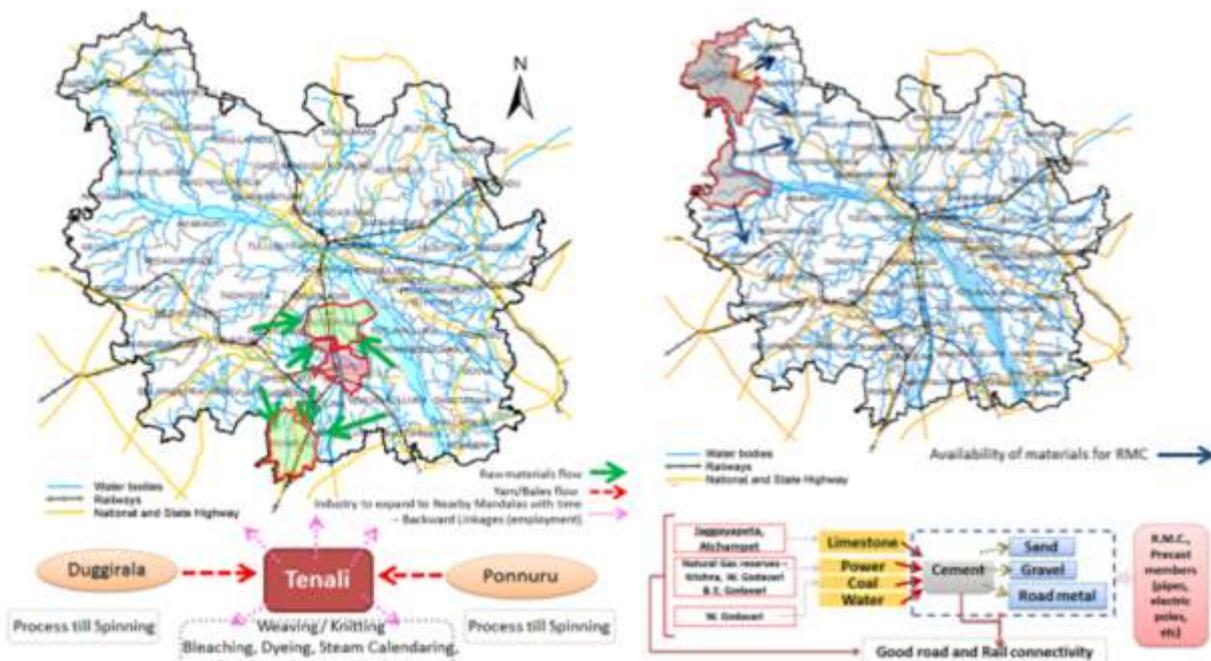


FIGURE-4 Identified Cluster For Spice Park

III.COTTON TEXTILE AND CEMENT INDUSTRY

An Integrated Textile Park at Tenali on is proposed to promote textile industry in Andhra Pradesh. This envisage 100 small scale industries relating to garment manufacturing, weaving, packaging and other accessories manufacturing units

in association with A.P Spinning Mills' Association (APSPA), AP Cotton Association and Guntur Ginners' Welfare Association.



MAP-7 Textile Park and Cement Industry



FIGURE-3 Linkages between different stakeholders

POLICY INTERVENTIONS

Special incentives package could be offered to the manufacturing units proposed to be set up in the rural areas located in high priority and priority zones. This could combat the high cost involved in development of the supply chain management, infrastructure development and manpower development.

Manpower training and skill development: State Government has established 'Anchor Institute' for sectors such, Food and Agro based, Mines and Mineral based and textiles. Industrial association/industry members should be involved in entire process of establishing and running of the anchor institutes so that they gain industry acceptance and market leadership easily.

Access to finance and administrative support: Reserve Bank to encourage commercial banks to lend credit to the industrial units located in rural areas or backward districts. As a special incentive 2% interest subsidy could be offered to the loans offered to the industrial units in rural areas.

After observing existing resources; natural and infrastructural, selection of Mandals for infrastructural updating, policy level proposals and environmental recommendations for a sustainable growth; we can foresee in the livestock sector like employment generation, economic betterment and environmentally conscious growth being fulfilled till 2037. To avoid spatial disparities and economical imbalance in future this is the right time to develop secondary and tertiary sector to achieve sustainable growth which will not lead to haphazard development and stabilize economic growth throughout the region. To reduce burden on Vijayawada urban it is important to distribute industrial development and economic opportunities throughout the capital region so that potential of different areas can be used.

ACKNOWLEDGEMENT

I would like to acknowledge the students of MPUR 2017 Batch of SPA Bhopal students for data collection and GIS Map Preparation. As the whole study is based on primary and secondary data available from the departments, hence in references only department names were mentioned.

REFERENCES

1. Andhra Pradesh Capital Region Development Authority, Andhra Pradesh
2. Amravati Capital Development authority
3. Economic development Board, Andhra Pradesh

4. <https://crda.ap.gov.in>

5. Machlipatnam Area Development authority, Andhra Pradesh

6. MPUR batch, 2016 “ Regional Planning Studio Report on APCR”, SPA Bhopal.

1770 THE CITY BODY AND METAMORPHOSIS OF URBAN FORMS

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ABSTRACT

In this article, the research work focuses on the analysis of the “dark matter” that embodies the city, not always visible yet constant, and looks into possible visions of development, new urban concepts and planning methodologies to better understand the metamorphosis of the city’s body. In order to do this, we propose to address some of the phenomena resulting from the urban sprawl and the emergence of diverse space categories in that evolution process. We analyze, from a historically-conceptual point of view, the roots of the Functionalist City and the adoption of zoning as an urban planning model and operative system of land use, closing the chapter with a critical analysis to current constraints of this urban model. The article concludes with the presentation of some new concepts that have come to be explored by contemporary urbanology, bearing in mind the diversity and heterogeneity which characterize the new territorialities formed within metropolitan areas.

Keywords: urban sprawl, city, urbanism, metamorphosis, territory.

INTRODUCTION

In this article we develop the concept of metamorphosis of the urban body of cities, as an adaptation process characteristic of the built environment and the social fabric. The adaptation and transformation of urban forms are constant metamorphic processes in cities, with characteristics that give rise to a renewed urban body resulting from its adequacy to each historical cycle, or as a result of natural or man-made disasters.

These changes manifest themselves more evidently in big cities, by the impact of the early 20th century new industrialization and urbanization phase, as result of the transposition into the urban planning of Frederick W. Taylor’s (1856-1915) theories about the need to increase the efficiency and competence of organizations, and the principles of mass production conceived by Henry Ford (1863-1947).

This radical process of urban transformation, whose image reflects the new social division of space and of the industrial standardized production, resulted in a more intense land use and occupation, contributing to a scale never before reached of urbanization by the end of the 20th century, the scale of megacities and global cities.

Since then, several urban and architectural approaches have been elaborated, facing the enormous scale of the economic and social challenges and the constraints that affect millions of people who have chosen the city as preferred habitat. However, only now their methodologies have reemerged, evoking other urban approaches that must be apprehended or recovered.

How can we include in the ongoing urbanization process all the multiplicity and aggregate approaches that are forming tangible and intangible emergent territories, whose description or mapping has become a very hard task to achieve?

The new urban dynamics have force urban designers to develop new proposals for planning and management of cities, especially in the case of large metropolitan areas. Facing rapid transformations and technological challenges several visions and methodological approaches in the teaching of urbanism are currently being discussed, in reply to numerous programmatic questions and philosophical orientations. This entails the reformulation of proposals and of academic course units, implying a holistic re-reading of the themes and objects of study, and requiring new teaching logics leading to a better understanding of the cities and megacities phenomenology.

This article seeks to focus its research work on the study of the “dark matter” that upholds the body of the city, although not always visible despite being a territorial constant, looking to the analysis of possible development visions, new urban concepts and planning methodologies to better understand the on-going metamorphosis of urban forms.

FROM THE BIG CITY TO THE URBAN SPRAWL

The expansion and urban growth are not unique phenomena of the modern city. “In fact, the city and the suburb appear in a concomitant way: (...) this extension would avoid the stuffiness of agglomeration closed within the perimeter of the walls” (Munford, 1964:605). However, unlike what has happened with the classical city, the various types of expansion and growth of last century’s major cities were not previously outlined in technical terms, nor were they the result of a conceptual or geographic-specific process. Their conformation appears as the result of the “natural” evolutionary cycle of each city with its surrounding territory, without it necessarily corresponding to a previously conceived theoretical-urbanistic basis.

The city has always been a polarizing urban reality of human activity, and the 18th century industrialization was first and foremost an accelerator of urban development, which had been growing steadily since the Renaissance. With the Industrial Revolution, the city lost its umbilical relationship with history and vernacular tradition. Emancipated, it reached adulthood and started a new life, independent of its paternity. It was in a gradual manner that the industry made its way

to the city in search of capital, markets and an abundant supply of low-cost labor, resulting in the formation of the big city and more recently the metropolitan regions, the world- and global cities.

To Ludwig Hilberseimer, “industries and mechanized transportation have made possible the creation and the rapid growth of our cities. But this growth, unplanned and undirected, has resulted in sheer chaos. Each part of the city affects other parts disadvantageously. Blight and slums appear. Traffic hazards increase. City dwellers begin to desert the city for the suburbs. The very forces which created the city seem now to be destroying their creation. Meanwhile, decentralization and suburbanization, proceeding without plan or direction begin to create outside the city the same chaos and confusion” (1955:108).

This growth, commonly referred to as *urban sprawl*, is used to describe the physical expansion of urban areas. Classically, the urban sprawl is a phenomenon that originated in the United States of America at the beginning of the 20th century, which was powered by the fast access to the private car ownership and the residents preference for isolated familiar houses, built on the outskirts of American cities.

Currently, the sprawling cities correspond to the idea of an inefficient and uncontrolled urban development, without planning, characterized by a mix of land uses and an expansion pattern of low-density vast areas, mostly in rural areas, in 18th and 19th century cities’ urban fringes. According to the European Environment Agency (EEA), the urban sprawl is the leading element of urban growth and implies unequal, scattered and spread out development with a tendency for the discontinuity, and is now seen as one of the biggest challenges in contemporary urban planning.

Referring to this multiplicity of spaces, Peter Sloterdijk, proposed the concept of *Foam City*, which he described as “a topological singularity, defined by manifold places to gather crowds, local apartments complexes serving as housing capsules and, finally, as territories where have being establish the various institutions of the world of work, through which, the majority of citizens ensure the economic foundation of your existence” (2005:578-579).

This marked metropolitan dynamics subverted the urban structures and led to a definition of the concept of Metropolis that overflows the classic space frame, comprising the perimeter of everyday urban activities in large cities and in their peripheries. In this context, the word *city* acquires an ambiguous meaning: should it be used to designate the entire urban agglomeration, or only its core (Marques, 2015:11)?

GLOBAL CITY AND MEGACITY

As Saskia Sassen refers, at the end of the 20th century the geography and the composition of the world economy have changed, producing a complex duality: a spatial dispersion, while the organization of economic activity remains globally integrated.

These changes in the functioning of cities had a massive impact both in urban form as well as in social and economic world order. According to Sassen, a new kind of city emerged: the global city (term first applied by Sassen in 1991).

We must, however, differentiate the concept of *global city* from the concept of *megacity*, establishing a difference between the true role each city represents globally – Calcutta is a megacity, but not a global city, Frankfurt is a global city but is not a megacity.

A global city, beyond its physical scale, has a direct and tangible effect worldwide through socio-economic and financial factors, the ability to influence the cultural industries and the circles of technological innovation, in the emergent context of the civilizational process that is appointed as globalization. Rather, a megacity can be characterized primarily by its scale and spatial dispersion, massive concentration of inhabitants and sufficiency of services – all this without having a correspondence to an interconnectivity with the beforementioned factors, associated with the global cities’ network.

The *Globalization and World Cities Study Group and Network* (GaWC) sought to develop a system to classify and establish a hierarchy on global cities, which they designate as *world cities*, taking into consideration that these “cities are assessed in terms of their advanced producer services using the interlocking network model (...) indirect measures of flows are derived to compute a city’s network connectivity – this measures a city’s integration into the world city network”⁴⁷⁰.

Among the various patterns of classification and hierarchy levels proposed by the GaWC, we highlight the following:

- *Cosmopolitan characteristics and economy of multinational corporations – this consists in identifying the strategic domain of certain global cities on the global system through analysis and order of preference regarding locations of multinationals corporations’ headquarters and the performance of its influence in politics, business, communications, finance, education, culture and technology.*
- *The new international division of labor – centered on the power and decision-making ability of multinational companies in the context of the new international division of labor, based on location criteria of the great financial centers, headquarters of international companies and institutions, important industrial centers, transportation centers and population size.*
- *Internationalization, concentration and intensity of service production – in which the urban hierarchy results from the high concentration of command points in the world economy organization, offer of services and markets for the products, and specialized innovations produced on a global scale.*

⁴⁷⁰ See GaWC Research Bulletin 23.

- *World cities as international financial centers – which identifies the major cities and their relative position as supranational financial centers, "Capital capitals" which enhance the effect of cities' polarization.*

Through the decomposition of these factors at various levels of analysis: cultural, political, economic, and geographic, simultaneously worked from an empirical and theoretical point of view, it is possible to estimate what distinguishes a world city from a megacity. This distinction between cities is subject to a monitoring process that evaluates the progress of development and consequent implications in their re-ranking, according to the previously established criteria.

Hence it is logical to conclude that the concept of global city or world city does not derive as much from its urban or architectural morphology, but rather from economic, technological or productive factors, which condition the urban body's configuration that then becomes understood as the supporting element of a complex connectivity of financial markets, from which urban development and possibly the urban public policies depend on.

NEW URBAN CONFIGURATIONS

As a result of the beforementioned economic transformations and the increased concentration of population in large cities, there is a significant territorial transformation, now being possible to perceive the main trends that characterize, in morphological terms, the formation of new urban organisms. According to Jacqueline Garnier (1997:126), the growth of urban contemporary organisms can be identified, generally, in four main space systems: urban-agglutination, urban-agglomeration, conurbation and urban-nebula. We proceed to analyze each of these forms of territorialization.

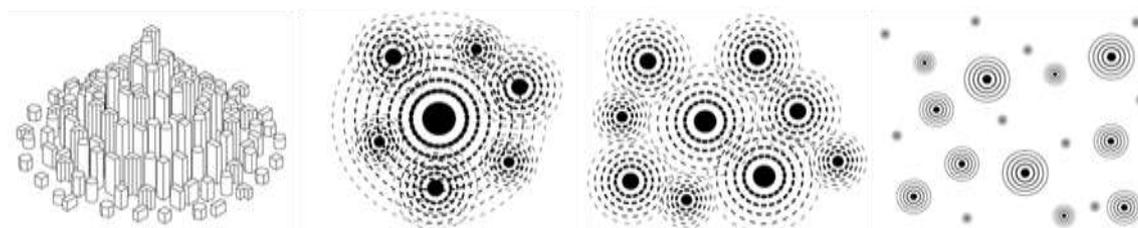


Figure 1 - Urban-agglutination, urban-agglomeration, conurbation and urban-nebula. (own source)

Urban-agglutination – In urban agglutination, also called internal filler, all the space inside the city is occupied. As much as possible is built in the same area, or the floors in urban buildings are multiplied by increasing built volume through growth in height. This urban morphology corresponds to what we can designate as *compact city*, which corresponds to the concept of *inner-city*, term used to designate the central area of metropolitan areas. Urban growth models developed by the Chicago School explain how this process can acquire different organic settings – concentric, by sectors, or multicore – the latter being the spatial model which best characterizes the current growth process of large cities, where each core becomes a sub-center of agglutination, by developing into a new urban centrality or *Central Business District*. After a first phase of urban concentration, the city tends to expand to the periphery obeying a growth process that we previously designated as *urban sprawl*.

Urban-agglomeration – The urban agglomeration is the result of the attraction that a main city exercises on surrounding areas, dormitory-cities, satellite cities and the culturally defined local centers. It is the main city that organizes the converging transport network, concentrations, etc., thus functioning as a “mother city” that “exports” to its colonies trade services, culture and the political and economic power kept from its old origin. Urban agglomerations can be of linear type, star-shaped or in network, usually depending on privileged directions for transport communications between the various sub-nucleus of the polycentric system.

Conurbation – Conurbation is a term originally introduced by Patrick Geddes to signify a new form of social grouping, born at the end of the first period of industrialization. “To focus these developments, indeed transformations, of the geographic tradition of town and country in which were brought up (...), we need some little extension of our vocabulary; ... what of ‘Conurbations?’ (...) new form of population-grouping, which is (...), developing new forms of social grouping, and of definite government and administration” (Geddes, 1949:14-15). Currently, the term conurbation applies to the spatial model that results from the parallel growth of several neighboring cities distributed in a territory where the main centers maintain a degree of independence from one another and a marked identity, even if one of them has some prominence. Examples of conurbations are the cities distributed along the East coast of the United States of America, or the Japanese Archipelago megapolis.

Urban-nebula – Urban-nebula consists of an irregular scattering of small towns, very close to each other, showing the existence of a spatially extensive and virtually homogeneous activity. In many cases these are new cities born of small industrial cores connected to service districts, or small and medium-sized cities where there has been a rapid increase in economic activity and intensive population growth, irregularly distributed by geographical areas of homogeneous nature, but not subject to the action of polarizing larger urban centers. There is, in this case, a certain independence of each urban nucleus. If this implies or can generate, on the one hand, competitive factors inducing local development, on the other hand, this structural autonomy can minimize the use of Regional synergies.

NEW SPATIAL CATEGORIES

In any of the urban settings described earlier, we can chart multiple built environment patterns, each one translating distinct social, cultural, economic and political meanings which distinguish them according to various categories of space:

urban, suburban, post-suburban, urban periphery, peri-urban and rururban. These categories can be understood as expressions of the urban sprawl territorialization, which we propose to analyze by taking into consideration its morphological topology and basic characteristics of land occupation.

Urban space – The urban space, usually associated with the concept of “city”, corresponds in general to a human settlement with a heterogeneous population, dependent on external food products but a supplier of goods and services to the surrounding area. Max Weber defined the “city” as a dense agglomeration of dwellings, a “location” and a “market place” (2014:44-45). A clear and universal definition of urban space raises numerous difficulties, resulting in each country adopting a definition for this category of space⁴⁷¹. Multiple criteria are used in order to define and characterize the urban space: administrative, quantitative (populational), minimum densities, functional performance, etc. In addition, there are important reasons of historical, cultural, and architectural nature that could justify the classification of what can be understood as urban space or city.

Suburban space – The classification of suburban space or suburb is given to the space that corresponds to the compact urban precinct that communicates directly with the traditional limits of the city, included, administratively, within the urban generation perimeter. This urban precinct is an area of residential neighborhoods, usually emerged around train stations and road transport. It is characterized by a mixed occupancy density, strong connections and dependence of the major transport axes, with very little traces of its former rural occupation.

According to Beaujeu-Garnier this new historical period of urbanization will give rise to various types of urban agglomerations. The *dormitory city* where a population lives that commutes daily to work in another city, which in general corresponds to the center-city. Another type encompasses what is traditionally called *satellite city*: small urban centers that offer employment to its population, but whose services, trade and equipment are relatively deficient, which leads people to search for complementary alternatives in the center-city nearby. A third category consists of old small towns, significantly distant from the large urban center, with well-defined local function and relatively satisfactory equipment and services (1997:130).

Post-suburban space – The establishment of the post-suburban space is not new in the development process of cities. Several examples illustrate how the relationship between center-city and its periphery is frequently transformed as a result of the deconstruction and reconstruction of the urban form and nature (Marques, 2015:14). The idea of a post-suburban space is pointed out by Garreau as a residential suburb transformed into an area of diverse activities (shopping malls, office parks, perimeter centers, multi-purpose centers, etc.) which structure new centralities in *Edge Cities* (1991).

Although the concept of post-suburban is not yet stabilized from the theoretical or technical point of view, it can be understood through the idea of *Suburbia*, defended by Bruce Bégout as an urban space that exceeds the central city and that can no longer be seen as a simple peripheral extension of the city, that straps all around and extends it (2013:13). “If the setting of the traditional City (...) corresponds to the Ptolemaic vision of a limited world, hierarchical and centralized, the suburbia acquired its mental and spatial configuration of the Copernican revolution: (...) an urban universe with no center or periphery unlimited, no hierarchy of places, an errantry space not limited for any sphere of fixed stars” (Bégout, 2013:25).

Peri-urban space – The peri-urban space (Garnier, 1997) is characterized by a great diversity of land uses, morphological and functionally organized in dependency of a central urban core and peripheral urban nucleus associated to the surrounding territorial system development. Here are located the *outer-cities* and *exurbs*, small towns or villages, far away from the center of the metropolis, but inhabited by people who work there. In the case of large South American or Asian megalopolis the peri-urban space is often termed *periphery*, an area normally associated with a “no-go area”, that is, an area suffering from severe urban fragilities which corresponds also to a “dangerous territory” for non-residents and a place of “forced” compromise of its residents with a certain marginality that manages the neighborhoods and residential areas. In a morphological perspective, the *periphery* corresponds to a type of urbanization mainly inhabited by low-income populations, characterized by informal and ephemeral or precarious buildings, occasionally stage for verticalization phenomena of its territory, designated as *hiperperiphery* (Torres and Marques, 2001) where the absence of basic infrastructure or services is evident.

Rururban space – This space category corresponds to the outer area of the peri-urban areas, which, as the term indicates, has predominantly rural features, but is subject to internal changes as a result of its proximity to spaces with urban characteristics. Its formation can result from a process of decentralization which involves the movement of people and jobs from larger cities to small villages, towns or cities located at a greater distance from the metropolitan center. As the name indicates, in the rururban area, the urban and the rural coexist; the rural area constitutes the “natural” territory, not destined for urban occupation, in which a vocation for agricultural activities, livestock-rearing, forestry or mineral-related activities is recognized, as well the space that integrates nature reserves for environment protection, or that is occupied by infrastructures that do not confer to it the status of urban land.

The boundaries between the various categories of space cannot be physically defined since each level has transition zones with mixed features. The inexorable urban sprawl ends up absorbing the smaller classic urban centers that integrate a network of nodal points of the system, or ceases to occupy agricultural spaces (small farmlands) which remain expectant of a real estate intervention or are converted into green spaces or urban parks. We can still find distributed around the

⁴⁷¹ According to the Regulatory Decree No. 15/2015 of August 19th, the Portuguese Ministry of Environment, Spatial Planning and Energy states that the urban land corresponds to what is urbanized in wholly or partly built and, as such, defined to be built in urban and territorial master plan.

great Center, several other urban polarities of variable sizes, interacting with the surrounding territories. Therefore, this classification cannot be understood as a sequence of space categories, since in practice these types of spaces are spread out unevenly and in a fragmented way throughout the city-region.

There are other categories of social, economic, cultural, ethnic, occupational and functional nature that allow us to understand the morphological stratification of the territory and the metamorphoses which occur in metropolitan areas. Nevertheless, an approach of the theme through these disciplines goes beyond our field of study, so we refer to them in order to alert the reader to other possibilities regarding territorial analysis.

FROM DISTRICTING TO ZONING

The multiple morphological settings and categories of urban spaces resulting from urban sprawl that we previously described, have given rise to a complex functional division of the land, which in turn implied the reconceptualization of theories and public policies for urbanism in order to develop appropriate tools for spatial planning and territorial management of metropolitan macro-structures.

Cities have always been divided, however, since the early 20th century a model of land division was institutionalized at international level: *zoning*.

According to David Johnson, the birth of zoning occurred in United States of America between 1911 and 1916, originating from a visit of lawyer Edward Murray Bassett to Germany in 1908: having made him particularly impressed with German method of reduction of residential density by dividing land use areas, a method that Werner Hegemann and other Germans urbanists were using for urban planning (1996:39).

In 1913, the Fifth Avenue Commission (created by George McAneny, Borough President in New York), submitted the draft of a report, mostly work of Bassett, which emphasized the regulation of buildings and the distribution of land uses, by “zoning”, as it came to be called (Johnson, 1996:39). In 1916, zoning was established as the main process of land development and control. As an urban planning model, it quickly dispersed throughout the United States (Johnson, 1996:40).

In Europe, the second CIAM⁴⁷², held in Berlin in 1931 was dedicated to “The Functional City”, whose “guidelines” would be based on those already used by Van Eesteren since 1929 at the Urban Development Section (PCS) of the Amsterdam Public Works Department, namely in 1934 in the Expansion Plan of Amsterdam.

“The Expansion Plan of Amsterdam was similar to other zoning plans implemented at the time, but it was beyond them when trying to predict and find future global developments. (...) specific housing strategies proposed in the expansion plan were left deliberately vague. (...) the plan of Van Eesteren was understood more as a ‘functional’ solution that took into account the “rational” development methods that would come to be organized by CIAM. This represents a change in the sense of a planning-oriented process that relied on comprehensive statistical data to project areas for various uses without draw any detail” (Munford, 2000:61).

In the fourth CIAM conducted in 1933, the concept of Functional City was structured on a set of postulates which gave rise to the so-called “Athens Charter”. The principles of the new urban theory did not advocate a solution of continuity, but a break with the old city, offering a modern alternative to the chaotic existing image of most major cities in the beginning of 20th century. To the CIAM, the city should be conceived as an aggregate of blocks associated with *neighborhood units*, in a group or set of groups distributed according to a functional hierarchy based on a *zoning* process.

Zoning consisted of an operation applied over the city plan with the aim of assigning to each function and each individual the proper place, based on the differentiation required between the various human activities, each one claiming its particular space in one of four dominant functions: *inhabitation units, work units, leisure units, and circulation units*.

To Peter Sloterdijk “the consistent mission to form a common element on three pillars of urban life – work, accommodation, public space, and gathering (the latter being equivalent to the leisure unit of the Athens Charter), implied that the terms ‘traffic’ and ‘communication’ became imposed on urban literature – as if we wanted to reduce the phenomenon of city to general movement and signal flows” (2005: 578-579).

According to Marcuse and von Kempfen, the land divisions by functional performance “are the result of economic, physical or organizational logic”, and “zoning [is] the accepted legal incorporation of such divisions” (2002:13). To these authors, “although functional zoning is generally defined by economic use (...)” this is not as obvious as it may seem, stressing other possibilities such as *‘performance zoning’*, which “seeks to define the permission of land uses not by its economic nature but by its environmental impact – generation of traffic, projection of shadows, blocking of air circulation, occupation of green space, etc. (2002:13).

The most important factor underlined by the functional model is the need for flexibility in the planning of new developments and to accommodate changing patterns from phase to phase. Nevertheless, this flexibility cannot be infinite and zoning does not imply the ceasing to stablish commitments as the land is consumed and its use is consolidated with buildings.

On this subject, an article entitled “Space and the City”, published in the April 2015 issue of THE ECONOMIST magazine, states that zoning codes were designed as a way of balancing the social good of a productive growing city with the private costs which growth often requires – yet, the land use regulations have evolved into something pernicious: a mechanism

⁴⁷² Congrès Internationaux d'Architecture Moderne or CIAM.

through which an artificial scarcity of land is generated, with high economic costs resulting from its weak utilization, in result of an application of zoning codes unable to balance social interest and urban growth, and of the regulation that limits the height and density of buildings, contracting supply and inflating its price.

CHANGES OF THE URBAN PARADIGM

Some new factors contribute to the change of functionalists paradigms, among which we highlight: a) the introduction of a urbanology based on a multi-disciplinary logic of the plan as instrument for territorial planning; b) the scale and increasing complexity of urban systems and infrastructures; and c) the growing need to satisfy sustainability issues through the (re) introduction of ecology concepts in the definition of the practical nature of planning. To these factors we add the problematic of exercising democracy, the right to social justice and equal opportunities that should govern the urbanization and the lives of their communities who dwell in it.

The formulation of a new planning methodology for mega-cities and metropolitan regions, results from the observation of the advantages in adopting an integrated and comprehensive planning process aimed toward strategic objectives that respond to challenges and opportunities, and the need to secure a negotiating and participative structure that provides coherence to the community project, represented by the actors and agents with impact on the articulation of both physical and social dimensions of cities.

The resort to a charter of urbanistic principles and the application of the strategic urban plan arises also as an answer to some of the shortcomings of the functionalist planning. In a simplified way, the new approach to city planning adopts two fields of study and characterization in terms of regional planning and urban planning: a) an analysis of the general trends in international, national and regional frameworks, which can influence urban development; b) an internal review of the factors that characterize the urban community, with the aim of defining the strengths and weaknesses, the potentialities and the insufficiencies relating to the themes previously listed.

Another significant change is the one that occurs with the perception of the metropolitan, as the one described by Sloterdijk to whom “the true function of metropolitan areas is clearly to ensure good neighborliness between centers and non-centers – no longer in form of a super centrality, but understood as an agglomeration of topographical forces” (2005:579).

This multi-polarity was denominated by the EDEC⁴⁷³ as *Polycentric System*, an articulation system for urban inter-centers, which corresponds to a territorial logic with the aim of achieving economies of scale in the complementarity generated between cities, and in the acquisition of critical mass and synergy effects made viable through the cooperation of cities with identical profiles and potential resources. Its focus is thus of a broader nature than the city itself, aiming to promote integrated territorial development strategies where several cities cooperate with each other, join forces to develop additional functions or in using together equipment and services.

Following the line of thought we have explored about urban paradigm changes, we highlight the principles laid down in the European Charter of Urbanism (2013), which is based on “new Athens Charter 2003”⁴⁷⁴, giving continuity to a global vision focused on the concept of *Connected City*, an urban development process anchored in the following topics:

A city for all, whose Government reaches social cohesion; The city with social participation, where urban planning should serve to strengthen the sense of belonging and identity; The healthy city, where it is possible to promote equal opportunities of access to public health facilities; The productive city, planned in order to strengthen its economic foundation, and that is able to provide local work to its citizens; The innovative city, which encourages the use of information and communication technologies; The city with accessibility and mobility, where public transport interconnection and car-free zones are created; The environment city, in which all plans and programs are based on principles of sustainable development; The city of culture, source and repository of human civilization, involving the principle of mixed uses, that introduces variety and vitality in the urban fabric.

If the Athens Charter, in 1933, presented an objective program for the city, pointing out specific guidelines for its zoning and urban design, the European Charter of Urbanism corresponds to a change of urbanistic paradigm, based on a set of principles of subjective order, reflecting the trends currently observed in contemporary society, identifying other potential urban development and the specific commitments that the planners should advocate as a response to challenges urbanization is facing.

CONCLUSIONS

The metamorphosis of urban forms are linked to technical and social revolutions and have a directly relationship with the dissolution of the city limits as a result of an unplanned *urban sprawl*, characterized by a certainly urban chaos or entropy, which has given origin to new and diverse urban configurations and categories of space that we tried to describe following a systematic approach.

The Metropolitanization phenomenon does not refer only to the growth of major cities, but also to a structural change of the urban environment, the redefinition of the hierarchy of cities, the modelling of space in consequence of complex networks of mobility, dispersion of social and economic activities, and a diffuse fragmentation of urban morphological units.

473 Esquema de Desenvolvimento territorial Comunitário (EDEC), 1999, Postdam.

474 Edited by the European Council of Social Planners.

Opposed to the conceptual model of the baroque city and to the culturalist concepts of the industrial city, Functionalism emerged as planning methodology for a city characterized by profound transformations: technological, economic and socio-demographic that alter the scale, composition, density and the interrelation of city with the territory.

Functionalism became the planning model of continuous urban expansion areas, in many cases to solve problems of unplanned growth that remains since the first industrial revolution, seeking to offer accommodation for a large number of people moving from the countryside to the cities or small towns to large ever growing metropolitan areas.

Analyzing the basic aspects of territorial organization guiding the major metropolitan areas, we can see that the networks of their polycentric urban systems rely on a functional hierarchical order and on horizontal relationships which reveal the need for an articulation inter-urban scheme, supported on the concept of growth poles.

The study of the evolutionary transformations of human settlements and of their new habitat, implies at the same time the need to review the analysis systems which allow us to obtain a synthesis of numerous variables, being simultaneously able to test the effectiveness of new urban standards developing a language that describes possible interdependencies between them, guiding their combinations and indicating how each one can be integrate into the existing built environment.

Theorists and practitioners have contributed to the reflection on the concepts identified in metropolitan areas, such as: multilevel territories, hybrid territories; urban alterity; spaces in transition, etc. – all related to social practices and cultures, actors and stakeholders of the urban space, factors that constitute a basis that allows for the characterization of the social identities of megacities in relation to other global or worldwide cities.

REFERENCES

- BÉGOUT, Bruce (2013), *SUBURBIA*, Éditions Incult, Paris.
- GARREAU, J. (1991), *The Levittowners, ways of life and politics in a new suburban community*, Pantheon Books, New York.
- HILBERSEIMER, L. (1955), *The Nature of Cities*, Paul Theobald & Co., Chicago.
- JOHNSON, David A. (1996), *Planning the Great Metropolis – The 1929 Regional Plan of New York and Its Environs*, E & FN SPON, Oxford.
- MARCUSE, Peter, KEMPEN, Ronald van (2002), *Of States and Cities - The Partitioning of Urban Space*, Oxford University Press, New York.
- MARQUES, Carlos Almeida (Coord.) (2015), *Planeamento Cultural Urbano em Áreas Metropolitanas: Revitalização dos Espaços Pós-Suburbanos*, Editora Caleidoscópio, Casal de Cambra.
- MUMFORD, Eric Paul (2000), *The CIAM Discourse on Urbanism, 1928-1960*, The MIT Press, Cambridge.
- MUMFORD, Lewis (1964), *La Cité à travers l'histoire*, Editions du Seuil, Paris.
- SARAMADO, José (2005), *As Intermitências da Morte*, Ed. Caminho, Lisboa.
- SASSEN, Saskia (2001), *The Global City*, Princeton University Press, New Jersey.
- SLOTERDIJK, Peter (2005), *Ecumes – Sphères III*, Maren Sell Éditeurs, Paris.
- TORRES, Haroldo da Gama, MARQUES, Eduardo Cesar, *Reflexões sobre a Hiperperiferia: Novas e Velhas Faces da Pobreza no Entorno Municipal* in Revista Brasileira de Estudos Urbanos e Regionais n. 4, May, 2001, pp. 49-70.

SS13.1. Citizenry and Regional Planning

1115 INTERGENERATIONAL TRANSMISSION OF INDUSTRY OF EMPLOYMENT AMONG RELIGIOUS COMMUNITIES IN URBAN INDIA

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ABSTRACT

It is assumed that the educational status of father has great bearing on the educational and occupational aspiration of the sons. An individual grows in the family and in the development of individuals, family's economic condition in general and father educational and occupational achievement in particular plays a great role. Here in this paper an effort has been made to present the intergeneration shifts in industry of employment among Muslims and Hindus religious groups. Education of fathers' and his occupation reflect the family's general social standing and indicate the benefit in terms of education and occupation provided to the next generation. The data for this has been taken from two successive rounds of the National Sample Survey (NSS) i.e. 2004–2005 to 2009–2010. Only those households have been taken into consideration in which two generations are living together. The cross tabulation of sons parameters with the males head of the households parameters shows that intergenerational persistence among Muslims was very high in the case of agriculture, manufacturing and trade and hotel industry. It is seen that intergenerational persistence is very high in the case of Muslims than the Hindus religious groups. So, one can say that the influence of fathers' industrial choice on the industrial choice of sons' is greater in the case of Muslims than the Hindus. Among Muslims throughout the period intergenerational persistence is very high in the case of the manufacturing sector. This shows the effect of the historical association of Muslims in this sector and also the influence of fathers' industrial choice, on the sons' industry of employment.

Keywords: Employment, Intergeneration, Muslims, Religious Communities.

INTRODUCTIONS

Intergenerational transfer of education and employment has been analyzed by sociologist. Intergenerational effect results from both the individual parent and the individual child. As mentioned by the Visakha Verma (2000)⁴⁷⁵, *'an understanding of the pattern of intergenerational occupational mobility is essential to know related issues like (1) what factors are responsible for the existence of unequal economic opportunities; (2) the reproduction of an existing division of labour and the perpetuation of existing class inequalities'*. It is assumed that the educational status of father has great bearing on the educational and occupational aspiration of the sons. An individual grows in the family and in the development of individuals, families' economic condition in general and father educational and occupational achievement in particular plays a great role. In studying intergenerational occupational mobility one is usually concerned with the relationship between social origin and current social position. Education and occupation are the major indicators of social status. The main aim of the paper is to see how inequalities in opportunities in term of employment in today's generation reflect very unequal opportunities that individuals inherit from their parents'. Equality of opportunities plays a great role in transfer of opportunities to future generations. The central argument is that: how children's occupational attainment is related to the fathers' occupational attainment? Is it a product of intergenerational stickiness or the result of other socioeconomic constraints? Limited empirical work has been done in this area of research in India. This approach of analyzing intergenerational occupational opportunity has been followed in several papers in different countries. But none of the study analyses intergenerational mobility among religious groups.

India is a multi-religious society and the nation can only prosper when every section and community of the country can garner the fruit of development. Some sections of the society made significant progress in terms of education and occupation while others are lagging behind. Muslims the largest minority community of the country is not performing well in many of the developmental parameters in general and occupation in particular. There has been a range of work on intergenerational mobility in the U.S and other western countries. This issue has not been well documented in India. A Few notable exceptions are Rajarshi Majumder (2010), Jalan and Murgai (2010), and Hnatkovska et al (2011), all of these scholars have focused on intergenerational mobility among the Scheduled Caste. The researcher is not aware of any other study, which documents the intergenerational occupational mobility among religious groups.

METHODOLOGY AND DATABASE

Methodology is a tool through which the research agenda is arranged in a systematic way. The methodology followed in the study is as follows. The study has used the National Sample Survey Organization (NSSO) database on Employment and Unemployment (Unit Level Records) for 55th, 61st and 66th rounds, pertaining to the years 1999-2000, 2004–2005 and 2009–2010 respectively. In order to present the intergenerational shift in employment among Muslims, the samples were restricted and information was taken only for those households in which one male member and their children are residing. The Co-residence is one of the criteria for the selection of household. Family records have been superimposed on personal records so as to obtain intergenerational data on education, employment and other socioeconomic parameters. Multilevel filtration has been done to obtain a desired sample. In the first instance, only those households in which father and their son in the age group of 15–59 years residing are taken into consideration and then the religious

475G. Visakha Varma and P. Hanumantha Rayappa (2000), "Pattern of Intergenerational Mobility: A Study of Calicut City", Artha Vijnana, Vol. XLII, No. 3, pp. 286–301.

breakup of these households are taken into consideration. This excludes the large number of households in which sons aged 15–59 years are not residing with the father also excluded the household whose children are outside the household for some reasons. This has reduced the sample size to a great extent, but the sample is representative enough to make the analysis. Intergenerational transition matrix has been used for education, industry and occupation transition. Each row of the table denotes occupation of father while column indicates the same for sons’.

Work Force Participation Rates by Religious Communities

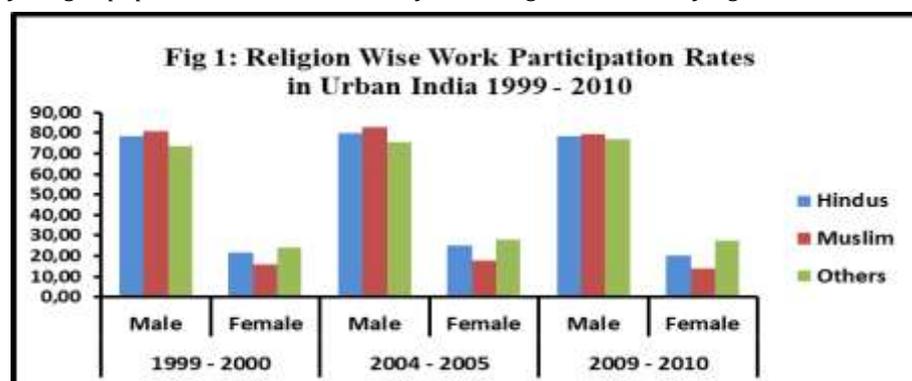
According to NSSO, “a person who is either working or seeking or available for work constituted the labour force”. Workforce participation rates or employment rates are important indicators to assess the proportion of the population actually engaged in any economic activities. Employment is critical for overall well being of the individual and their families.

Table 1 Employment Rates among Religious Communities in Urban India 1999–2010

States	1999 - 2000			2004 - 2005			2009 - 2010		
	Hindus	Muslims	Others	Hindus	Muslims	Others	Hindus	Muslims	Others
J&K	45.40	42.70	45.10	47.40	46.60	43.40	48.70	44.10	50.50
U.P	48.00	53.40	41.10	49.70	55.00	46.60	43.40	48.50	52.00
Bihar	43.80	45.20	39.30	41.80	51.10	41.90	40.90	40.90	47.60
Assam	47.30	53.50	47.90	50.00	49.10	50.20	46.10	42.60	40.10
West Bengal	49.70	53.80	47.60	52.20	55.80	49.60	51.30	54.70	32.70
Kerala	55.90	42.90	51.90	56.00	40.50	54.80	55.60	37.50	56.70
India	51.50	50.30	49.30	54.10	51.60	52.60	50.70	48.10	52.40

Source: Employment & Unemployment among Religious Groups NSS Rounds 55th, 61st & 66th

The table 1 presents the workforce participation rates of religious communities. The analysis of the table shows interesting facts. It can be observed that from 1999–2000 to 2004–2005, the workforce participation rates among Muslims have increased in majority of the selected states. It is also found that during the period 2009–2010, workforce participation rates have declined among both the Hindus and Muslims. The possible explanation might be due to the increase levels of education the workers are unwilling to participate in any kind of employment. However, errors may be on account of sampling decision. The above table shows, the Muslim population employed/worker in any gainful activity to the total Muslim population (15–59 years). Fig 1 shows that the female work participation rates are very low among both religious communities. Work participation rates among Muslims females were much lower than the Hindus and other religious communities. The possible reason for the sorry state of Muslims female work participation rates might be due to Muslims religious outlook. The other reason as mentioned in the Sachar Committee report (2006)⁴⁷⁶ ‘One of the reasons for lower participation rates of Muslim women may be higher dependency rates due to relatively higher share of the younger population in the community, resulting in women staying at home’.



Religion Wise Status of Employment of Workers

Another important issue with regards to employment is the type of employment being generated. Here an attempt has been made to explore this aspect of employment. During 1999–2000 (table 2), among Hindu workers, 38.20 per cent of male 36.90 per cent of female were self employed. The corresponding proportions for Muslim were 52.70 per cent for male and 55.40 per cent for female. The proportion of regular wage employed among Hindus was very high. The proportion of Muslims, male self employed was lower than the Hindu male. The same is true in case of female. Only 22.40 per cent of Muslims female are regular wage employees. One can also infer from the data that the proportion of casual labour was higher among female than among male workers across the religious communities.

Table 2: Religion Wise Status of Employment of Workers In Urban India 2009–2010

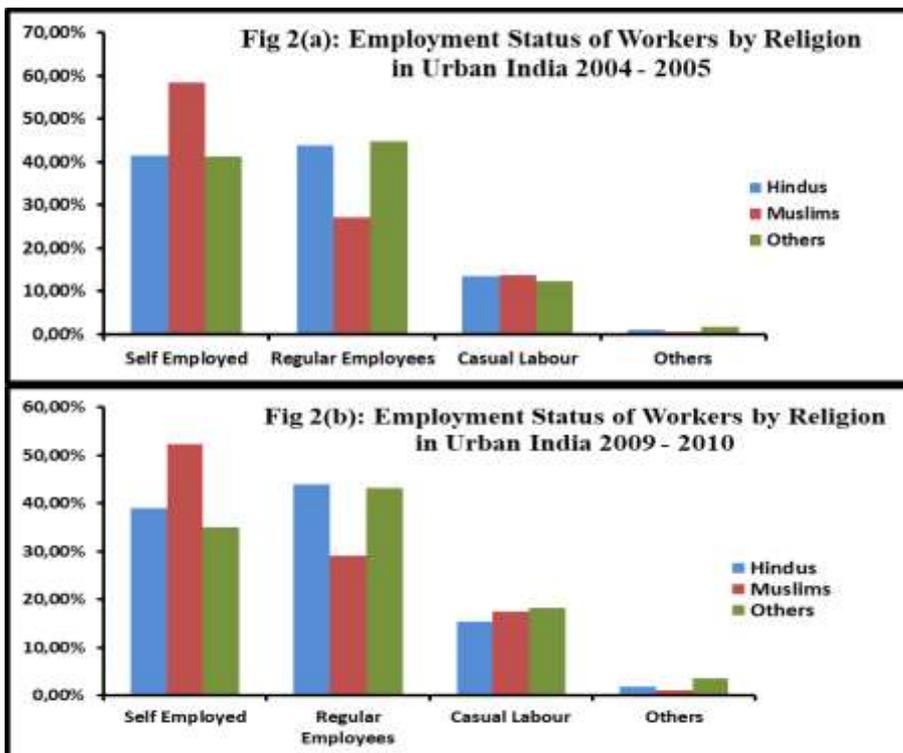
Employment Status	1999 - 2000		Muslim		Others	
	Hindus		Male	Female	Male	Female
	Male	Female	Male	Female	Male	Female
Self Employed	38.20	36.90	52.70	55.40	40.10	25.10

476Sachar Rajinder (2006), “Social, Economic and Educational Status of the Muslim Community in India”, A Report Prepared by Prime Minister’s High Level Committee.

Regular Employees	44.90	36.80	29.20	22.40	43.50	54.00
Casual Labour	14.60	23.30	16.10	19.50	12.90	16.70
Others	2.20	2.80	1.90	2.60	3.30	3.80
2004 - 2005						
Employment Status	Hindus		Muslim		Others	
	Male	Female	Male	Female	Male	Female
Self Employed	42.00	39.90	58.50	58.40	43.50	34.90
Regular Employees	44.70	41.10	27.50	25.40	43.50	48.20
Casual Labour	12.30	17.60	13.50	15.10	11.70	14.40
Others	1.10	1.30	0.50	1.00	1.40	2.60
2009 - 2010						
Employment Status	Hindus		Muslim		Others	
	Male	Female	Male	Female	Male	Female
Self Employed	39.90	35.10	52.60	50.40	36.20	31.20
Regular Employees	44.20	42.50	29.40	26.80	42.30	45.90
Casual Labour	14.10	20.60	17.00	20.50	18.00	18.70
Others	1.80	1.70	0.80	1.80	3.40	4.10

Source: Employment & Unemployment among Religious Groups NSS Rounds 55th, 61st & 66th

For urban Hindus male, the proportion of self employed declined from 42 per cent in 2004–2005 to 39.90 per cent in 2009–2010. The same trend was observed in case of urban Muslims male, which was 58.50 per cent in 2004–2005 and decreased to 52.60 per cent in 2009–2010, while the proportion of Muslim female self employed decreased from 58.40 per cent to 50.40 per cent during the same period. The further analysis highlighted a rise in the Muslim males and females share in regular wage earning and casual labour during the 2004–2005 to 2009–2010. Similar trends were also observed in the case of the Hindus. Thus, it can be concluded that self-employment grew significantly with a fall in casual employment in 2004–2005; there was a marginal rise in regular salaried employment during the same period.



In 2009–2010, the trend was different. The proportion of self employment has decreased in case of Muslim female and it is the lowest since 1999–2000. The decline of self-employment was very high for Muslim female workers. As pointed out by Sonya Rastogi (2007),⁴⁷⁷ ‘Muslims are underrepresented in both public and private sectors and are largely confined to non-farm self-employment. Muslims are also less likely to be employed in the protected sector, and are therefore in more vulnerable employment positions. It is important to note that wage employment itself does not confer economic advantages and historically, Muslim participation in self-employment has protected them somewhat from the dire poverty faced by landless agricultural laborers, but their exclusion from regular employment, reduces their avenues for upward economic mobility, particularly in the current era where the rewards to white collar work have been rising’.

Religion Wise Proportion of Workers in Different Industrial Categories

⁴⁷⁷Rastogi, Sonya (2007),” Indian Muslim Women’s Education and Employment in the Context of Modernization, Religious Discrimination and Disadvantage, And the Rise of Hindu Fundamentalism and Muslim Identity Politics”, Doctoral Thesis submitted to University of Maryland.

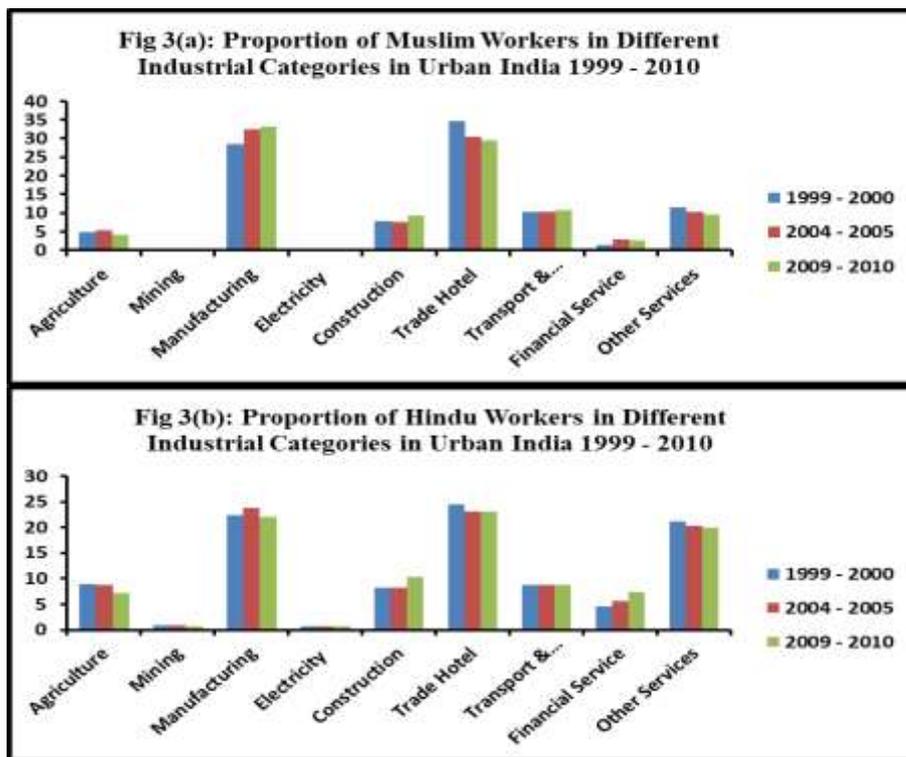
To assess the structural change in the employment pattern of usual worker the different rounds of NSSO data are compared. The table 3 shows the religion wise percentage distribution of usual status⁴⁷⁸ workers by industrial categories in urban India. It is observed from the table that employment of Muslims as well as Hindus has declined in primary sector that is agriculture and mining and quarrying activities during the period under consideration. It can be seen from the table that a sizeable proportion of Muslim workers were employed in the manufacturing sector. Muslims share in this sector was 28.50 per cent in 1999–2000 which rose to 32.50 per cent during 2004–2005 within the span of five years, this further increase to 33.20 per cent during most recent quinquennial rounds of 2009–2010. More importantly, along with a decline in the share of employment in agriculture, there has also been a decline in the share of employment in manufacturing for Hindus in urban areas during 1999–2010. It can also be inferred from the table that a greater proportion of Muslim workers are engaged in trade, hotel and restaurant, the corresponding shares of Hindus are also high in this sector.

Table 3: Religion Wise Distribution of Workers by Industrial Categories in Urban India 1999 – 2010

Industrial Categories	1999 – 2000		2004 – 2005		2009 – 2010	
	Hindus	Muslims	Hindus	Muslims	Hindus	Muslims
Agriculture, Hunting & Fishing	8.90	4.90	8.70	5.40	7.20	4.20
Mining & Quarrying	0.90	0.50	0.90	0.20	0.70	0.30
Manufacturing	22.30	28.50	23.70	32.50	22.10	33.20
Electricity, Gas & Water Supply	0.80	0.30	0.70	0.30	0.70	0.40
Construction	8.20	7.80	8.30	7.70	10.40	9.30
Trade, Hotel & Restaurant	24.50	34.70	23.10	30.40	23.00	29.60
Transport, Storage & Communication	8.70	10.30	8.80	10.30	8.70	10.90
Financial Business & Services	4.50	1.50	5.70	2.80	7.40	2.70
Community, Social & Personal Services	21.20	11.50	20.30	10.20	19.90	9.50

Source: Employment & Unemployment among Religious Groups, NSS Rounds 55th, 61st & 66th

It is observed that even in the services sector, there has been a fall or no change in the proportion of employment in the trade, hotel and restaurant and transport and communications sector with a slight increase in the finance and real estate sector. The entire decrease in proportion of employment in the agricultural as well as the manufacturing sector has been compensated by an increase in employment in the construction sector among both the religious communities in urban areas.



MANUFACTURING SECTOR RELIGION WISE ANALYSIS 1999-2010

Two Digit Level

One digit industrial classification present broad generalization and show greater proportion of Muslims are concentrated in the manufacturing sector. Manufacturing sector constitutes host of activities; here an attempt has been made to analyse within manufacturing sector Muslims are mostly employed to which type of manufacturing activity. The greater proportion of total Muslim workers is employed in the manufacturing industries. Analysis of religion wise manufacturing

⁴⁷⁸Usual status worker corresponds to usual principal status and usual subsidiary status worker together.

sector employment at a disaggregated level that is two digit industrial classifications shows that in 1999–2000, within the manufacturing sector almost 39 per cent of workers were engaged in manufacturing of tobacco product (13.70 per cent), textiles (23.10 per cent) and wearing apparel (12.70 per cent). The corresponding shares of Hindus workers were 3.40 per cent in tobacco product, 16.20 per cent in textiles and 7.20 per cent in wearing apparel. Another interesting fact which emerged from the table is that Muslims presence was remarkable in tanning and dressing of leather industry. One of the possible explanations for this is because of religious sentiment Hindus do not consider it suitable to engage themselves in this industry. In printing, chemicals and fabricated metal products, etc. Muslims workers' shares were negligible while the presence of the Hindus is remarkable. It can be inferred from this that in all those sections of manufacturing, which requires technical and managerial skill Muslims presence are conspicuous (Appendix, 1) by its low share.

During 2004–2010, the same trend has been observed. Out of the total workers engaged in manufacturing sector Muslims' shares in textile and wearing apparel has increased considerably. It was 24.20 per cent and 20.80 per cent in 2004–2005, which rose to 27.50 per cent and 23.30 per cent respectively during 2009–2010. Major concentration of Muslim workers in these industries attributed to their historical dominance in these industries. It is also found that in the food product and beverage industry, Muslim workers declined from 10.90 per cent in 1999–2000 to 5.10 per cent during 2009–2010. In all other manufacturing industry sections their shares are abysmally low.

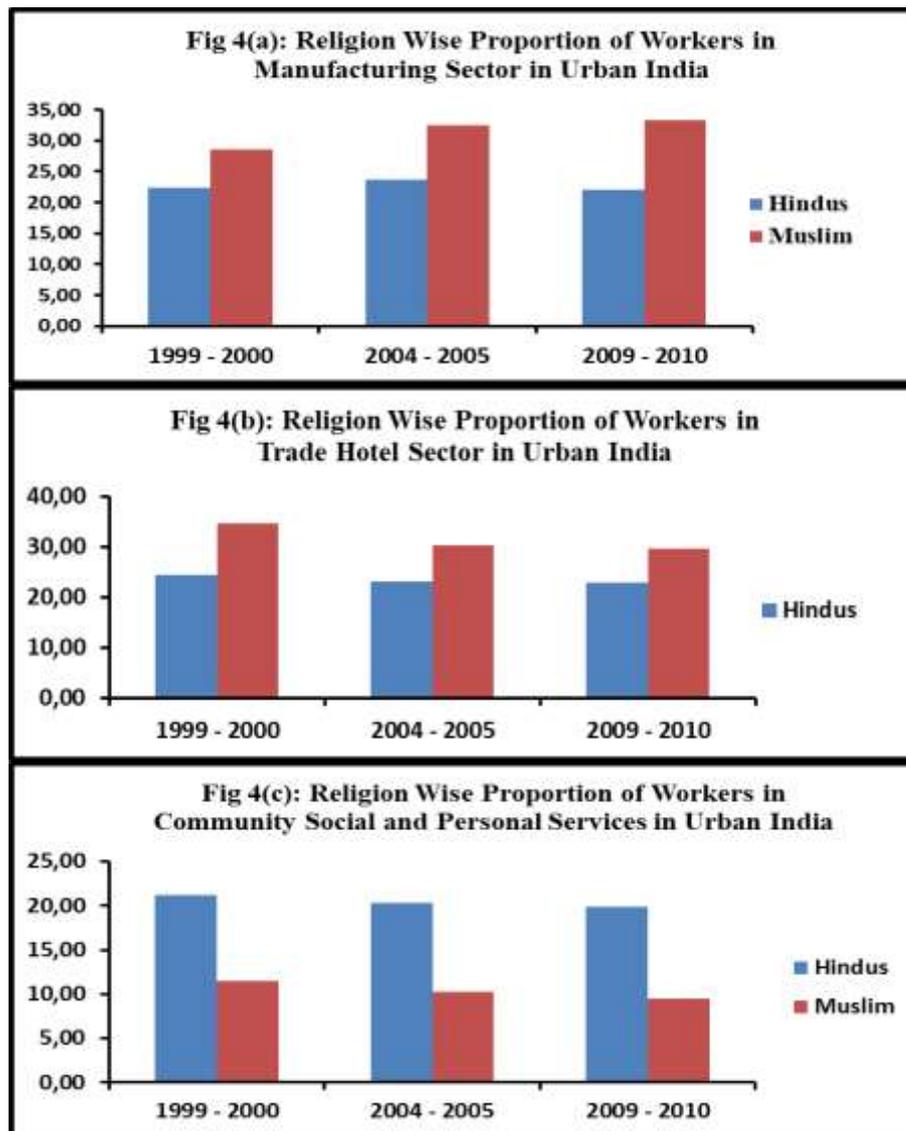


Table 4: Shares of Workers in Trade, Hotel & Restaurants & Community Services Sector in Urban India (Two Digit Level) 1999 – 2010

Trade, Hotel & Restaurant						
Trade, Hotel & Restaurant	1999 – 2010		2004 – 2005		2009 – 2010	
	Hindus	Muslims	Hindus	Muslims	Hindus	Muslims
Sale Maintenance & Repair of Motor Vehicles	4.50	9.80	5.70	9.90	5.10	9.60
Wholesale Trade & Commission Trade	10.50	7.30	13.00	12.90	14.20	12.00
Retail Trade, Except of Motor Vehicle	73.00	75.50	67.10	69.90	67.60	69.30
Hotel & Restaurants	12.00	7.40	14.20	7.40	13.10	9.00
Community Social & Personal Service						
Community Social & Personal Service	1999 – 2010		2004 – 2005		2009 – 2010	
	Hindus	Muslims	Hindus	Muslims	Hindus	Muslims

Community Social & Personal Service	Hindus	Muslims	Hindus	Muslims	Hindus	Muslims
Public Administration & Defense, Social Security	38.50	31.10	29.70	21.70	30.40	26.00
Education	24.40	22.60	28.00	30.20	29.40	30.20
Health & Social Work	9.10	6.30	9.50	13.00	10.70	8.40
Sewage and Refuse Disposal, Sanitation	1.60	0.70	1.20	0.30	2.30	1.10
Activities of Membership Organizations	1.80	2.30	2.20	3.00	1.80	3.60
Recreational, Cultural & Sporting Activities	2.50	4.60	3.00	3.50	3.20	3.00
Other Service Activities	14.80	24.70	11.00	13.30	11.70	17.60
Private Household with Employed Persons	7.20	7.80	15.40	14.90	10.60	10.20
Extra Territorial Organizations and Bodies	0.10	N.A	0.00	N.A	N.A	0.00

Source: Employment & Unemployment among Religious Groups, NSS Rounds 55th, 61st & 66th

TRADES, HOTEL AND RESTAURANT: RELIGION WISE ANALYSIS 1999 – 2010

Two Digit Level

The presence of Muslims workers' in trade, hotel and restaurant industry is remarkable. Trade, hotel and restaurant are broad industrial category. It gives the generalized picture. Further, in order to ascertain within this broad category, in which specific industry Muslims are largely employed, industrial classification at two digit levels has been analyzed. It is found that in 1999–2000, a greater proportion of Muslims workers were largely employed in retail trade industry i.e. 75.50 per cent. The corresponding shares of Hindus in this industry were 73 per cent. It is also observed that during the span of ten years, Muslims shares in retail trade industry has declined, still their presence in this industry is significantly very high as it was 69.30 per cent during 2009– 2010, greater than the Hindus (67.60 per cent).

Another important fact revealed by the table is that during the period under consideration, in all sub classification of trade, hotel and restaurant industry, there is an increase in employment among Muslim workers, the same is true with the Hindus workers also. This is mainly due to the fact that in the post liberalization period shares of service sector in the employment generation, has increased considerably and provides opportunities for both the religious communities, but within this there are inherent disparities. Thus, it can be assumed that as the majority of the Muslims are self employed, they are largely concentrated in retail trade and hotel industries.

COMMUNITY, SOCIAL AND PERSONAL SERVICES: RELIGION WISE ANALYSIS 1999–2010

Two Digit Level

Another important industrial sector, which employs sizeable proportion of Muslims workers is community social and personal services. From the table 5, it can be assessed that in 1999–2000, in the public administration & defense, social security, industrial sub classification, shares of Muslims workers were 31.10 per cent which declined to 26 per cent in the subsequent period i.e. 2009–2010. The corresponding share for Hindus was 38.50 per cent and declined to 30.40 per cent. Although there are disparities in employment among different religious communities, yet the declined in employment was observed in all religious groups. One interesting fact which emerges from the table is that in 1999–2000, Muslims workers' share in the education sector was 22.60 per cent, which further rose to 30.20 per cent during 2009–2010. The share of Hindus workers in this regard was 24.40 per cent and 29.40 per cent. Increasing shares of Muslim workers in education were due to the slight increase in education among Muslims. It can also be assumed that decreasing share of both Hindus and Muslims workers in defense and public administration sector is due to changes in the preference of youth about this sector. Moreover, the harsh work culture in the defense could be another deterrent for youth to enter into this industry.

Religion Wise Intergenerational Industry Transition Matrix: 2004–2005

Here an attempt has been made to facilitate industry choices of two groups. The purpose is to analyse the relation between fathers' industry choices to that of the sons'. In order to facilitate the presentation, an attempt has been made to aggregate the four digit industry code that individuals report into one-digit. Thus seventeen categories have been grouped into seven broad categories comprising agriculture, Manufacturing, Construction, Trade Hotel etc., Transport, Storage etc., Financial Intermediation, Community Social and Personal services. The result presented in the table 5, as with the education transition matrix, each row of the table denotes the industry of the fathers' employment while the column indicates the industry of the sons' employment. Thus going across the columns along any row *i* would indicate the probability that a household head working in the industry *i* have the sons' working in the relevant industry column. Off-diagonal elements measure the degree of intergenerational industry mobility. The same analysis has been done for both the time period of 2004–2005 and 2009–2010.

Table 5: Religion Wise Intergenerational Industry Transition Matrix in Urban India 2004–2005

All Population	Sons' Industrial Category						
	Agriculture	Manufacturing	Construction	Trade ,Hotel	Transport	Financial Intermed	Other services
Fathers' Industrial							
Agriculture	75.30	5.50	2.10	6.40	4.30	0.80	5.60
Manufacturing	5.80	56.80	5.50	15.30	6.40	1.90	8.30
Construction	10.90	12.30	43.20	13.80	10.10	0.70	9.10
Trade, Hotel	7.00	10.90	4.10	58.80	8.90	2.20	8.10

Transport	9.50	14.50	5.20	15.80	30.10	1.20	23.80
Financial Intermediation	9.00	15.40	4.00	15.60	11.00	22.00	23.10
Other services	3.90	14.60	4.60	9.10	11.60	2.50	53.70
Hindus	Sons' Industrial Category						
Fathers' Industry	Agriculture	Manufacturing	Construction	Trade ,Hotel	Transport	Financial Intermed	Other services
Agriculture etc	75.70	5.00	2.50	6.30	4.30	1.00	5.30
Manufacturing	6.50	54.30	7.30	12.40	6.20	2.30	11.00
Construction	11.70	10.80	44.10	10.10	11.70	0.80	10.70
Trade, Hotel	6.90	11.50	4.70	56.60	8.90	2.50	8.90
Transport	8.60	14.50	5.40	13.10	30.20	1.50	26.60
Financial Intermediation	9.30	18.30	4.90	12.80	11.60	18.40	24.60
Other services	3.80	14.20	3.50	8.40	11.00	2.80	56.30
Muslims	Sons' Industrial Category						
Fathers' Industry	Agriculture	Manufacturing	Construction	Trade ,Hotel	Transport	Financial Intermed.	Other services
Agriculture etc	75.10	7.20	0.20	6.60	5.50	N.A	5.50
Manufacturing	4.00	61.80	1.00	23.50	6.60	1.10	1.90
Construction	7.90	12.90	43.50	27.50	6.20	N.A	2.10
Trade, Hotel	8.00	11.40	3.20	60.80	10.50	0.40	5.80
Transport	9.70	15.40	4.70	24.40	29.20	N.A	16.50
Financial Intermediation	7.60	5.00	N.A	23.30	15.00	32.60	16.50
Other services	4.70	21.80	8.10	15.90	10.90	N.A	38.50

Source: Calculated by Author from NSSO 61st Round Employment and Unemployment Unit Level Data.

N.A: No Population Covered under that Particular Industrial Category.

The table shows some interesting facts. Among all religious groups it is seen that if the father is employed in agriculture and allied industrial sector of the economy, there is a greater probability of sons being employed in the agriculture and allied sector. This sector has highest intergenerational persistence. Intergenerational persistence in a choice of industry is also high in the industrial category of trade hotel, manufacturing and construction while it is low in financial intermediation and transport sector. It is also seen that if the father is in financial intermediation or transport and storage sector of the economy, there is a greater shift in industrial choices of the sons of the household while in other industrial category intergenerational persistence is very high.

Similar analysis has been made to assess the situation in the religious communities of Hindus and Muslims. In the case of the Hindus too it is found that intergenerational persistence is highest in the case of agriculture and allied sector, trade and hotel, manufacturing and community social and personal services while it is low in financial intermediation and transport storage and communication industry. It can be inferred from the table that if the father is in a particular industry, there is very high probability of sons being in that particular industry.

The same analysis has been done for Muslims father son households and it is found that as in the case of Hindus the intergenerational persistence among Muslims are very high in the case of agriculture, manufacturing and trade and hotel industry. It is seen that intergenerational persistence is very high in the case of Muslims than the Hindus religious groups. So one can say that, the influence of fathers' industrial choice on the industrial choice of sons, is greater in the case of Muslims than the Hindus. From the table it can also be inferred that if the father is employed in manufacturing and trade and hotel industry, there is most likely that sons' will also be employed in that sector. If the father is in manufacturing, around 62 per cent of sons' are also in the manufacturing sector and only 38 percent are employed in other industrial category. Thus sons' choices of industry are largely influenced by the fathers' industrial category.

Table 6: Religion Wise Intergenerational Industry Transition Matrix in Urban India 2009–2010

All Population	Sons' Industrial Category						
Fathers' Industrial	Agriculture	Manufacturing	Construction	Trade Hotel	Transport	Financial Intermed	Other Service
Agriculture	84.00	2.70	1.20	3.30	3.10	0.40	5.40
Manufacturing	4.00	57.20	6.90	12.20	7.40	2.40	9.80
Construction	7.30	8.70	51.80	12.40	8.10	1.80	9.80
Trade, Hotel	4.00	8.10	5.10	64.00	7.30	2.10	9.30
Transport	5.10	11.90	9.90	13.20	41.60	2.10	16.20
Financial Intermed	2.30	22.60	3.70	13.70	15.50	19.50	22.70
Other Service	3.80	10.50	9.80	7.40	7.30	2.40	58.80
Hindus	Sons' Industrial Category						
Fathers' Industrial	Agriculture	Manufacturing	Construction	Trade Hotel	Transport	Financial Intermed	Other Service

Agriculture	84.50	2.70	1.30	2.30	2.90	0.40	5.70
Manufacturing	4.00	55.60	6.80	12.30	6.90	3.20	11.20
Construction	6.30	7.90	51.20	12.40	7.50	2.40	12.20
Trade, Hotel	4.40	7.40	5.50	61.90	6.90	2.40	11.50
Transport	6.60	11.70	9.60	11.10	37.20	2.00	21.70
Financial Intermed	2.40	21.20	3.90	11.80	15.20	21.50	23.90
Other Service	4.30	9.60	10.60	7.70	5.20	2.20	60.30
Muslims	Sons' Industrial Category						
Fathers' Industrial	Agriculture	Manufacturing	Construction	Trade Hotel	Transport	Financial Intermed	Other Service
Agriculture	77.20	1.70	0.40	12.70	5.40	N.A	2.60
Manufacturing	2.50	62.20	6.70	12.50	8.90	N.A	7.10
Construction	2.70	14.90	50.50	18.60	12.50	N.A	0.90
Trade, Hotel	2.30	9.80	3.10	71.90	9.70	1.20	2.00
Transport	1.50	3.90	9.50	20.10	58.60	2.70	3.70
Financial Intermed.	3.20	21.70	N.A	34.20	17.50	6.00	17.50
Other Service	3.20	10.90	8.30	11.70	12.10	0.90	52.90

Source: Calculated by Author from NSS 66th Employment and Unemployment Unit Level Data.

N.A: No Population Covered under that Particular Industrial Category.

Religion Wise Intergenerational Industry Transition Matrix 2009–2010

The table 6 shows the interesting fact, during 2009–2010 it is seen that the intergenerational persistence is very high in agriculture industry, the same pattern has been observed in the case of Hindus and Muslims religious communities. Among all religious groups, the table shows the high intergenerational persistence in case of all industrial categories, meaning thereby if the fathers in particular industry, the probability of sons' are being employed in that industry is significantly high.

The religion wise analysis shows the same trend as is observed in the case of total population. The sons of agriculturist are largely employed in the agricultural sector. Not all the industrial category shows high intergenerational persistence as in the case of transport and financial intermediation, the intergenerational persistence is very low. This suggests that the sons' of father employed in these industrial categories moves to other industrial category not necessarily in the industry of his father.

As mentioned before the purpose of this analysis is to see whether intergenerational persistence is the main factor of Muslims being employed in certain industrial groups and not in other. This research finds that the intergenerational persistence among Muslims father son is very high as compare to other religious communities. From the table it can be seen that in 2009–2010 also, high intergenerational persistence has been found in agriculture, manufacturing, trade and hotel. It is also observed that as compared to Hindus intergenerational persistence among Muslims are low in the case of agricultural, while it is high for manufacturing trade and hotel, and transport industry. Thus, one can conclude that among Muslims throughout the period intergenerational persistence is very high in the case of the manufacturing sector. This shows the effect of the historical association of Muslims in this sector and also the influence of fathers' industrial choice, on the sons' industry of employment.

CONCLUSIONS:

To sum up the foregoing discussion it can be said that

- In 1999–2000, a greater proportion of Muslims were self employed. Their shares in regular salaried employment were lower than Hindus. During the subsequent periods, i.e. 2004–2005 and 2009–2010, though there is a rise in the Muslims male and female shares in regular wage employment, they are still lagging far behind the Hindus and other religious communities.
- Industrial category wise analysis of Muslims workers shows that a relatively greater proportion of Muslims were employed in the manufacturing sector. Muslims share in this sector was 28.50 per cent in 1999–2000 which rose to 32.50 per cent during 2004–2005 and further increased to 33.20 per cent during 2009–2010.
- It is also found that a greater proportion of Muslims engaged in trade, hotel and restaurant sector. Muslims presence in financial business and services, and community, social and personal services were lower than the Hindus. This also suggests that Muslims, mainly engage in the employment which does not demand high educational and technical expertise.
- In 1999–2000, within the manufacturing sector, a greater proportion of Muslims workers were engaged in the manufacture of textile (23.10 per cent), tobacco products (13.70 per cent) and wearing apparel (12.70 per cent). Over the period of time Muslims shares in the manufacture of tobacco products declined while their shares in textiles and wearing apparel manufacturing is still very high.

- Muslims presence was remarkable in tanning and dressing of leather manufacturing. In printing, chemicals, publishing, and fabricated metal products manufacturing their shares was negligible. Thus, it can be said that in all those sectors of manufacturing, which requires technical and managerial skills, Muslims presence is conspicuous.
- A significantly higher proportion of Muslims workers were employed in the retail trade sector within the broad industrial sector of trade hotel restaurant and community services. Thus, it can be said that the majority of Muslims are concentrated in retail and wholesale trade industry.
- A sizeable proportion of Muslims workers were employed in community, social and personal services industry sector. Within this sector comparatively higher proportion of Muslims were engaged in public administration and defense.
- In case of Hindus, it is found that intergenerational persistence is highest in the case of trade and hotel, manufacturing and community social and personal services while it is low in financial intermediation and transport storage and communication industry. It can be said that if the father is in a particular industry, there is very high probability of son being in that particular industry.
- The intergenerational persistence among Muslims are very high in the case of manufacturing and trade and hotel industry. The influence of fathers' industrial choice on the industrial choice of sons' is greater in the case of Muslims than the Hindus. If the father is employed in manufacturing and trade and hotel industry, there is most likely that sons will also be employed in these sectors. Thus son choices of industry are largely influenced by the father industrial category.
- In 2009–2010, high intergenerational persistence has been found in manufacturing, trade and hotel. As compared to Hindus intergenerational persistence among Muslims are high for manufacturing trade and hotel, and transport industry. Among Muslims throughout the period intergenerational persistence is very high in the case of the manufacturing sector.

REFERENCES

- Azam Mehtabul and Bhatt Vipul. (2012), "Like Father, Like Son? Intergenerational Education Mobility in India", IZA Discussion Paper.
- Beck Scot H. (1983), "The Role of Other Family Members in Intergenerational Occupational Mobility", *The Sociological Quarterly*, Vol. 24, No. 2, pp. 273–285.
- Blanden, J.P. Gregg and S. Machin (2005), "*Intergenerational Mobility in Europe and North America*", Mimeo, Centre for Economic Performance, London School of Economics.
- Checchi, Daniele (1997), "Education and Intergenerational Mobility in Occupations: A Comparative Study", *American Journal of Economics and Sociology*, Vol. 56, No. 3, pp. 331–351
- Emran M. Shahe and Sun Yan (2011), "Magical Transition? Intergenerational Educational and occupational Mobility in Rural China: 1988–2002", Discussion Paper AEA Seminar.
- Ferreira Francisco and Gignoux Jeremie (2010), "Educational Inequality and its Intergenerational Persistence: International Comparisons", *Unpublished Manuscript, paper presented in IARIW Conference, Switzerland*.
- Garner, Maurie and Lawrence E. Hazelrigg (1974), "Father- to-Son Occupational Mobility in France: Evidence from the 1960s", *The American Journal of Sociology*, Vol. 80, No. 2, pp. 478–502.
- Hnatkovskay Viktoria, Lahiri A. and Paul S.B. (2012), "Breaking the Caste Barrier: Intergenerational Mobility in India", *Unpublished Manuscript*, University of British Columbia.
- Saxena, N.C (1983), "Public Employment and Educational Backwardness among Muslims in India", *Man and Development*, Vol. 5, No. 4, pp. 113 – 149.

1137 NON-WESTERN ALTERNATIVE STRATEGY FOR POPULAR PARTICIPATION IN ENVIRONMENTAL GOVERNANCE PROCESS OF BANGLADESH

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ABSTRACT

In most countries, the demand for environmental conservation percolates upward, from ordinary people to decision-makers. However, in Bangladesh and other developing countries, there is often no demand from the people for environmental protection laws: rather, there may be apathy or hostility to the issue. Therefore, in many such countries, well-constructed laws are not enforced and have no effect. This article explores, first, the underlying cultural and cognitive differences which lead western and eastern people to have very different concepts of the environment and of their roles in protecting it. Then, it develops non-western alternative strategies for making a place for popular participation in environmental protection law and policy which is consistent with non-western culture and philosophy. The study is based on secondary data collected through content analysis method from relevant literatures, research journals, books, news articles, web sites and various published and unpublished materials. The outcome of the study would lead to better environmental results in reality.

Key Words: Environmental Protection, Culture in Government, Western vs. Non-western, People's Participation, Law Enforcement.

INTRODUCTION

In most countries, the demand for environmental conservation percolates upward, from ordinary people to decision-makers. The people form environmental concern groups like [Earth System Governance Project](#), [International Union for Conservation of Nature](#) (IUCN), [World Nature Organization](#) (WNO), [Centre for Science and Environment](#) (CSE), even the Green Party, put the environment in the headlines and make it impossible for the State or major opinion-makers to ignore or forget the Earth.

In America, in the 1960s, it was the 'highway revolts'⁴⁷⁹ against building of new highways that helped to produce the Environmental Protection Act 1970, creating the Environmental Protection Administration. It was ordinary people, sharing information, holding meetings and demonstrations, lobbying politicians etc. whose pressure produced green stickers⁴⁸⁰, saved the whales⁴⁸¹ and the baby fur seals⁴⁸², got genetically-modified food labelling requirements or bans⁴⁸³ and international environmental NGO Greenpeace almost started a war between France and New Zealand over nuclear fallout from bomb tests in the Pacific Ocean in 1985⁴⁸⁴.

However, in Bangladesh, environmental protection has been a "top-down" affair⁴⁸⁵. Donor countries pushed Bangladesh to act and the Government acted, mainly to keep the donations coming. Some say that the real purpose was merely to create an image of environmental protection and not to do anything for the environment. There was no groundswell of support or public demand. Environmental policy is not an issue in Bangladeshi elections, except sometimes at the local level. The majority of the people are apathetic, uninformed or even hostile to environmental protection, especially when it interferes with popular infrastructure construction⁴⁸⁶.

This article will first explore why Bangladeshis have so much less interest in protecting the environment than Europeans, Americans and Australians. Then the article will consider how an effective environmental protection policy can be constructed without such popular support as exists in other countries, in ways more consistent with Asian culture.

PART I

Environmental Policy without Environmental Consciousness: The Bengali Concept of the Environment

Bengalis have a concept of the environment much like that of other tropical, non-western people, like Africans and South Americans, who, not so long ago, lived in nature in a jungle setting⁴⁸⁷. They never looked after nature: nature looked after them. They have a great faith in the power and perfection of nature and cannot believe that anything they do could damage it.

479 Mohl, R. "Stop the Road" (2004) 30 Journal of Urban History 674.

480 See e.g. International Standards Organisation, ISO 14001 and ISO 14000 series.

481 International Whaling Commission Schedule, para. (e) (1982).

482 At least from having their fur sold in the European Union, Commission Implementing Regulation (EU) 2015/1850.

483 Bello, W, "26 Countries Ban GMOs", The Nation (29 Oct 2013).

484 Wilshire, K., "French Spy Who Sank Greenpeace Ship Apologises For Lethal Bombing", The Guardian (6 Sept 2015).

485 Cf. Islam, N., "Protecting Bangladesh's Environment" (2000) 88 Journal of Social Studies 34, at 36 et seq. who lamented the unmet need for a broad-based social movement for the environment in Bangladesh that never existed.

486 As the author found in his study of environmental governance in Rajshahi, Bangladesh, "Environmental Governance of Urban-Local Government in Bangladesh: Policies and Practices" (PhD Dissertation, Institute of Bangladesh Studies, University of Rajshahi, 2015).

487 Cf e.g. Swan, K. and Conrad, K., "The Conflict between Chinese Cultural and Environmental Values in Wildlife Consumption" in Routledge Handbook of Environment and Society in Asia (2014) and Meinert, C., ed. Nature and Environment (2013). Indeed, Oberlin College offers a paper entitled "Nature and the Environment In East Asian Culture" <http://obiemaps.oberlin.edu/courses/nature-and-the-environment-in-east-asian-culture/> accessed 19.5.16.

Western people think of themselves as custodians of the Earth and responsible for maintaining it⁴⁸⁸. Most Bangladeshis are Muslims and the *Quran* says:⁴⁸⁹

Do you not see that Allah has made subject to you whatever is in the heavens and whatever is in the earth and amply bestowed upon you His favors, [both] apparent and unapparent?

Of course, if you believe that nature is created “subject to you”, you do not care so much about what happens to nature. You use it and enjoy, without any responsibility or care for it.

There are other cultural aspects to the difference in thinking too. Western people are teleological⁴⁹⁰: they always ask “what is the purpose?” and believe that they can change the future from action today. Asians conceive of time as the ebb and flow of the sea, believe that they cannot change anything and consider that all they can do is to adjust as everything changes around them⁴⁹¹. Of course, if you believe that you can change the future, you want to act today to save the Earth for your great grandchildren. Yet, if you believe that you can do nothing, the concept of trying to do something is quite silly.

The role of science is also an important source of the differences in thinking between Bengalis and western people about nature. Science is not a Bengali concept. Science is thoroughly western in its emphasis on the objective, on logical inference and on its attempt to understand processes and predict their outcomes⁴⁹². That is not to say that Bengalis do not study science but it is difficult for them: someone who gets “golden A+” (all subjects A+) in the Science stream in the Bangladesh Higher School Certificate is thought of as extremely intelligent, as few can do it. Indeed, a few years ago, almost all the Bangladesh Bank Governors (a highly prestigious position) were Physics graduates, not economists.

The point here is not about who gets better marks in Science but to emphasize that western people instinctively believe and trust scientists but Bengalis do not. If scientists say that the world is being destroyed by our actions, westerners feel that they must stop it urgently. Bengalis are unlikely to understand the scientists, less likely to believe them and may find their predictions of doom rather humorous. The scientists are not like them: they are different

A Different Kind of Politics

Western politics is fundamentally interest group politics⁴⁹³. Parties appeal to different interest groups by offering them the policies they want. In Government, the interest groups jostle for influence and negotiate among themselves to arrive at policy decisions. The pluralist model⁴⁹⁴ predominates and no one can make a decision by himself.

Bangladesh politics is not like that. Policies are handed down by a charismatic Party leader. When there is a coalition Government, the policies may be the result of negotiations between the Prime Minister and her coalition partners. The leader's Party members follow blindly to support the policies, with their lives if necessary and the opposition Party members oppose root and branch. There is no negotiation and interest groups do not take a leadership role to get their preferred policy adopted. Rather, the Parties try to infiltrate, intimidate and puppetise the civil society organizations to get them to support their Party's policy choices.

Therefore, there is no obvious porthole for civil society organizations to use in influencing policy decisions in the direction of protecting the environment. There has never been a Green Party in Bangladesh, although there is now one in almost every western country. The one successful civil society organization on environmental issues, BELA (Bangladesh Environmental Lawyers Association), has not really tried to use the political process to get environmentally-friendly policies. They use the courts to stop environmentally-unfriendly actions and have been very successful in getting High Court injunctions to stop various acts of central and local government.

Some Environmental Movements

Yet things might be changing. BAPA (“*Bangladesh Poribesh Andolon*” meaning “Bangladesh Environment Movement”), is a Bangladesh environmental voluntary society (which stresses that it is not an NGO and receives no contributions) that has achieved some major successes on environmental policy issues. They proceed through seminars, conferences, deputations, press conferences, publications and public rallies. On their website, they claim among their policy successes the banning of plastic bags, leaded petrol and two-stroke engine vehicles⁴⁹⁵. The views and opinions of civil society and NGOs are now given more importance by the Government⁴⁹⁶.

The formulation of NEMAP (National Environmental Management Action Plan), in 1995, was the first time that the Bangladesh Government actively involved the NGOs and civil society, in policy development. The Government

488 One of the most clear examples was the British Government's White Paper, “This Common Inheritance” in 1990, HMSO, Cmnd 1200, “We have a moral duty to look after our planet and to hand it on in good order to future generations”.

489 Quran 22:10 (Surat al-Haj).

490 See e.g. Popkin, R., *The Columbia History of Western Philosophy* (2013) 59 - 61.

491 See e.g. Ames, R., “East Asian Philosophy” in *Routledge Encyclopedia of Philosophy* (2016) (Informa UK Ltd).

492 Siddique, M.N.A., “Values Promoted through Secondary Science Education In Bangladesh” presented at International History, Philosophy and Science Teaching Group Biennial Conference, Notre Dame University, June 24-28, 2009, notes: “Science teachers and science graduates face tensions between Eurocentric science values and teachers' social, personal and religious values”. <http://www3.nd.edu/~ihpst09/abstracts-5.html> [accessed 19.5.16]

493 See e.g. Cigler, A., Loomis, B., Nownes, A., *Interest Group Politics* (2015).

494 Dahl, R., *Who Governs?* (1961).

495 <http://bapa.org.bd/>

496 Mollah, M A H, “The Role of Civil Society In Good Governance” (August 2007) 13 *Social Science Journal* 45. See also Ahmad, M. and Rahman, A., “Stimulating Role of NGOs in Bangladesh” in Misdorp, R., *Climate of Coastal Cooperation* (2011).

“proactively initiated a consultation process, in association with NGOs, journalists, academics, and other segments of civil society”⁴⁹⁷.

The only NGO directly related to Environmental Impact Assessments (EIA) in Bangladesh is the National EIA Association of Bangladesh (NEAB), which was formed in late 1997. It provides a platform for the EIA planners, practitioners and enforcing agencies in Bangladesh. Since its inception, NEAB has been working to create awareness of EIA in all sectors of government planning. It assists in the development and extension of EIA, prescribing a Code of Conduct for EIA professionals, building national capability and establishing a liaison between EIA practitioners and policymakers in Bangladesh. A Memorandum of Understanding was signed between the NEAB and International Union for Conservation of Nature (IUCN), Bangladesh Country Office, in 1999. Under the agreement, IUCN’s Asia Regional Environmental Assessment Program, based in Kathmandu, Nepal, and NEAB are working together to strengthen environmental assessment capacity in Bangladesh.

Bangladesh Environment Network is based in New York City and is composed of Bangladeshi emigrants. They have been mainly assisting in communication about the environment since 1998 and work mostly through BAPA.

Many national and local newspapers and periodicals have introduced *Environmental Pages* on a regular basis. Television and radio are also engaged in broadcasting environmental issues with national and global implications sometimes, especially on 5 June (Environment Day).

The civil societies and NGOs have established effective linkages with the regional and international agencies, including the UN agencies like ESCAP, UNEP, and UNDP, for implementing environmental programs. They have provided training, workshops, seminars, etc. on a collaborative basis. Some research and educational institutions provide important information and policy guidelines to the Government, civil society and NGOs on environmental issues.

PART II

A Non-Western Strategy for Environmental Protection

There are some truths which transcend culture and one of them is that the environment must be protected. People in some cultures may have less information and less concern about the environment but that does not change the fact that their environment is endangered now too. In such cases, dying may be culturally sensitive but it can never be an acceptable result: at least because what happens to one culture on this little globe affects other cultures. Slash and burn agriculture was very much a part of Indonesian culture but the release of huge amounts of greenhouse gases from burning forests punched a big hole in everyone’s ozone⁴⁹⁸, from which we have still not recovered.

So an alternative strategy must be found and that must be culturally sensitive. The alternative strategy cannot depend on the sort of popular movements that have powered the environmental movements in the west but must obtain its legitimacy from the sorts of places that non-western leadership obtains it.

Now let us revise for a moment where non-western leadership gets its legitimacy:

- **Ascribed Status** – age, gender, family background, etc
- **Wealth** – in Asia, wealthy families are liked instinctively and often without reason, sometimes because they bribe everyone generously
- **Association** - people who are associated with persons of high status and influence often obtain some vicarious power and influence from that association
- **Required Status** – as in the Bangladesh local government legislation in 2009⁴⁹⁹, when the leaders require people to participate in a process, even when they would not have dared try, participation becomes acceptable and possible

Using these basic concepts of what gives an Asian the right to participate in a process and to monitor the actions of his social superiors, we can begin to develop the idea of a participatory process of environmental protection policy⁵⁰⁰ not based on environmental consciousness. Participants should be mostly older, male⁵⁰¹ and from famous or wealthy families. They should be associated with people of high status. The legislation should require the participation of other

497 Ahmed, R. and Roy, C., “An Integrated Approach To Environmental Management in Bangladesh” in Werlen, R. (ed.), *Global Sustainability, Cultural Perspectives and Challenges for Trans disciplinary Integrated Research* (2015) at p. 196

498 Augustyn, H., “A Burning Issue” (July/August 2007) 20 (4) *World watch*

499 Local Government (Union Parishads) Act 2009 and Local Government (City Corporations) Act 2009. See e.g. Pranab Kumar Panday, “

500 Bulkeley, H and Mol, P.J., “Participation and Environmental Governance”, *Environmental Issues* (May 2003) no. 2 (2003): 143–54 explain the development of popular participation as an essential concept of environmental governance in the west from the 1980s onward. By 2011, Wesseling, A., Paavola, J., Fritsch, O., Renn, O., “Rationales for Public Participation in Environmental Policy and Governance” (Nov. 2011) 43 (11) *Environment and Planning* 2688 were calling public participation a “mantra” of environmental governance (in the west).

501 It is true that there are women leaders in Asia: in Bangladesh, two women have been Prime Ministers for almost the whole time from 1990 to the present. Yet those women are only there because one is the daughter of the founder of the nation and one is the wife of a national hero who was also a very popular President: both assassinated. This is true in other nations of Asia too: Prime Minister Sirimavo Bandaranaike of Sri Lanka (daughter of a former Prime Minister); Prime Minister Aung San Suu Kyi of Myanmar (daughter of Gen Aung San, who liberated the nation from the Japanese in World War II); Prime Minister Indira Gandhi of India (cousin of Prime Minister Jawaharlal Nehru); Prime Minister Park Choong Hae of South Korea (daughter of President Park Choong Hee); Prime Minister Shinawatra of Thailand (sister of Prime Minister Thaksin Shinawatra). Yes, women can be leaders in Asia: but they need to draw their legitimacy from some popular male member of their family who was a politician or national hero. Similarly, women can be a part of local environmental councils but preferably the daughter or sister or wife of the popular local male MP or male local council Chairman.

persons who do not meet these requirements, to give them their missing status. Inclusion of other persons without the required social status and without legislative mandates might cause the members to lack popular support and respect, so that they are ignored or laughed at in practice.

The picture emerging seems to be one of a kind of Environmental Congress: a group of wealthy, high-status people who are required to act on environmental issues. We can imagine the kinds of issues they would be suitable to act on, not being technical experts:

- auditing expenditures on environmental protection
- hearing complaints against the enforcement or non-enforcement of environmental policy
- developing new ideas for environmental policies
- setting out goals and objectives for environmental policies
- setting up meetings for community participation in developing environmental policies

Such a local Environmental Congress could inject communities with some interest and information about the environment. They could start discussions on needs and priorities. They could hold officials responsible (depending on the powers given to them in the legislation establishing them) or at least ask them questions about what they are doing and why. They could make plans and lay out goals and objectives for improving the environment in their local areas.

Obviously the establishment of such Environmental Congresses would have to be a “top-down” action. No one is rushing to create them. It is their creation in legislation that would give them the legitimacy they need to accomplish their goals. The legislation should set out areas of their authority and give a mandate to investigate official actions, make plans, organize popular meetings, audit expenditures, adjudicate complaints and to submit policy proposals directly to the Minister.

Britain started to involve individuals in environmental policy but this was participation in implementation, not in policy development⁵⁰². Mainly, these were campaigns to educate the public and ask them to carry out policy decisions like making their homes more energy efficient or reduce carbon emissions⁵⁰³.

CONCLUSION

While some environmental organizations have been created “from the bottom up” in recent years, there has not been a fundamental change in the ways most Bangladeshis think about the environment. There is still no widespread demand for environmental protection.

This situation could continue indefinitely: however, there are real consequences to doing so. In the west, strong civil society movements for environmental protection keep pressure on the State, to show action and results. When this is absent, things can tend to settle into a “no noise” situation, where nothing is done and no one complains about it. In politics, “the squeaky wheels get the grease”.

There have been many reports that the environmental laws and policies in Bangladesh and other developing countries are mainly for show and do not lead to any results⁵⁰⁴. This is the direct result of the absence of political and public pressure in favor of these issues.

This is not only a phenomenon of Bangladesh. This is a common reaction of ordinary people to environmental protection in many parts of the developing world. At one level, hungry people care about roads more than trees: yet it runs deeper. As discussed at the beginning of this article, the concept of the role of people in the environment is fundamentally, philosophically and culturally different in non-western societies. What has happened in Bangladesh (or, more accurately, the fact that little has happened) was therefore totally predictable and understandable. Leaving aside the broader issues about non-western societies trying to copy western law to become “modern”, let us just say that the environment is not the right place to do that.

In Brazil, Jose Puppim de Oliveira found that government agencies often fail to implement environmental protection policies mainly because they lack political support, have insufficient resources, have underdeveloped institutional capacity, and tend to overlook the importance of cooperation at the local level⁵⁰⁵. The story sounds the same as Bangladesh. Gamman found a similar picture in his study of the West Indian islands, St Lucia, Barbados and St Kitts. He ascribed this to four major elements: national politics, behavior in the donor agency, the culture of decision making, and economic necessity. So he was one of the first to recognize the role of political culture in the failure of environmental protection in developing countries⁵⁰⁶.

502 Eden, S., “Public Participation In Environmental Policy” (1996) 5 Public Understanding of Science 183 at 185.

503 Eden, S., id. calls this “top-down involvement”, contrary to the Government’s stated goal of participatory involvement.

504 Faure, M., Enforcement Issues For Environmental Legislation In Developing Countries, UNU/INTECH Working Paper No. 19, (March 1995). “Causes of Environmental Law Failures”. www.ecovitality.org/badlaw.htm (accessed on 29.5.16). Africa-Asia Expert Meeting on Enforcement of Environmental Law, Inter-Regional Technical Co-Operation under the Framework of South Co-Operation 19-22 May 2014 Jin Tai Hotel, Beijing China. Rose, G., “Gaps In The Implementation of Environmental Law At The National, Regional and Global Levels” First Preparatory Meeting of the World Congress on Justice, Governance and Law for Environmental Sustainability (12 - 13 October 2011), Kuala Lumpur, Malaysia.

505 Puppim de Oliveira, J., Implementation of Environmental Policies in Developing Countries (2009).

506 Gamman, J., Environmental Policy Implementation in Developing Countries (1990).

Bell and Russell start their article by saying⁵⁰⁷:

Most developing countries have long since established laws and formal governmental structures to address their serious environmental problems, but few have been successful in alleviating those problems.

Now we are arguing that we need to look more deeply, to culture, to understand why. That article said that the problem was caused by international finance organizations pushing market-based solutions on people who lacked the infrastructure and what we might call the “market-based culture” to carry them out. Yet it is so pervasive a problem that we believe it runs deeper than that.

If we care about the environment, then we need to care about what happens to it in the developing world, where many of the problems are. So far, there has been a lot of action in the western countries and not that much real change outside them. If this goes on, the environment will not be improved.

This article has put the argument that there is a fundamental difference in world view between the western and non-western countries about the environment. When we accept and understand it, we can understand why the global summits failed and why environmental protection, western-style, is not working in the non-western countries. So we need to start thinking about ways in which we can be more effective in protecting the environment in the non-western world. This article has put forward one idea for trying to do that: the centrally-sanctioned, locally-based “Environmental Congress”. It is certainly not the only possible way. Yet let us begin to think in such a culturally-sensitive way of new alternatives to get better results in protecting the environment in non-western countries.

507 Bell, R.G. and Russell, C., “Environmental Policy for Developing Countries” (2002) 18(3) (Spring) Issues in Science and Technology.

1180 CITIZENRY AND IRRIGATION MANAGEMENT: A CASE STUDY OF TWO WATERSHEDS OF WEST BENGAL

ABSTRACT

The 73rd Constitutional Amendment Act,1992 introduced the concept of participatory governance in India. Since then participation has been an attribute, common to all avenues of the government. The importance of irrigation for an agricultural economy like that of India called for participation in the decision making and implementation of schemes in the irrigation sector as well. It called for Participatory Irrigation Management (PIM) which refers to the involvement of the irrigation users- the farmers, in the management of the irrigation system-at all levels and in all aspects of management. It called for Participatory Irrigation Management (PIM) which refers to the involvement of the irrigation users- the farmers, in the management of the irrigation system-at all levels and in all aspects of management. PIM is closely linked to Irrigation Management Transfer (IMT), which is the transfer of management responsibilities from the government agencies to the stakeholders or private sector entities. This was attained by organising the farmers and stakeholders into various groups which came to be known as “water users groups”. PIM has a number of advantages over the traditional irrigation management that includes better cost recovery, equitable distribution of water among farmers, reduced tail end deprivation, need based utilisation, ecological benefits, strengthening of the managerial capacities of the beneficiaries etc. A number of projects have been in operation across India which provides for the formation of such user groups. In this paper the Pradhan Mantri Krishi Sichai Yojana (PMKSY)-the erstwhile Integrated Watershed Management Programme (IWMP), has been studied to understand the status of PIM. For the purpose, PMKSY programme (IWMP7/ Batch III) in the South 24 Parganas and (IWMP 1/ BATCH III) in the Bardhaman (west) districts of West Bengal have been considered. The study has been made since the inception of the project in 2011-12 till the current year 2016-17. The agro- ecological condition of the South 24 Parganas district is well suited to the cultivation of horticultural crops. This is hindered by the unavailability of sweet water in the region and the prevalence of conventional farming techniques among the farmers. Bardhaman faces the shortage of cultivable land. The study here reveals how the organisation of local masses into various user groups, under the assistance of the watershed committees and the government departments, benefitted the regions. The study of two districts from two diverse agro-climatic regions show how the local needs vary climatically, thus necessitating the proper comprehension of local needs. Thus the study at the micro level, reveals how potential based planning can be enabled using the local expertise and involvement of the “folk”. It calls for a better understanding of the positive effects of grassroot level planning that includes the citizenry at levels of planning, its implementation and proper execution. : Participatory Approach, Grassroot Level Planning, Citizenry, Participatory Irrigation Management, PMKSY.

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1204 THE STATE DETERMINED GROWTH CENTER AND VACUUM IN REGIONAL DEVELOPMENT: A STUDY OF OF ULUBERIA INDUSTRIAL GROWTH CENTER, HOWRAH, WEST BENGAL, INDIA

ABSTRACT

Growth Center Strategy is a very familiar approach in regional planning. Growth centres are considered as potential for optimum utilization of existing resource basewith least environmental degradation for a sustainable development of a defined region. It is the task of regional planner to identify and plan growth centers after detailstudy of socio economic and historical background of a region. But it is often found that the state itself labels some sites as growth center that sometimes lack detail study of the socio economic structure and historical background of the region. This paper envisages the impact of such state determined Growth Center in regional development with a case study of Uluberia in Howrah District, West Bengal. Uluberia GC was planned during 90's along with other 7 growth centers in a Plan named "Vision 2025" by Kolkata Metropolitan development Authority to fulfill multifaceted objectives i.e. reductionof congestion problem of Kolkata metropolitan area, industrial resurgence, overall regional economic growth through local employment generation. The basicpremise behind such planning was that the location lies outside the embargo of the metropolitan area, and if proper infrastructural support could be channelized in effective manner it would result into overall regional development without increasing pressure in Kolkata Metro city. For this purpose i) the industrial units have been classified in terms of size, pollution categories, types of products, employment generation capacity etc. ii) The pattern of functional linkage of this growth center also been identified by the manufactured product supplyand labour supply areas. iii) The study also attempted to determine the success of the studied centre for fulfillment of its planned objective. It is found that the area is functionally linked with different parts of the country (West Bengal, Mumbai, Gujarat, Madhya Pradesh, Uttar Pradesh etc.) as well as abroad (China, Middle East countries, USA etc) through collection of raw material and delivery of finished product. The Uluberia GC employs approximately 2500 persons but more than 50% of labour are coming from other than Howrah region (Midnapore, South 24 Parganas, Hooghly, Kolkata). On the other hand, 30% of industries closed permanently and some of them are facing industrial sickness due to strong competition, adverse effects of demonetization, increased transport cost. It is realized that the 'growth center' lacks thequalities of a true growth Center as they are. The growth center planning for Uluberia does not taken into consideration the availability of local resource and local linkages and acts as a segregated industrial area. This planned growth center plays the role of isolated industrial pocket. It neither fulfils the goal of its planning i.e. to reduce the burden of Kolkata nor does it succeed to exert growth for its immediate region. It calls for preparation of a proper regional plan through reducing the specific growth generating factors for the area. Key words: Growth Center, Functional Linkage, Regional Planning.

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SS13.2. Citizenry and Regional Planning

1254 ROLE OF THE COMMUNITY RESIDING IN NEW TOWN IN THE PLANNING AND DEVELOPMENTAL PROCESSES TAKING PLACE IN THE TOWNSHIP

Kahini Ojha, Aritra Chakraborty

1 INTRODUCTION

A city or town is made of the people, by the people and for the people. In fact, it can be said that the inhabitants of a city or town are the ones who give life to the urban space, making it a living entity with a distinct cultural landscape. Hence, the government and people in authority should place the citizens as the first priority before formulating any developmental policies. It is essential for any inclusive city to have citizens who are aware, better informed and is capable of thinking ethically and sustainably before conducting their daily activities. In this regard, Singapore sets an excellent example of how sincere efforts made by the government in giving immense significance to the quality of life and making its citizens the first priority, acted as a catalyst for Singapore to become an inclusive and 'Intelligent Island' with high human development index (Mahizhnan 1999).

The urban population of India is growing at a faster rate than its total population. This is especially true in case of the Indian metropolitan cities. In fact, the India: Urban Poverty Report of 2009 estimated that by 2030, 41% of India's population would reside in urban areas. It is paradoxical that to deal with the socio-economic problem of the immense pressure created on the urban areas, India has adopted the approach of creating new satellite towns near the metropolises to decongest them, instead of adopting measures to regenerate the existing socio-economic conditions of the cities. This approach of India has been termed as the "bypass" approach by Bhattacharya and Sanyal (2011) who are of the opinion that this would just solve the problem temporarily.

Park, Burgess and McKenzie (1984) were of the opinion that a city 'is something more than a congeries of individual men and social conveniences.' Thus, a city can be defined as:

a state of mind, a body of customs and traditions, and of the organized attitudes and sentiments that inhere in these customs and are transmitted with this tradition. The city is not, in other words, merely a physical mechanism and an artificial construction. It is involved in the vital processes of the people who compose it; it is a product of nature, and particularly of human nature (Park, Burgess and McKenzie 1984, p.1).

In this age of globalization, the urban elite want to be a part of the global cities for the attainment of which the large cities are going through the phase of gentrification. Since the 1900s, the concepts of urban metabolism, smart cities, sustainable cities and green cities have been popularized by renowned global institutions and scholars; citing their significance in tackling with the perils of the rapid pace of urbanization. Thus, the policy makers have key role to play in improving the quality of life of the people living in cities and to make the cities liveable. Lindfield and Steinberg (2012) were of the opinion that a city could be considered to be a green city only when measures were 'undertaken in a comprehensive, planned manner that not only positively impacts the city in question but also contributes to environmental sustainability at the global level.' Thus, the whole idea behind the creation of green cities is to make these cities liveable.

Green cities are becoming an integral part of urban planning in the contemporary times. 'The green city is an ideal of universal appeal that transcends temporal, special and cultural divides' (Hestmark, cited in Jim 2004). It can be assumed that a city with high quality of green spaces could be considered as an example of effective planning and management which is suitable for establishing a healthy environment for humans and flora and fauna in general (Adams and Leedy, Johnston, Godefroid, cited in Jim 2004). Thus, green cities can be defined 'as those that are environmentally friendly' (UNEP 2011). Some cities are also called green because of their highly ambitious green policies which aim towards better environmental performance.

New Town is a satellite town of Kolkata, located in the district of North 24 Parganas of West Bengal, India. It is a fast growing planned township which is situated in the eastern part of the Kolkata Metropolitan Region. New Town had nailed it into the smart city status in the second round of the Smart City Mission of India. Since, the Government of West Bengal was against imposing water tax and was sceptical about the outcome of pumping in Rs.500 crores from the corporate sector to match the grants given by the Central Government of India, the former decided to spurn the smart city offer (*The Telegraph Metro* 18 August 2016, p.15). Thus, keeping in mind the long term development of the region, in 2016, the Government of West Bengal decided to develop New Town into a green city instead of a smart city.

The authorities in charge of New Town have adopted a set of progressive policies which are easily available and accessible to the public in the official website of New Town Kolkata Development Authority (NKDA) to make them operative in a transparent manner. However, it is most important for the inhabitants of the township to be aware of these policies, especially the ones related to the Green City Mission to successfully and effectively transform New Town into a green city. Thus, this is a unique feature of New Town, where the Government is trying to incorporate its citizens in the planning process by initiating e-governance and other awareness programs to ensure an inclusive and holistic development of the township.

2 MATERIALS AND METHODS

A mixed approach comprising of both qualitative and quantitative techniques have been used to prepare this report. The various sources of the secondary data collected were the daily newspaper *The Telegraph* (especially its Friday edition *salt lake*), journals, blogs, the information provided in the official websites of NKDA and Housing Infrastructure

Development Corporation Limited (HIDCO) and by interviewing a few government officials of NKDA and Bidhannagar Municipal Corporation (BMC). Primary data was collected by interviewing randomly selected one hundred and seventy residents of Action Area - I of New Town (which is the most populous and developed part of the township) with the help of a detailed questionnaire.

Simple, cartographic techniques had been used to analyse the data obtained. Likert Scale was used to analyse the questions where the respondents had been asked to rate the amenities that the township provides them. There were also a few open ended questions in the questionnaire schedule which were meant to study the perception of the people about their township. Such perception based questions were analysed by using the software NVivo 7 and online word cloud creating software.

3 THEORY

New Town which was carved out of the larger area of Rajarhat in the later years of its developmental process was erstwhile a fertile piece of agricultural land. The land use pattern of New Town has gone through a drastic change over the years from being a prosperous piece of agricultural land to completely being converted into a township with no agricultural land in it. It is a well planned modern township with an approximate population of 70,000 to 90,000 people residing in it and an approximate population of 30,000 to 60,000 people commuting to and from it for work (NKDA 2017). After Sector V of Salt Lake, New Town forms the second IT hub of the Kolkata Metropolitan Region. New Town is enabled with 10.5 km of Wi-Fi Zone connecting the Major Arterial Road stretching from the Airport to Sector V of Salt Lake. It is India's first Wi-Fi road connectivity and this stretch has already been declared as a green corridor (Chakraborty 2014).

The State Urban Development Department has planned New Town's Green City Mission by taking suggestions from the Indian Green Building Council, Indian Institute of Technology Kharagpur, Kolkata Municipal Corporation and the Confederation of Real Estate Developers' Association of India. By adopting the "green" policies, New Town has taken a leap towards achieving its development in a sustainable manner. Since, New Town is still at an early stage of development, it is remarkable to see the progressive transformation that is taking place in the township to make it an environmental friendly and inclusive town.

One hundred and seventy people residing in Action Area - I of New Town were surveyed about the extent to which they as citizens were aware of the Green City Mission, the developmental works taking place in their township, the amenities that they are entitled to in their neighbourhood and the facilities that their residential complexes provide them. Action Area - I was selected as the study area since it is the most inhabited and developed part of New Town.

3.1 Emergence of New Town as a place of residence

New Town as a township is approximately a decade and a half old. The sudden growth of real estate after liberalisation witnessed innumerable stakeholders building modern residential complexes in New Town. Though many residents said that they had bought their land many years back, they had shifted recently after the construction work had completed. There were also a few people who bought apartments in New Town as assets since the price of land of New Town has been ever increasing since its inception. Such people visit their apartments once in a while as they mostly live in their house which is in the proper city of Kolkata.

Among the people surveyed, most of them claimed that they were residing in New Town for less than five years. Many among such people were students and employees studying in schools or colleges, or working in the offices of Sector V, New Town, Salt Lake and Kolkata. Thus, these people who recently moved into the township were mostly people who hailed from places outside the Kolkata Metropolitan Region and came to New Town for the livelihood opportunities available in this growing township. It is to be noted that a significant percentage of people came from other districts of West Bengal and even outside West Bengal who live in New Town in rented apartments. This shows how the livelihood opportunities of New Town has acted as a pull factor in attracting people from far and wide places to come and reside in New Town.

People who were residing for more than five years were all permanent residents. An important fact that can be inferred from this is that though New Town had started experiencing in flow of residents from more than ten years ago, it witnessed maximum in flow of residents in the last five years. This also reflects upon the fact that there has been rapid pace of urbanization and development of New Town in the last five years.

Some of the people said that they had shifted to New Town as they had bought their own home. Thus, it was a shift from rented apartment to own apartment. These people lived in different parts of Kolkata and chose New Town as their permanent place of residence because it is a well planned city in their opinion. Many retired people exclaimed that they shifted to New Town to move away from the congested city life of Kolkata. There were happy with the open space available in the township. Few among these people were old couples who lived by themselves as their children do not live in the same city. Thus, they chose to move out from the hustle bustle of congested city life and live within a peaceful environment.

3.2 Background of the residents

New Town from its very conception had been built for the urban elite. Most of the people surveyed had responded by saying that their family income (per annum) ranges between Rs.6,00,000 to Rs.9,00,000, followed by people with family income above Rs.9,00,000 per annum. Only 28% of the people said that their family income (per annum) ranges between

Rs.3,00,000 to Rs.6,00,000 and a mere 5% of the people said that their family income (per annum) was less than Rs.3,00,000.

Thus, it can be inferred that New Town comprises of people belonging to the upper class and upper middle class. These are the people who have chosen New Town as their place of residence to avail the modern amenities and experience world class infrastructure. New Town is being planned following modern city planning guidelines and this is what is attracting people to shift to New Town. With the skyrocketing price of land of New Town, it has become one of the posh localities of the Kolkata Metropolitan Region.

From the survey it has been seen that while proper Kolkata still dominates the place of work or the location of the school or college of most of the respondents, it is closely followed by Sector V. After Sector V, it is Salt Lake and then New Town which forms the destination of the place of work or college of these respondents. Most of the people surveyed were either students or people belonging to the service sector. It is to be noted that New Town is barely more than a decade old. So, going by the age of the Kolkata and Salt Lake versus the age of New Town, it can be said that New Town has made remarkable growth in providing livelihood opportunities not only to its own residents, but also to the residents of the Greater Kolkata. In fact, the central business district of New Town which is still under the planning and development process claims to be the next commercial hub of the Kolkata Metropolitan Region.

The survey result reflects upon the fact that New Town has emerged as a township where people who migrated to Kolkata for educational and employment purposes, have made their temporary homes. Due to its proximity to Sector V of Salt Lake which is the IT hub of Kolkata Metropolitan Region and which also houses a number of commercial and educational institutions, these migrants have chosen New Town as their place of residence. It was also found out that people chose New Town as their place of residence because of its comparatively cheaper rent than Salt Lake.

4 RESULTS AND DISCUSSION

4.1 Awareness of the citizens about New Town being transformed into a green city

New Town is under the massive ambitious mission of getting transformed into a green city. However, it is most important for the inhabitants of the township to be aware of this Green City Mission to successfully and effectively transform New Town into a green city.

From the survey undertaken, it has been revealed that more than 50% of the people are aware of the basic concept behind a green city and the fact that New Town is being transformed into a green city. This is an important point to be noted since it is this basic awareness of the citizens about their township that is praiseworthy. Those few people who said that they were not aware of New Town being transformed into a green city were the people who were not from the Kolkata Metropolitan Region and had shifted to New Town recently.

Newspaper formed the source of information about the Green City Mission of New Town to 68% of the residents, while 14% of the people came to know about the Green City Mission from the hoardings that were displayed in the township. This reflects upon the pivotal role of media in spreading awareness among the people about the Green City Mission of New Town. Spread of word from acquaintances about New Town being transformed into a green city formed the source of information to 17% of the residents; and from this it can be said that the people were genuinely enthusiastic towards the initiation of this green city project. However, only 1% of the people came to know about the Green City Mission from government websites like the official website of NKDA and WBHIDCO. The fact that the government had put up notices in its website, shows the interest of the government to involve the citizens of New Town in the planning process. This was an important initiative taken up by the government to create an inclusive society but unfortunately very few people had availed this medium to obtain their knowledge.

It was good to see that majority of the people were enthusiastic about this mission and looked forward to the changes that were taking place in the township to make it a green city as 55% of the residents said that they keep a follow-up of the news updates on the Green City Mission of New Town, while 45% of the people said that they do not bother themselves with it. Among the people who kept a follow-up of the happenings of their township, 88% of the people banked on the newspaper to acquire information, while the remaining 12% people got the information from their acquaintances.

Whether the residents were criticizing some of the policies or were in praises for the policies initiated by the government to transform New Town into a green city will be discussed in the later part of this article; but the fact that they were getting themselves involved in the discussion is what needs to be appreciated. Their eagerness, their opinions, their acute sense of belongingness and some of their possessiveness towards their township is what reflects upon the love and the healthy relationship that the residents share with their place of residence.

4.2 Role of the government in spreading awareness among the citizens about the Green City Mission

One of the most important aspects behind creating a green city is to make its citizens aware of the concept behind a green city. From the survey conducted it was revealed that 35% of the people confirmed about the awareness programmes that were being held by the government where the opinions of the residents were asked for to make New Town a more citizen-friendly township. The residents who said that there were awareness programmes held and their opinions were asked for, mentioned the various ways in which the government had made them aware and had asked for their opinion. The different ways in which the government had approached the citizens were:-

- Letters were sent to some of the respondents. In the letters, the government had made them aware of the Green City Mission and had asked for their opinion regarding what are the changes they would want to see in the township.
- While inaugurating one of the parks in New Town, the people present in the inaugural ceremony were made aware of the Green City Mission of New Town and an interactive session was held where the opinions of the residents were being asked for regarding the changes they wanted to see in the township.
- Some of the residents had submitted the changes they wanted to see in the township to the 'Durga Puja Committee' of their residential complex and their letters were sent to NKDA.
- Some of the residents said that they had received text messages in their phone where they were made aware of the Green City Mission and their opinions for asked for regarding the changes they wanted to see. However, one of the respondents said that only those people who had registered themselves as residents of New Town in the official website of NKDA were the ones who got text messages from the government.
- During a medical camp that was held in one of the parks in New Town, the people present over there were asked to fill up forms stating the changes they wanted to see in New Town.

Some of the respondents said that though they were not present in the awareness programmes, they had heard about it from their acquaintances.

4.3 Extent to which the residents were aware of the facilities provided to them by their residential buildings

Green buildings form an integral part of any city that claims itself to be a green city. This aspect of the green city especially needs to be taken care of because of the rapid pace of urbanization taking place in the township.

Most of the respondents lived in residential buildings with 5 to 15 floors, followed by buildings with up to five floors and then buildings with more than fifteen floors. The floor of a building is indicative of the height of the building and this is why this was an important question that had to be asked to the respondents. It has been mandated by the authorities that buildings above the height of 15 metres should install solar panels and in the next section of this article, it would be seen that all the respondents who said that their residential buildings have solar panels installed it, live in buildings which have more than fifteen floors. Also the more the number of floors, it can be expected that the more will be the number of modern amenities available to the residents of such buildings. This is because such buildings are constructed by large real estate companies whose target group comprise of the urban elite who do not want to compromise on neither luxury nor amenities.

A large number of people said that they do not have any idea about whether their building is green certified, or have solar panels or water harvesting/recycling system but another significant percent of respondents said that their buildings do not have any of the three mentioned aspects that a building present in a green city should have. Among the three mentioned criteria, solar panels being installed dominated the rest, followed by the building being green certified and then having water harvesting/recycling systems. Most of the respondents who said that their buildings fulfil all the three aspects mentioned above, or at least two among the three aspects, belonged to high rise buildings having more than fifteen floors. It is to be noted that the concept behind transforming New Town into a green city was initiated in the year 2016, and the respondents who had been surveyed lived in residential buildings that were constructed way before that. Thus, it can be said, in due course of time more buildings are expected to come up that would abide by the green building norms.

4.4 Role of the residents and the extent to which they are aware of the amenities present in the township

It is important for any settlement to have residents who are aware of their surroundings and the amenities that they are entitled to. The same principle applies to New Town and it is more important for its residents to be aware citizens because an important aspect of green city is having citizens who are aware and are eager to actively participate in the functioning of the city in their own small ways to create an environmentally friendly urban space.

Having access to WiFi is an important aspect of any modern city that plans to function through e-governance. This is because if free WiFi is provided it would encourage the residents to actively be a part of the e-governance. New Town has taken up e-governance seriously and has also set up the Bishwa Bangla network for providing free WiFi to the people present in New Town. However, this WiFi is available only through the 10.5 kilometre stretch of Major Arterial Road stretching from Sector V of Salt Lake to Airport. Thus, the WiFi connectivity works well only in and around the area of the Major Arterial Road, while the places away from it either do not have access to it or face the problem of poor network.

Among the people surveyed, most of them said that they have access to the free WiFi provided by the government, while another group of people said that they do not have access to the WiFi as their residential area is out of coverage of the network. Some people also said that though they have access to the free WiFi, the network is poor and cannot be used effectively. One of the respondents said that the government is planning to set up another WiFi tower near her house which would provide free WiFi to the people who are living away from the Major Arterial Road.

Unfortunately most of the people surveyed were not aware of the online system of lodging complaint in the official website of NKDA. This is an important part of e-governance where people can fill up a citizen grievance form available in

the official website of NKDA and lodge a complaint without going through the hustle of physically visiting the NKDA office. It is a privilege that the citizens of New Town are entitled to but due to the unawareness of the citizens, this facility has not been utilized in its full potential. When the respondents who were aware of the system of lodging online complaints were asked if the system is effective and responsive, all of them unanimously said that they have no idea as they had never lodged a complaint. This reflects upon another issue that people are satisfied with the basic facilities like supply of water and electricity in their home. Till a few years back New Town was in the news for the high iron content in the water that it supplied to its residents. However, after the recent establishment of the water treatment plant near Nazrul Tirtha, this problem has been solved.

On being asked whether the respondents segregate wastes into biodegradable and non-biodegradable wastes, other than a few people, the majority said that they do segregate wastes before disposing them. It was good to see that most of the people abided by this waste management norm set by the government. In fact, when the respondents were asked whether there are sufficient wastebins in the township, they all unanimously answered by saying that there are sufficient wastebins in the township. A striking fact about New Town is its picture perfect cleanliness.

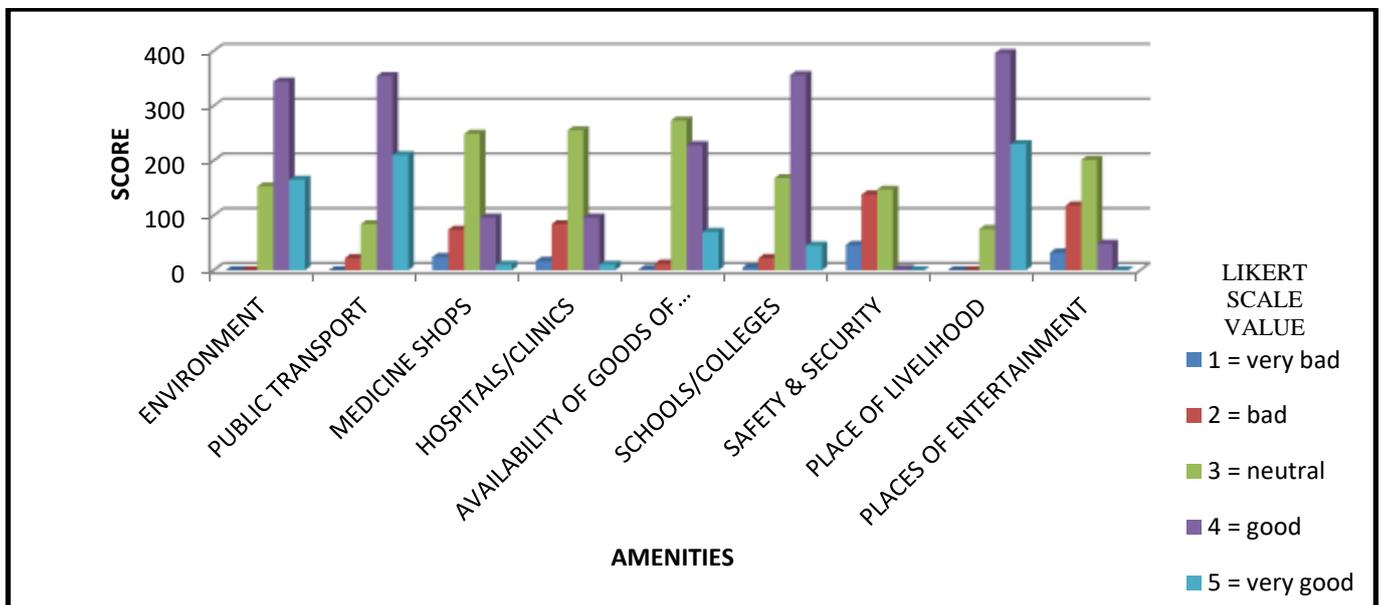
One of the key and basic aspects of the Green City Mission of New Town is to increase the green cover of the township. But from the data collected, it was revealed that the indiscriminate felling of trees to make way for construction work and further urbanization is still continuing. The respondents who are residing in New Town for a long time said that over the years the greeneries of New Town has been declining. Quite a few respondents said that leaving aside the part of land occupied by Eco Park, large extents of the township are devoid of sufficient greeneries. On the other hand, people who had shifted to New Town recently or had shifted to New Town from congested places were of the opinion that New Town has sufficient greeneries/water bodies/parks.

The survey conducted revealed that some of the major concern of the respondents were regarding the increasing air and noise pollution arising from the construction sites and lack of sufficient public washrooms in the township. Few respondents also complained regarding lack of usable pavements because of the hawkers encroaching the pavements. But there were also many respondents who were satisfied with the available pavement space and were not disappointed with the hawkers as they were themselves loyal customers of the hawkers.

ATMs and banks form an integral part of our daily lives. Thus, proximity of residences to ATMs and banks have become an important aspect to judge the quality of infrastructure available in a town or city. When the residents were asked how far is the nearest ATM or bank from their place of residence, all the one hundred and seventy respondents answered by saying that they are located approximately within 1 kilometre of radius from the place of their residence. This remarkable feature shows the demand for such infrastructures in the township. Presence of such financial institutions nearby also reflects upon the fact that New Town is indeed a posh locality which has more ATMs or banks present than the number of medicine shops!

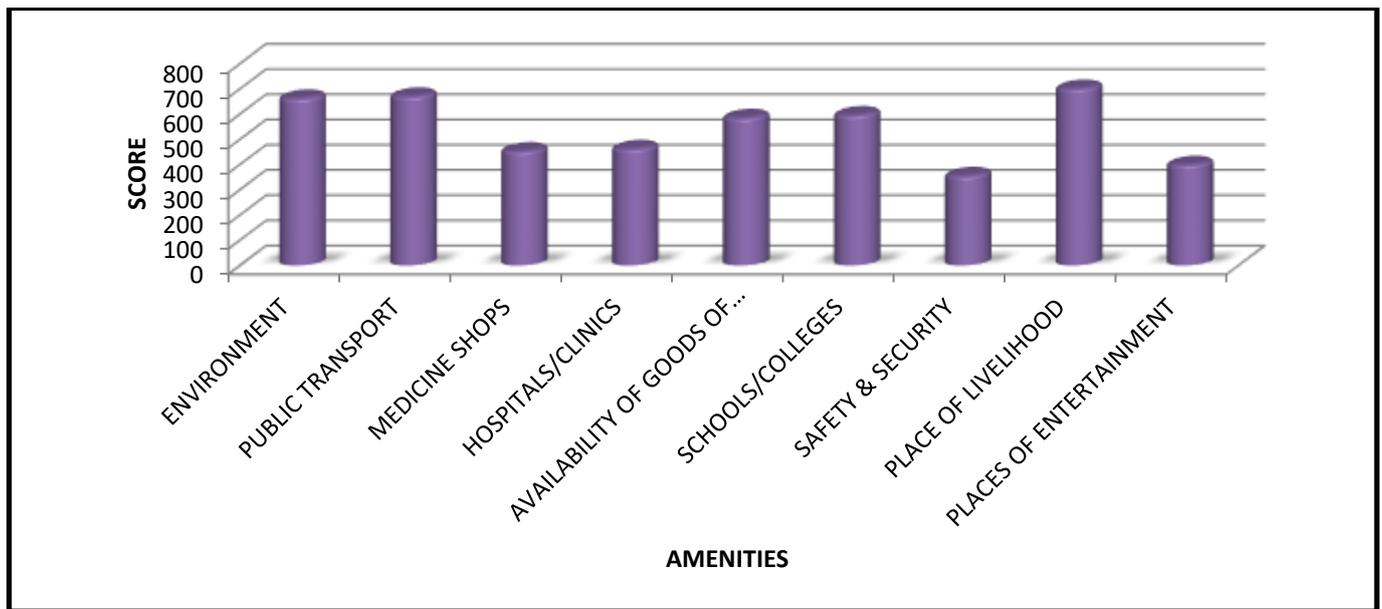
4.5 Resident’s perception of New Town

The perception of the residents on the town where they reside is of great importance. The most important part of the primary survey was to study the residents’ perception of New Town. For studying this, Likert Scale was used to rank the amenities available. The other opinion based open ended questions asked were - what in their opinion is the best part of living in New Town, the major drawbacks of New Town and what are the changes they want to see in New Town. From the answers received for these three questions, word frequency query was run in NVivo and then word frequency clouds were prepared to analyse the data. Going by the rule of word frequency cloud, the more the number of times a word has been mentioned in the data collected, the bigger would be the size of the word in the word frequency cloud created, hence, reflecting upon the importance of that word.



(Source: Primary Survey)

Fig. 1: Study of the respondents' perception on the amenities available in New Town, using Likert Scale



(Source: Primary Survey)

Fig. 2: Total score of each of the amenities calculated from the Likert Scale values

In Fig. 1, the score has been calculated by multiplying the number of respondents who had chosen a particular Likert Scale value with the value of the Likert Scale chosen by the respondents. While Fig.1 shows the individual Likert Scale score of each of the amenities, Fig. 2 shows the total score of each of the amenities.

From Fig. 1 and 2 it is clear that according to the respondents, New Town serves as an excellent place of livelihood while safety and security of the township is very poor. The reason behind the high score of place of livelihood is the presence of innumerable commercial institutions in New Town and its close proximity to Sector V of Salt Lake which is the IT hub of the entire Kolkata Metropolitan Region. On the other hand because New Town is still under the process of development and is dotted by large vacant plots of land with construction work going on, it serves as the hide-out of the anti-socials and the criminals at night, which is why it makes the township an unsafe place, especially at night.

Environment and public transport also scored high and individually had high Likert Scale values. As far as the environment is concerned, people gave high Likert Scale ranking for the clean and peaceful environment, while some respondents gave low Likert Scale ranking because of the pollution caused by the construction sites, presence of hawkers and safety and security issues. Public transport received high Likert Scale ranking by the people who reside near the Major Arterial Road, while those who reside in the interior parts, gave comparatively lower ranking. However, the overall score of environment and public transport are high.

Availability of goods of daily need and presence of schools/colleges have also scored moderately well. Those who had given low ranking to availability of goods of daily need, stated that the township is devoid of sufficient mechanical repairing shops, standard shops selling groceries (not hawkers or malls) and petrol pumps. Some of the respondents had given low ranking to the availability of schools/colleges in the township stating that there is a lack of good primary schools/colleges teaching non-technical subjects. On the other hand, schools/colleges received high ranking by those who stated that even though there are not many educational institutes within New Town, but plenty of them, especially colleges are present in Sector V which is in close proximity to the township.

The scores of hospital, medicine shops and clinics, and places of entertainment are on the lower side of the score card. Respondents who had given low ranking to hospital said that there should be more government hospitals and multi-purpose hospitals established in the township. Many of the respondents complained that medicine shops are found in clusters in the township and are not ubiquitously distributed; while there is a severe lack of doctor's chambers and clinics in the township. Mixed reviews were derived from respondents ranking places of entertainment as the middle aged and the old people were fairly satisfied with the places of entertainment available; while the youth gave low ranking to the availability of places of entertainment. This is because the youth complained of lack of standard restaurant chains, lounges and nightclubs in the township.

Thus, by using Likert Scale, we have been able to derive at a wide range of opinions on the amenities available and not sufficiently available in New Town. It was a useful technique to assess the areas of strength and weakness of New Town.

Word frequency query was used in NVivo 7 to check the number of times a particular word has been used. It is an obvious fact that the more number of times a particular word is used, that word would be of greater relevance. Word frequency query is an important technique that can be used to NVivo to effectively analyse qualitative data.

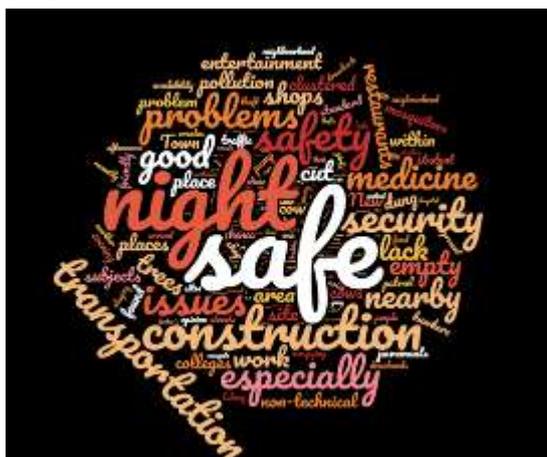


(Source: Primary Survey)

Fig. 3: Word frequency cloud on residents' opinion on the best part of residing in New Town

Fig. 3 gives a glimpse of the word frequency query that was being run in NVivo 7 using words which were drawn from the comments made by the respondents to the question on what according to them is the best part of living in New Town. From the figure it can be seen that words like 'clean', 'peaceful', 'city planned', 'nice environment', 'congested' (implying less congested), 'greens', 'modes' of 'transportation' and 'e governance' have been most frequently used words.

Thus, it can be inferred that according to the respondents, the cleanliness of the well planned township, the peaceful environment, less congested space, greeneries and different modes of transportation available are the various advantages of living in New Town. The combination of these various factors acts like the pull factor attracting more people to come and reside in New Town.



(Source: Primary Survey)

Fig. 4: Word frequency cloud on residents' opinion on the worst part of residing in New Town

From Figure 4 we can at a glance see the most frequently used words by the respondents when they were asked what according to them is the worst part of residing in New Town. From the figure it can be clearly seen that words like 'safe', 'safety', 'night', 'construction', 'security', 'transportation', 'medicine', 'empty', 'trees', 'restaurants', 'entertainment', 'mosquitoes', 'college', 'hawkers', 'petrol pump', and 'drunkards' are some of the most frequently used words.

Thus, it can be inferred that safety and security, especially at night is a matter of major concern of most of the respondents. Some of the respondents also complained of drunkards being seen in the empty streets at night. People were also disappointed with the pollution caused from the construction sites and the indiscriminate felling of trees to make way for the construction work. Lack of sufficient modes of transportation at night, prevalence if too many mosquitoes, lack of sufficient number of petrol pumps in the vicinity, lack of non-technical colleges and lack of restaurants and places of entertainment in the township are some of the major drawbacks of residing in New Town.



(Source: Primary Survey)

Fig. 5: Word frequency cloud on residents' opinion on the changes they wanted to see in New Town

Figure 5 shows the result of the word frequency query that was run in NVivo 7 using words drawn from the response made by the respondents when they were asked about what are the changes that they would like to see in New Town. From the figures it can be clearly seen that words like 'security', 'entertainment', 'safety', 'police', 'transport', 'patrolling', 'medicine', 'construction', restaurants', 'trees', 'petrol pump' and 'lounges' were some of the most frequently used words.

However, this question had drawn different opinions from people belonging to different age groups, except the common issue of safety and security which everyone irrespective of their age group were concerned about and wanted the authorities to take initiative to make New Town a safer township to reside in. Some of the respondents had also suggested that there should be police patrolling at night to increase the safety and security of the township.

It was noticed that respondents belonging to the younger age group wanted more places of entertainment like good restaurant chains and lounges to open up in the township. On the other hand, most of the elderly respondents wanted more medicine shops and clinics to open up in New Town.

Most of the respondents said that they were waiting for all the construction work to get over as soon as possible because the construction sites were causing pollution. Some of the respondents also said that they were eagerly waiting for the construction of the East-West Metro Rail service to get over soon so that they can travel in metro. Some of the respondents also said there needs to be more petrol pumps established in the township.

Many among the respondents said that they would like to see more trees being planted in the township as a whole and not only in Eco Park. Some of them said that because New Town is gearing up to become a green city, the authorities should pay special attention to increasing the green space of the township ubiquitously and not only focus upon Eco Park.

5 CONCLUSION

It can be said that a trend of the government has been observed where huge investments are being made behind developing the infrastructure and beautification of the township; while there are major setbacks noticed in providing the citizens of New Town with some of the basic amenities like a safe environment and ubiquitous distribution of medical facilities and green space. For a holistic development of the township, the authorities should first focus on providing the basic amenities like safe and secured environment, provision for more ubiquitously distributed medical facilities and at last but not the least prevent further felling of trees in New Town. Other investments should be made after these basic amenities are being made available to all the citizens of the township.

Some of the important observations made and recommendations suggested are:-

- The authorities have made sincere efforts to spread awareness about the Green City Mission among the residents of the township. However, a gap has been observed between the efforts made by the authorities and the residents, as all the residents are not aware of the awareness programmes that were held in the township. Majority of such people comprise of the working people.

Thus, such methods of spreading awareness should have been applied where all the residents would have been aware of the happenings in the township. Like for example, hoardings should have been put up by the traffic signals, in the bus terminus and outside major places of public attraction like Eco Park, City Centre 2, Axis Mall, Nazrul Tirtha, Rabindra Tirtha, Mother's Wax Museum etc. to make the people aware of the government's ambition of turning New Town into a green city and the other developmental works that are taking place.

It would have been even better if the authorities would have asked the residents to fill up online forms about what are the changes they wanted to see in the township. This could have been done through sending push messages to the residents in their mobile phones with the link of filling up the online form. In this way, it would have been an inexpensive means of reaching out to the mass and creation of a more inclusive society.

- Though the authorities of New Town have made provisions for e-governance, unfortunately very few residents are aware of it. The same applies to some of the other amenities like new public washrooms that have been

constructed; or norms such as segregation of wastes into biodegradable and non bio-degradable wastes before discarding them, are certain facts of which many of the citizens of New Town are unaware of.

To ensure that all the residents of the township are aware of the norms that they are supposed to follow and are also able to enjoy the amenities that they are entitled to, the authorities in charge of New Town should periodically send circulars to the secretary of each of the residential complexes, who would be in charge of putting up the circulars in the common notice board of each of the residential complex so that all the people of the respective residential complex can have a glance through it. Hence, it would be the responsibility of both the policy makers and the community residing in New Town to maintain a two-way communication for ensuring holistic development of the township. The residents should also be made aware of the provision of e-governance and encouraged to periodically check the official website of NKDA and WBHIDCO to get updates about what is happening in New Town.

- The condition of public transportation in the interior parts of the township is very poor and residents availing public transport have to solely depend on the availability of totos (e-rickshaws) or bank on booking app cabs. Provision should be made to extend public transportation routes to places in New Town that are away from the Major Arterial Road and connect the interior parts of the township.

Another problem related to transportation is lack of availability of public transport from late evening onwards. Once the peak hour is over, the availability of public transport reduces or one has to wait for a long time to avail public transportation facilities.

- Most of the residents complained about New Town being unsafe at night and sometimes even in the afternoon. This is because of the empty plots of land and large number of construction sites which at times turn out to be the hide-outs of the anti social people. Theft is also common in the township as many of the apartments lay vacant either because its inhabitants are out for work for long durations or its inhabitants live in proper Kolkata and have bought these apartments as assets. Some of the residents also complained of incidents of snatching of valuables, even in broad daylight.

Thus, policies should be formulated to increase safety and security of the people of New Town. One of the methods through which this can be done is through police patrolling in the township at night. CCTVs can also be installed at regular intervals in the interior parts of the township, as this is where most of the crimes take place.

- New Town lacks sufficient availability of machine repairing shops, service centres, clinics and doctors' chambers, petrol pumps and local shops where goods of daily need would be available (not malls or hawkers). Though plots of land have been allocated to educational institutes in the township, they are yet not functional as they are under construction. Thus, these basic facilities should be increased and made available to the residents as soon as possible.
- One of the major and basic facility that New Town lacks is that there is not a single active fire station in the entire township. According to one of the articles written in the Friday special edition of *The Telegraph salt lake*, though the foundation stone for a fire station had been laid behind Axis Mall of New Town four years back, construction work has still not begun. One of the representatives from the state fire and emergency services was quoted saying in the same article that construction work could not begin as they were yet to receive funds for the construction from the Public Works Department.

Thus, it is highly recommended that all the internal disputes should be solved and construction of the fire station should begin at the earliest. Since, New Town comprises of high rising buildings, there should be provisions in the fire station to tackle with any fire mishap in the higher floors of the buildings.

Thus, it can be concluded by saying that the residents of any settlement form the foundation on which the entire civilization rests. The diligence of the government and the enthusiasm and cooperation of the citizens are all that are required to create an inclusive society. A society can grow up to be a healthy one only when it houses healthy and aware residents.

BIBLIOGRAPHY

- Batra, L. 2009, A Review of Urbanisation and Urban Policy in Post-independent India, Jawaharlal Nehru University, India.
- Bhattacharya, R. & Sanyal, K., 2011, 'Bypassing the Squalor: New Towns, Immaterial Labour and Exclusion in Post-colonial Urbanisation', *Economic and Political Weekly*, vol. XLVI, no. 3, pp. 41-18.
- Campbell, S., 1996, *Green Cities, Growing Cities, Just Cities?* Urban Planning and the Contradictions of Sustainable Development, Taubman College of Architecture and Urban Planning, University of Michigan, Unites States of America.
- Chakraborty, S, 2014, '10.5km Wi-Fi zone in Rajarhat New Town', *The Times of India*, 18 June, viewed 27 February, <<http://timesofindia.indiatimes.com/city/kolkata/10-5km-Wi-Fi-zone-in-Rajarhat-New-Town/articleshow/36728018.cms?>>
- Chakraborty, S., 2017, 'but no sign of fire station', *The Telegraph salt lake*, 7 April, p.1.
- Coaffee, M., 2008, *Risk, Resilience, and Enviromentally Sustainable Cities*, University of Manchester, United Kingdom.
- Ghosal, A., 2016, 'Green City Mission: Rs.50 lakh each for all 125 municipalities in West Bengal', <<http://indianexpress.com/article/india/green-city-mission-rs-50-lakh-each-for-all-125-municipalities-in-west-bengal-mamata-banerjee-4438068/>>, viewed 10 May 2017.
- Gill, S.E., Handley, J.F., Ennos, A.R., & Pauleit, S., n.d., *Adapting Cities for Climate Change: The Role of the Green Infrastructure*, *Climate Change and Cities, Built Environment Vol. 33 No.1*, viewed 24 January 2017.
- Haughton, G., 1997, *Developing sustainable urban development models*, Leeds Metropolitan University, United Kingdom.
- Jim, C.Y., 2004, *Green-space preservation and allocation of sustainable greening of compact cities*, University of Hong Kong, China.

- Kennedy, C., Pincetl, S. & Bunje, P., 2007, *The Study of Urban Metabolism and its Applications to Urban Planning and Design*, University of Toronto, Canada and UCLA, United States of America.
- Lindfield, M. & Steinberg, F., 2012, *Green Cities*, Asian Development Bank, Philippines.
- Mahizhnan, A., 1999, *Smart cities, The Singapore Case*, The Institute of Policy Studies, Singapore.
- Marsal-Llacuna, M., Colomer-Llinas, J., & Melendez- Frigola, J., 2014, *Lessons in Urban Monitoring taken from Sustainable and Livable Cities to better address the Smart Cities initiative*, Department of Architecture and Urban Planning, Campus Montilivi, Politécnic Building III, Room 121 and Institute of Informatics and Applications, Department of Electrical Engineering, Electronics and Automatics, Campus Montilivi, Politécnic Building IV, Spain.
- Mohan, R. & Dagupta, S. 2014, *Urban Development in India in the 21st Century : Policies for Accelerating Urban Growth*, Stranford University, Strandford.
- Park, R. E., Burgess, E. W., & McKenzie, R. D. 1984, *The City*, The University of Chicago, Chicago.
- Riffat, S., Powell, R. & Aydin, D., 2016, *Future Cities and Environmental Sustainability*, University Park, United Kingdom.
- Sengupta, S., 2015, 'New plans for New Town', *The Telegraph* salt lake, 13 May, p.1.
- Sengupta, U, 2012, *Inclusive development A state-led land development model in New Town, Kolkata*, School of Planning, Architecture and Civil Engineering, Queen's University Belfast, Northern Ireland.
- Swanwick, C., Dunnett, N. and Woolley, H., n.d., *Nature, Role and Value of Green Space in Towns and Cities: An Overview*, Built Environment, Vol 29, No. 2.
- Vanolo, A., 2013, *Smartmentality: The Smart City as Disciplinary Strategy*, Universita di Torino, Italy.
- Yanarella, E.J., Levine, R.S. & Lancaster, R.W., 2009, *Green versus Sustainability From Semantics to Enlightenment*, Mary Ann Liebert, INC., viewed 24 January 2017, <<http://dnr.wi.gov/topic/SmallBusiness/documents/sustainability/GreenVersusSustainability.pdf>>
- <<http://www.nkdamar.org/Pages/index.aspx>>, viewed 15 January 2017.
- <http://www.unep.org/resourceefficiency/Portals/24147/scp/REC/GER_12_Cities.pdf>, viewed 24 January 2017.
- <<http://www.wbhidcoltd.com/>>, viewed 2 May, 2017.

1278 CITIZENRY AND GOVERNANCE: A GENDERED PERSPECTIVE IN KOLKATA MUNICIPAL CORPORATION AREA

ABSTRACT

In India, the world’s largest and one of the oldest democracy, a three-tier electoral system is in operation- constituting of Members of Parliament, Members of Assembly and Members of Urban Local Body or Panchayat depending on the level of urbanisation. Long back Plato initiated the debate that whether in a democracy there should be a direct rule of ‘demos’ i.e. the masses or of the ‘notables’ i.e. the representatives and was in favour of latter. Later philosophers like Thomas Paine, James Mill also spoke in favour of representatives or ‘down-scaling’ of governance with division of power. In modern democratic setup, it is through the elected representatives at all levels the citizenry seek to articulate their urges, expectations and grievances. In a real democracy, equal rights of men and women are imperative both in terms of electorates and representatives. But the representation of women in the seats of power has been abysmally low all through, for which 33 percent reservation in the lowest tier has been constitutionally approved. In the megacity of Kolkata, which is said to be the intellectual capital of the country, the situation is no different. The endeavour of the paper is to find out the role of the elected women representatives in serving the citizens by utilising the local area development (LAD) funds allocated to them like Member of Parliament Local Area Development Scheme (MPLADS), Bidhayak Elakas Unnayan Prakalpa (BEUP), Councillor’s Fund; highlighting the effectiveness of the projects in bridging critical infrastructural gaps; analyzing the sector-wise fund utilisation, project maintenance and management, viability of the projects ; bringing out the actual position of the women representatives in the political structure and society in general highlighting their achievements and struggles; and portraying the role of the women electorates- their psyche, needs, aspirations. The discussion involves quantitative and qualitative analysis about the involvement of citizenry in local area development projects and local governance, sectoral involvement of funds, temporal progress of schemes, level of fund utilization, degree of infrastructural development carried out by women representatives along with the perception study of the women electorate about their elected counterparts to get a fair bit of idea about the true position of the women at all strata in political sphere.

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1296 ASSESSING THE DIFFERENTIAL IMPACT OF MICROCREDIT PROGRAMMES UNDER SELF HELP GROUP MODEL (SHG) AND NON-BANKING FINANCE COMPANY MODEL (NBFC)

ABSTRACT

Various traditional and innovative approaches have been adopted by micro financial institutions (MFIs) for increasing the credit flow to the poor vulnerable people of unorganized sector in India. It helps them to improve their socio-economic status through utilization of the credit. In this study SHG model under National Rural Livelihood Mission (NRLM) and NGO based Non-Banking Finance Company (NBFC) Model: not for profit and for profit patterns have been considered with the aims to assess the differential impact of microcredit programme for the betterment of the beneficiaries. For this purpose, five point Likert-Scale questions have been asked to measure the effectiveness of both of the programme in the following variables i) income, ii) productivity level and skill, iii) poverty status, iv) food security, v) child education, vi) health, vii) asset building, viii) living status, ix) repayment. It is considered that borrowers who had scored more than 60% in the above mentioned variables have improved their livelihood. In this study 5 selected explanatory independent variables are i) time with the institution, ii) mode of credit utilization, iii) household types by income source, iv) loan sufficiency, v) involvement with other credit organization. To understand the effects of the independent variables on beneficiaries' improvement researcher have carried out a bivariate (chi-square) as well as a multivariate analysis (logistic regression). Chi-square test and Odd ratios (ORs) derived from the logistic regression analysis reveal that most of the variables are statistically significant in relation to improvement of the beneficiaries. In case of SHG the base rate for improved beneficiaries is 46.9% and 53.1% for not improved category. As compared to borrowers who did not improve, borrowers who improved it is more likely to cultivators (OR 1.23) and non-agricultural workers (OR 2.08) as main source of income in respect to reference category with several income source, to utilize the credit in fully productive activities (OR 14.70), partial productive activities (6.36) than non-productive activities. Borrowers categories with involvement with SHG for 1 to 4 years and 5 to 8 years are less likely to improve their livelihood (OR .06 and .35) than the reference for 9 or more years. So far the "improved beneficiaries" of NGO is concerned the study shows different result where base rate of improved beneficiaries is 67.9% and 32.1% for not improved beneficiaries. Compared to borrowers who did not improve, borrowers who improved it is more likely to agricultural labor (OR 2.85) household as main source of income, to use the credit in fully productive activities (OR 5.25) and to have involvement with other credit organization (OR 4.23). Identically the time association with NGO has no significant role in improvement of beneficiaries. It is found that predictor variables interact differentially with improvement of beneficiaries in case of the models of microcredit delivery under consideration. It is due to the structural and functional differences of these models. Key Words: SHG, NGO, microcredit, NRLM, NBFC, improved, effectiveness, binary logistic regression, OR.

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1307 A STUDY ON EFFECT ON QUALITY OF LIFE BY “INFORMATION MISMATCH” AMONG RESIDENTS AND PUBLIC SECTOR AFTER AN EARTHQUAKE IN HISTORIC CITIES – CASE STUDY IN L’AQUILA ITALY

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ABSTRACT

The purpose of this study is to be clarified that constructing gaming simulation model based on information scenario from questionnaire survey in L’Aquila. This gaming simulation model is expected that it can be reproduced real situation and real DIM in the time of disaster in L’Aquila, Italy. However, it couldn’t do gaming simulation to test subjects, the result of gaming simulation will be provided not only players can understand actual situation of disaster time, but also it can be measured what kind of DIM mostly reduced, what kind of DIM is affected victim’s QOL and Sense of Place factors.

Keywords: QOL, Sense of Place, Disaster Information Mismatch (DIM), Gaming Simulation

1 RESEARCH BACKGROUND AND OBJECTIVES

The international disasters database (EM-DAT: Centre for Research on the Epidemiology of Disasters) reported number of disasters was less than 50 events in 20th century but increasing exponentially toward the end of 20th century, now reported natural disasters over 10 times from 20th century in 21st century in its “World trend of natural disasters 1900 – 2010”. In case of historic cities, it is really weak of city’s vulnerability. It means that it is easier to being destroyed itself when earthquake happened. At the same time, it also has vulnerability for resident’s safety after an earthquake. In this sense, it should be safe for resident’s living environment in times which is all disaster phase. In this sense, it takes consideration to make evacuation plan with participatory process for resident’s safety to understand their own town’s risks before occurring big earthquake [2]. However, it must be considered policy and plan based risk after occurring natural disaster. One of them is an Information sharing system among victims and information sender such as national relations, public sector, NPO (NGO), some volunteers and so on. But nowadays, information sharing after the natural disaster is not working well, because of emergency time. People have to survive from natural disaster, but all of things is information such as where should we evacuate immediately after earthquake, when will public sector provide food and water living in evacuation shelter and so on. In our survey, a lot of disaster information mismatch among residents need and sender’s supply is occurred in L’Aquila, Italy. At the same time, if disaster information mismatch is happed, victim’s feeling become feeling of uneasy. However, what kind of information mismatch and which disaster phase affected to residents feelings. The purpose of this study that is constructing gaming simulation model based on information scenario from questionnaire survey, case study in L’Aquila Italy.

2 RELATED WORKS

2.1 Disaster Information Mismatch among victim’s needs and information senders

This section review about disaster information mismatch among victim’s needs and information senders in historical area. Disaster information mismatch is some phenomena that has a gap between victims needs and information senders supply. This phenomena is happened around the world in a time of disaster. For instance, in case of Ayutthaya flood in 2011, it was occurred by heavy rain as two time the previous year. It was damaged the whole of Thailand including capital of Ayutthaya from August to December 2011(The death: 813, the missing: 3(The department of the interior, Thailand)). In this time, it was shared huge disaster information by public information, mass media, inter- organizational relations, however it was mentioned[3]: how much necessary information was given victims from huge disaster information, was it include really necessary information.

As shown Fig. 1, in the field of tourism, people with more sever access needs require additional and more specialized information. However, the supply of this information becomes more scarce for those with higher accessibility requirements. So the gap between demand and supply of accessibility increase, with a greater effect on those who need information[4]. In this sense, this situation is same as a time of disaster. There are variety of people such as baby, young, adults, aged people in disaster area. Thus, it has multiple specialized information needs in each disaster phase: temporary evacuation, temporary shelter, temporary house phase). It must be filled in those kinds of gap between demand and supply. This is information issue for victims. In this study, those kinds of phenomena as information problems and information mismatch among demand and supply is called “Disaster Information Mismatch(DIM).

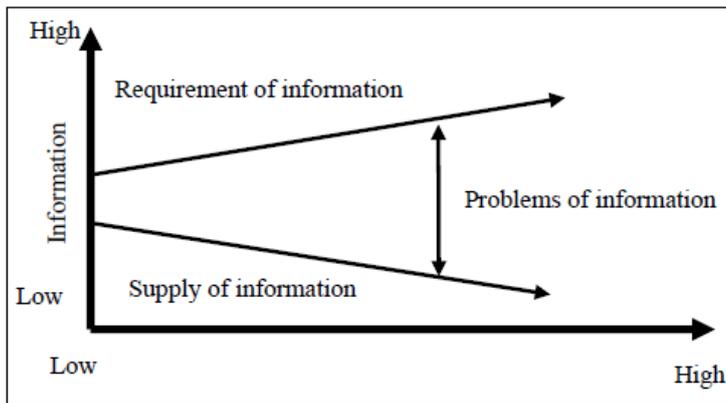


Fig 1. Information Issue for disabled travelers[4]

2.2 Victim's consideration QOL in a time of disaster

This section reviews two categories of previous study on the subject Quality of Life: research on components of Quality of life, and research on necessary condition in disaster prevention to be regional inheritance in the field of psychological aspect.

Demura et al[5], constructed QOL components model based on previous study[5]. QOL which means subjective satisfaction is composed by condition of individuals (physical aspect, psychological aspect, social aspect and so on) and condition of environment. When it is focused on psychological aspect, it is composed by feelings of uneasy, pain of body and so on. In consideration of victim's QOL in a time of disaster, victim's QOL is more decreasing than normal life, because of changing life environment by disaster (it is increasing the feeling of uneasy). At the same time, historical city has much vulnerability. It means that historical city has historical building which is easy to broken by natural disaster. So victims must evacuate the other place for a long time in a disaster time. Thus, psychological aspect of QOL is most consideration things.

On the other hands, research on necessary condition in disaster prevention to be regional inheritance in the field of psychological aspect, Kanegae et al[6], mentioned that not only national relations and public sector must need "Disaster Preparedness" but also it most necessary of suitable and immediate "Disaster Response" by residents(victims) to be sustainable inheritance and to be decreased the damage by natural disaster. Shirotsuki et al[7], elaborates on the importance of resident's participatory process after natural disaster to reserve and restore historical city, cultural heritage. Participating those kinds of activity is depended on emotional bonding as thoughts, feelings, beliefs to specific place and community. Thus, it has usefulness to be clarified that effect of resident's participatory intention by resident's emotional bonding to be regional inheritance in policy science aspects. In this sense, it must be consider emotional bondings (Sense of Place[8]) in a time of disaster as same as QOL.

3 RESEARCH DESIGN

3.1 Case Study in L'Aquila Italy

L'Aquila, Italy is one of the municipality, provincial capital and prefecture capital located in center of Italy with a population of 67,000. It was occurred big earthquake(M 6.3) in 4th April, 2009. It is easier to generate earthquake because of collision among Eurasia Plate and African Plate. It is damaged not only 309 deaths, but also many historical buildings such as church of Anime Sante, provincial buildings and so on were collapse. As case of Italy in historical area, it has "Authenticity" to restore historical areas. Thus, it takes long time to restore whole of the historical city. It means that victims must evacuate other place for more long time than usual city. In actual condition, nowadays more than 10,000 people live in temporary houses (L'Aquila Municipality)(Name: C.A.S.E and M.A.P.), but it has been 10 years since L'Aquila Earthquake happed. In case of L'Aquila Earthquake, all of things after disaster is coped by public sector (DCP: Department of Civil Protection).

3.2 Recovery process after an earthquake in L'Aquila Italy

This section describes the process of recovering after a disaster in L'Aquila Italy. Vivacqua et al.,(2012) mentioned Risk Management process after a disaster were divided into "Mitigation", "Preparedness", "Response", "recovery". But recovery process is longer than other disaster phase in historic city because it takes long time to reconstruct their buildings that it has long history and it is difficult to repair them in sight of authenticity. Thus in this study, it is divided Response and Recovery into temporary evacuation, evacuation to shelter and move to temporary shelter (Fig 2).

In L'Aquila, it established more than 100 laws such as "the PS" and "the PdR" that is one of most influential. It has started to build in C.A.S.E and M.A.P as temporary housing in 19 areas, L'Aquila. (Fig 3). After reconstructing victim's houses, they came back home. But it remains more than 10,000 people stay in these temporary houses.

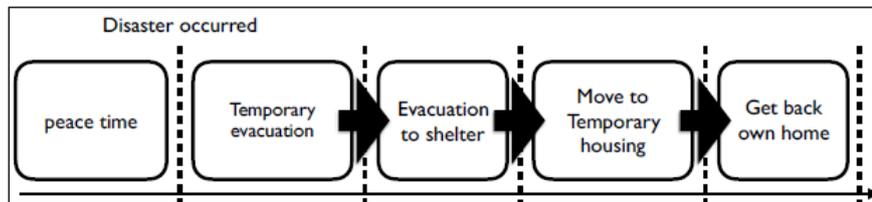


Fig 2. Process of Disaster Phase



Fig 3. Temporary housing in L'Aquila(Left: C.A.S.E, Right: M.A.P.)

3.3 Abstract for questionnaire survey

This section describes the abstract for questionnaire survey in L'Aquila for constructing gaming simulation model with DIM scenario. Table 1 is displaying the questionnaire contents distributed to victims living in L'Aquila had experienced L'Aquila earthquake in 2009.

Table 1. Questionnaire Survey

Questionnaire survey 1	
Date	From 2 nd to 26 th February
Scope of the survey	Victims living in L'Aquila(including students)
Number	27 samples
Contents	<ul style="list-style-type: none"> ● Actual DIM happened in L'Aquila Earthquake in 2009 ● Sense of Place factors ● Intention of moving other place without L'Aquila after the earthquake in 2009.

4 CONSTRUCTING DIM SCENARIO BASED ON QUESTIONNAIRE SURVEY

In this section, it describes constructing DIM scenario based on conclusion of questionnaire survey. First of all, phenomena of DIM are happened in various time after big earthquake. So it divided disaster 4 phases[9]: from happened earthquake to move temporary evacuation phase, living in temporary shelter phase, living in temporary houses phase, restore phase. Restore phase is that victims can live in house without temporary houses. Second of all, it is describes making scenario. In scenarios, it is set in situation that big earthquake is happened as same as L'Aquila Earthquake in 28th February 2018, it is very cold day. In case of L'Aquila Earthquake, all of things after disaster is coped by public sector (DCP: Department of Civil Protection). So it is estimated that DIM is happened by communication of DCP members and victims Moreover, in this study, it is measured resident's QOL by occurring DIM, so each scenario has not occurring DIM case and occurring DIM case in 4 disaster phase to show to test subject.

4.1 Scenario in earthquake happened to moving evacuation space

In this section, it is considered that is constructed DIM scenario in a time of earthquake happened to moving evacuation space. As a result of questionnaire survey, most often answer is "I don't know where is the evacuation place, and which root is safety" in from happened earthquake to move temporary evacuation phase. Thus, DIM of from happened earthquake to move temporary evacuation phase is that case of not understanding temporary evacuation place and safety root, and case of understanding.

4.2 Scenario in arriving and staying in Temporary Shelter

From this section, it is made DIM scenarios in a time of arriving and staying in Temporary Shelter. In the result of questionnaire survey, two most often disaster information needs are "Confirmation of family's safety" and "actual condition of their house and entry to City Center". But DPC member didn't share such a kind of information. In this case, it is made two scenarios. One of case, when big earthquake happened, victims must take care of their family's safety. So one of the DIM situation of temporary shelter phase is that victims want to know family's safety, and person ask DCP member to know family's safety, but they don't know how to do. Other scenario is about actual condition of their house and date of entry city center. Before L'Aquila Earthquake, almost people live in around "City Center". They have a life in City Center from a birth. But there are so many historical buildings in City Center. In L'Aquila Earthquake, everyone cannot enter to City Center because almost building was collapsed and it was so dangerous. So, victims wanted to know actual condition of damage of house and when it is possible to enter to City Center. In second DIM case, it is set scenario that victims want to know actual situation of house and when it is possible to enter to City Center, so person ask DCP staff about it, but they answer is "we don't know in detail".

4.3 Scenario in moving temporary Shelter

Last scenario is that application of living temporary shelter in the time of moving from temporary shelter. Italy constructed temporary houses after L’Aquila Earthquake (Name: Progetto C.A.S.E and M.A.P). Many victims moved to temporary houses. But respondents of this questionnaire survey worried about how to apply to live in temporary house. So last DIM scenario is that victims want to know how to apply to live in temporary house, person ask them about it, but their answer is “we are not sure now”

5 GAMING SIMULATION MODEL WITH DIM SCENARIO AND ITS EVALUATING METHOD

In this section, it describes constructed gaming simulation model with DIM scenario and its evaluating method. Before its explanation, it is explained the validity of using gaming simulation model in this study. In this study, it will be clarified effects of victim’s QOL and emotional bondings to place by DIM. However, it is impossible to reproduce actual situation in the time of disaster in a virtual space. One of capable methods is gaming simulation. In a gaming simulation model, it includes 4 parts: “Briefing”, “Making a Role”, “GAME”, and “Debriefing” sections. From now on, it will be describing each part in bellow.

5.1 Briefing

In this section, it presents “briefing” in this gaming simulation model. In Briefing section, facilitator will explain rule of the game, introduction of L’Aquila, Italy (In case which there are some person have never been to L’Aquila.), and introduction of L’Aquila Earthquake. Moreover, facilitator also will take test subject who never been to L’Aquila to City Center (Mostly Main Street), L’Aquila to see real situation of under reconstructing in virtual space using Google Street Map (Fig 4). In this sense, test subject can have image and feeling in L’Aquila.

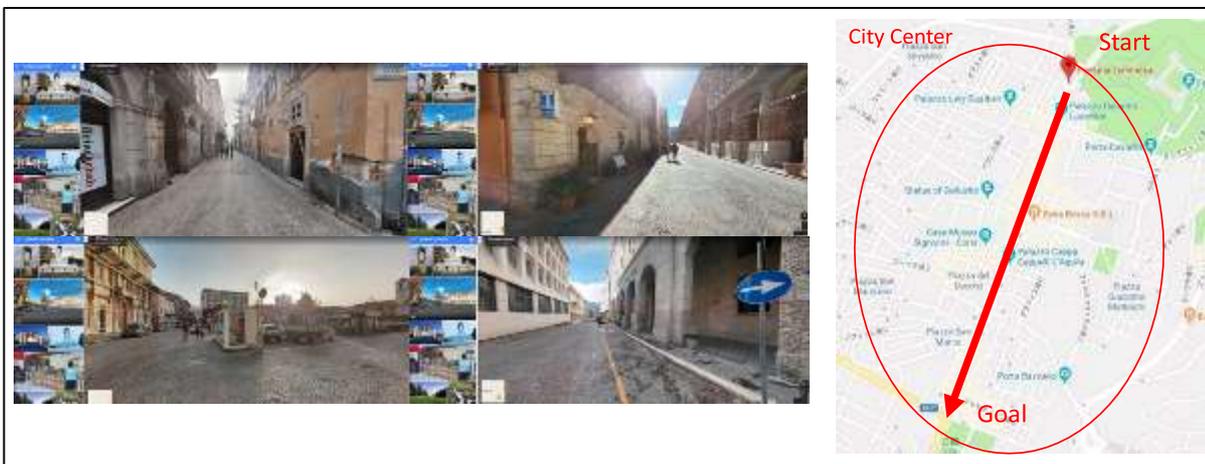


Fig 4. Google Street Map(Left) and the way of waking in virtual space(Right)

5.2 Making a Role

In next this section, it presents “making a role” in this gaming simulation model. In this gaming model, earthquake will happen in L’Aquila, so test subject has a role as L’Aquila’s resident. In this gaming model, it will be set role in bellow (Fig 5). The reason(Fig 6) why role in this game “have strong attachment to L’Aquila is more than 74% respondents answered “strong agree” and “ Agree a little” to question: I feel relaxed when I’m at my Place(L’Aquila) before the L’Aquila Earthquake.

[Role in this gaming]

- You are resident living in L’Aquila for almost 25 years. When you are child, you often go out City Center with your friends after school.
- You have a strong attachment to L’Aquila and you can feel relax in being in L’Aquila.

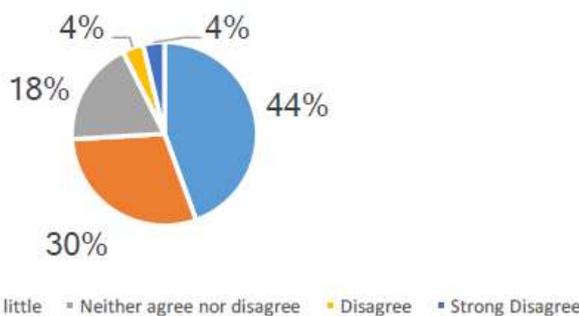


Fig 6. Result of questionnaire survey about place attachment factor

5.3 GAME with DIM scenarios

From this section, it describes GAME with DIM scenarios. As it is constructed DIM scenarios based on result of questionnaire survey divided by 3 disaster phases, it shows both of DIM and No DIM scenarios to test subjects in order of disaster phases. For instance, in the time of “from happened earthquake to move to evacuation space”, as shown in Fig 7, facilitator shows one of the scenarios (DIM or No DIM) randomly, after showing scenario, test subject answers some questions. Next, facilitator shows other scenarios (if he shows DIM scenario in the time of “from happened earthquake to move to evacuation space”, after that, he shows No DIM scenario in the time of “from happened earthquake to move to evacuation space”), after showing scenario, test subjects answer some questions once again. Then, it will be moved to next disaster phase. So, test subjects can experience one term of disaster in virtual space. After showing all of scenario, it will be finished this gaming.

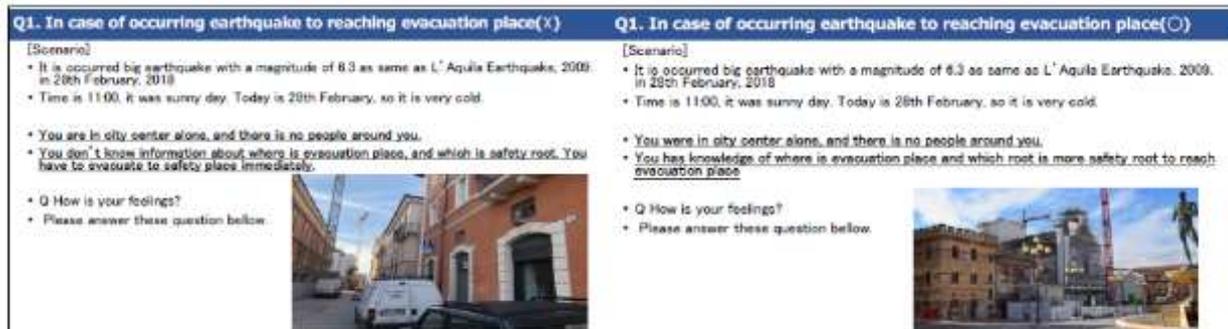


Fig 7. Example of DIM scenario (left: happened DIM, right: No DIM)

5.4 Debriefing

In this section, it describes “Debriefing” in this gaming. First of all, the word of debriefing means the process of most important point after gaming simulation. It means that the experience of gaming simulation is not just experienced, it is most important process of debriefing for players to attach more deep understandings, insights, and willingness to learn [10]. Thus, in debriefing in this gaming, facilitator explains why these scenarios was made by, what based was these scenarios made by, and so on. By doing so, player of this gaming can understand actual situation of time of disaster and DIM happened.

5.5 Evaluating victim’s QOL with Sense of Place factors

As shown Table.2, it is abstract of survey. In questionnaire survey, it is compose by feelings of satisfaction(Q1) and uneasy(Q5), Sense of Place[8](Q3,4,5) factors and intention of moving to other place without L’Aquila(Q6) based on related works. In feelings of satisfaction and uneasy section, responses were scored on seven-point scale from 1” satisfied” to 7” unsatisfied. At first, respondents feeling is 4” Now your feelings” If respondents don’t change their mind by showing scenario, respondents have to check 4” Now your feelings” In Sense of Place factors section, Sense of Place is comprehensive components: composed by Place Attachment, Place Identity, Place Dependence. In analysis, response were scored on seven-point scale from 1” Most agree” to 7” Most disagree. But now, it didn’t do gaming simulation, and cannot verified its validity.

Table 2. Questionnaire Survey

Questionnaire survey	
Contents	Feeling of satisfaction(Q1), Feeling of uneasy(Q5), intention of moving other place without L’Aquila(Q6), Place Identity(Q2), Place Attachment(Q3), Place Independence(Q4)[8]

6 CONCLUSION AND FUTURE DESIGN

In this study, it is constructed gaming simulation model with DIM scenarios can measure not only victim’s QOL but also victim’s emotional bondings to place using by Sense of Place factors. This gaming simulation model is expected that it can be reproduced real situation and real DIM in the time of disaster in L’Aquila, Italy. However, it couldn’t do gaming simulation to test subjects, the result of gaming simulation will be provided not only players can understand actual situation of disaster time, but also it can be measured what kind of DIM mostly reduced, what kind of DIM is affected victim’s QOL and Sense of Place factors.

ACKNOWLEDGEMENTS

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REFERENCES

EM-DA: The international disaster database, (2012), <http://www.emdat.be>
 Toyoda, Y: A Study on Community Evacuation Planning in Urban Areas during a Downsizing Period: Doctoral Dissertation, Ritusmeikan

University, (2012)

Diana, C., Thomas, B., Michael, E, H, : Lack of spatial resilience in a recovery process: Case L'Aquila, Italy, *Tecnological Forecasting & Social Changing* 121 (2017) p76-88

Eleni, M., Dimitrios, B,: Information Provision for Challenging Markets: The Case Study of the Accessibility Requiring Market in the Context of Tourism. *Information & Management* 50 (2013) p. 229-239

Sinichi, D., Susumu, S: Quality of Life (QOL) Assessment for Japanese Elderly: the course of QOL studies and assessments of health-related and subjective QOL, *Journal of Japan society of Physical Education, Health and Sport Science* 51 (2006) p. 103-115

Hidehiko, K., Yusuke, T.: Text Education of disaster Prevention of Cultural Heritage (in Japanese), Ritsumeikan University, (2013)

Masahiro, S., Satoshi, O.,: A Fundamental Study on Relationship Between Resident's Emotional Bonding to Place and Disaster Preparedness and Awareness for Conserving Ayutthaya World heritage, *Journal of Disaster Mitigation for Urban Cultural Heritage, Ritsumeikan University* 2, (2008), P. 27-34

Bradley, S., Richard, C.: Sense of Place as an Attitude: Lakeshore Owners Attitude Toward Their Properties. *Journal of Environmental Psychology* 21 (2001), P. 233-248

Vivacqua, A.S., Borges, M. R. S.,: Taking Advantage of Collective Knowledge in Emergency Response System, *Journal of Network and Computer Applications* 35(1) (2012), P.189-198

Kiyoshi, A., Hiroshi, D., Toshiyuki, K., Humitoshi, K., Mieko, N.: Gaming Simulation (in Japanese), Union of Japanese Scientists and Engineers (1998)

SS13.3. Citizenry and Regional Planning

1367 ROLE OF LOCAL SELF- GOVERNMENT IN WATER RESOURCE MANAGEMENT OF RURAL WEST BENGAL- A CASE STUDY FROM SUNDARBANS

ABSTRACT

Following the 11th schedule of Indian Constitution (article 243G (b) Local Self Government is conferred with the “Power, Authority and Responsibilities to prepare plan and implementation of schemes for economic development – such as Minor Irrigation, Water Management”. Prevailing Mahatma Gandhi National Rural Employment Guarantee schemes (MGNREGS) in India enable the rural lsg to carry out the schemes on Manag like-1) Water harvesting – works like ponds, tanks, small dam, stop dam, etc. (section 4.(i).2) – working manual of MGNREGA), 2) irrigation canal including micro and minor irrigation works – construction, de-silting, lining, renovation and correction (section 4. iii). This paper aims to analyse the role of rural Local- Self- Government (Gram Panchayat) in harvesting of rainwater through MGNREGA programme in Sundarbans area of West Bengal. Sundarbans is mostly saline affected mono cropped area but there is enough monsoon rainfall that could be conserved there. There is an urgent need to de-silting, re-excavate of existing minor canals and excavation of ponds, tanks for harvesting of excess monsoonal rain water. The methods of the study consists of i) measurement of depth and volume of existing canals as well abundant river cut-off (100%), ponds (60%), ii) Preparation of the Rainfall Budget, iii) watershed delineation and determination of outlet point with the help of Arc GIS, IV) Determination of potential irrigation water with the help of IRC:SP:13-2004, v) volume of irrigation water created by the Local Self Government through MGNREGS and determination of wasted monsoonal rainfall. It is observed from the survey that only two canals are re-excavated out of 12 natural canals and 576 ponds are excavated through this programme in last 10 years. The total volume of all water bodies is 5.1 million cubic meters which have capacity to preserve 32% of excess rainfall. That could cover 2.09 sq km (13.79%) of the canal catchment area. The volume of excess rainfall is 15 million cubic meter of it, at least 55% rainfall could be conserved even after loss of rainwater through Infiltration, Base Flow, and Potential Evapotranspiration. But in reality only 32% of excess rainfall is reserved in the existing irrigation structures. The total volume that is created by the Gram Panchayat (G.P) through the MGNREGS is 1 million cubic meter in 2007- 2017. It is observed that maximum emphasize is given for the excavation of Non- farm pond (80%) than canal excavation work. Hence the initiative that has been taken by the G.P for irrigation development through MGNREGS programme is not properly implemented. Again negligence of irrigation causes peoples’ dissatisfaction with agricultural income. It again acts as push factor for out migration of agricultural labour. To break this vicious cycle, emphasize should be given on the re- excavation of canal and abundant river cut-off. It calls for preparation of the regional plan in holistic way. : LSG, MGNREGA, Rain Water Harvesting, Sundarbans

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1424 ASSESSING THE ROLE OF BRICK INDUSTRY ON CHANGING RIVER MORPHOLOGY IN THE LOWER GANGA DELTA AREA OF WEST BENGAL, INDIA AND ITS REGIONAL IMPACT

ABSTRACT

Brick is an essential material for urban development. The main raw materials for the industry are soil and coal. In Ganga Delta area of West Bengal, there are 772 brick fields along the river Ganga, Nowi, Sunti, Nonagong, Haroagong-Kultigong, Ichhamati which produce 25.5 million bricks per brick field per year on in an average. It needs 2484.9 m³ of soil which is mostly extracted from the said rivers. This study focuses on how the river morphology is affected by the brick fields in lower Ganga Delta in West Bengal. For that, cross profile, volume of cross sectional area, tide monitoring, quantity of suspended sediment at different position on the sampled rivers are determined. As well as 60 brick fields have been surveyed to collect information on demand of raw materials as well delivery of bricks by quantity and location, and These rivers have a self-destructive nature of tide. The observed duration of tide inflow is about 5 hours and outflow duration is 7 hours approx. So, silt is deposited in a rate of 0.48 gram/liter. If it is collected by the brick industry scientifically, it can help the rivers to maintain their flow. But the river silt usually extracted without any consideration of silt accretion points. Even the river bank(levee) is often scabbled. This is to minimise the transport cost. Besides construction of spur of broken bricks and, silt pond on the river accelerate the silt deposition. The immediate effect of these changes are river bank erosion and intrusion of brackish water into the agricultural field, it again reduces the soil fertility. The profile of the river becomes asymmetric near the brick fields. Till 2016, 90% of the brick fields had no certificate of pollution control,Besides violating the State Land Reforms Act 1955 (sec-4), brick companies convert agricultural land into brick field and big ponds for collection of loamy soil, needed to produce high quality bricks. The newly emerging urban nodes like Kolkata New Town, Barasat, Sonarpur, Baruipur are the recipient centres of the produced bricks. Rapid urbanization around the metropolis in absence of long term comprehensive planning is not only creating the drainage problems but also is hampering the regional system. : brick field, cross profile, silt pond, sinuosity, suspended sediment, , tide monitoring, metropolis, regional system,

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1505 SURVEY FOR CONSCIOUSNESS ABOUT CAREER CHOICE OF LOCAL RESIDENTS - CASE STUDY IN BALI, INDONESIA

ABSTRACT

Recent years, there is a subject about economic development for tourism industry and concentration of labor populations in international tourism destination in developing country. For this subject, in this study, we intend to survey the current situation of the choice of local people's occupation, and we conducted a consciousness survey to know 'the idea of work values for future career choice' in local residents. This research contains two studies background. The first point is the viewpoint of student's consciousness of career choice and the second point is the viewpoint of labor in resort areas in developing countries. The former is based on previous research on occupation selection. The latter is based on the status of employment at Bali island in Indonesia. We will show this study with these two viewpoints as the main theme. In this study, a questionnaire survey was conducted. This questionnaire is classified in 5 contents (1. Face Sheet, 2. the idea of work values, 3. about working in the tourism industry, 4. about working in agriculture, 5. about the tourism industry mixing the agriculture) and has 59 questions in total. The style of all questions except for the question of Face Sheet is answered by likert scale of eight levels. This survey is targeted at University Students and high school students.

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1664 REGIONAL PATTERN OF RELIGIOUS COMMUNITY-WISE CHILD NUTRITION: A CASE STUDY OF NORTH 24 PARGANAS, WEST BENGAL

ABSTRACT

Background: Child nutrition is a major national health issue worldwide because it’s mostly represent national as well as community-wise state of health and economic development. Traditionally, a person’s nutrition level has been defined at a personal level as well as at a societal level and should integrate other factors into a health assessment, including evaluations of diet, physical activity, family history, and other appropriate health screenings. The present study is designed to determine and analyse the regional pattern and socio-economic factors associated with nutritional status of children in different communities. This study is aimed to compare age and gender-specific height, weight and Body Mass Index (BMI) percentiles and nutritional status among primary school-aged children using different anthropometric measurement. Objectives: To investigate the nutrition status using anthropometric measures among the primary school children in rural areas and to find out different socio- cultural and economic factors that influence the nutritional status of this population. Methods: A cross-sectional study is performed among school going children in nine rural blocks out of total 22 blocks of North 24 parganas. Socio-economic and demographic characteristics are documented and anthropometric measurements are performed to calculate Nutritional Status. Major calculated indices are BMI-for-age, weight and height-for-age. The data is entered and analysed using SPSS (IBM SPSS Statistics 23). Results: An intensive health and nutrition study is conducted on 200 children (aged 1–12 years) in nine blocks of north 24 parganas in West Bengal and nutritional status calculated in three forms such as underweight, stunting and wasting. Under nutrition is found to be more common in primary school children in minority communities. Basically, female children are significantly more prone to under nutrition. Though low monthly family income, large family size, Food habit and access to better sanitation are found to have influence on nutritional status yet maternal education and employment ratio are more significantly associated with under nutrition among school children. Conclusions: Child malnutrition is a major national health issue in different Regional-communal sectors of west Bengal. This study not only related to untoward health issues but to social issues as well. Health education programmes among the population studied could be effective for solving the problem.

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SS13.4. Citizenry and Regional Planning

1543 SOCIO-POLITICAL INDENTITY CONSTRUCTION OF INDEGENOUS COMMUNITY IN BANGLADESH

ABSTRACT

Identity is a subset category in which membership is determined by attributes associated with descent, language, religion, culture, history, ethnicity, citizenship. There has been an increasing convergence and divergence on the categorization of indigenous identities in Bangladesh. This paper examines how various brands of identity politics have served to create the basis of social exclusion, resulting in different forms of identities i.e. indigenous, tribes, races, ethnic sects, minority, aboriginal, upajati, jhumiya, pahari, adibashi etc. This paper has been prepared based on the secondary data, which has been collected from reviews of books and articles, development reports, government documents and electronic resources. Indigenous people have been at the fore-front of various struggles against feudal and colonial forms of oppression and exploitation. The British reign extracted their regional wealth and segregated them from the rest of Bengal, followed by the Pakistan government behaved in the same manner. By denying the existence of ethnic, the state of Bangladesh declared the people of Bangladesh are to be known as Bangali/Bangladeshi, while they prefer the term indigenous or Adibashi. This identity dilemma is a threat for this community and has resulted in perceptions of marginalization and social exclusion. In many respects, the security and integrity of all indigenous is seem to be threatened, and they are targeted not only of land-grabbing, but also of human rights violations including arbitrary arrest, rape, killing and religious persecution. They are also marginalized and deprived of economic benefits, social power and privileges. Following the marginalization, this community has been experiencing tremendous pressure to sacrifice their traditions, languages, and cultures, which in turn gives rise to anxieties and irritation. Now it is the time of affirmative action and implementing international norms, constitutional recognition as indigenous people is a must to end the discrimination and repression against them.

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1587 THE ROLE OF COMPLEMENTARY CURRENCIES IN TERRITORIAL DEVELOPMENT

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INTRODUCTION

As theme of the 12th RSAI World Congress is *Spatial Systems: Social Integration, Regional Development and Sustainability* in this paper I argue, that complementary currencies (CCs) are effective bottom-up tools that can play an important role in territorial development. Complementary currency is a popular research topic, but its literature is still scarce compared to research on territorial development.

The questions this paper deals with: (1) Can a development model, that - rejecting traditional methods of development researches - does not focus on assets, but rather on extending capabilities and on the ability of a local community have more significant economic and social consequences than the traditional models? (2) How can a local community implement such a monetary innovation and what are the impacts of such innovations? To answer these questions a systematic approach is necessary, thus the paper attempts to synthesize existing typologies, and build a new systematic classification.

For this the chosen framework approach is Amartya Sen's Capability Approach to local development. Based on this typological framework the paper attempts to build a practical model of implementing a complementary currency.

The first section discusses the terms and concepts related to complementary currencies, with special emphasis on the Capability Approach (CA) to local development. The second section determines the place of complementary currency in the theory of Capability Approach. The third section discusses previous attempts to classify CCs, the fourth proposes a typology. The last section presents the conclusion.

LOCAL DEVELOPMENT AND CAPABILITY APPROACH

The term local development is used in a variety of ways by practitioners, policy makers and academics depending on which social or economic phenomenon they focus on. Under development one understands interventions made to improve a situation. The scale of improvement when using the term local development includes "the territory with diversified land area, characterized by economic, social, cultural and political homogeneity and a common, broadly understood identity" (Sekula, 2002:59).

An important, though obvious, observation is that there are also different opinions regarding the objective of local development. Some researchers place the emphasis on economic development; others combine economic and non-economic factors (Wilson, 1995, cites Mezei, 2006). Bennett and Krebs (1991) or Faragó (1991) consider job creation as the primary goal of local development (Mezei, 2006). According to Puljiz (2004) the main objective of local economic development is enterprise development, which then entails the growth of employment and the improvement of the quality of life (Mezei, 2006). According to Jouen (2011) "local development means territorial, integrated strategies which mobilize many local actors in the form of a partnership. Its short-term aim is to improve the local living and working conditions, and its long-term ambition is structural change" (Jouen, 2011:2).

Definitions focus on well-being and quality of life, but it is not clear what is understood under well-being. Most of the terms focus on instruments, means of welfare eg. improving competitiveness and innovativeness, and based on the dominant traditions of welfare economics automatically assume a link between these and quality of life (Gébert, Bajmóczy, 2014).

At the core of capability approach is the expansion of freedoms. Well-being is evaluated through the notions of functioning and capabilities. Functioning means a set of activities/role/characters that can be practiced/done/played by or are attributed to a person. Capability means the level of freedom a person has to choose from the available functionings. It means all available alternative ways of life that a person can pursue; that is, the ability of a person to show what he can or could do (Gébert et al., 2016:26). The notion of deprivation is closely linked to this, as it means that a person does not possess enough resources and conversion factors to enhance his freedoms.

The standard version of Amartya Sen's approach focuses on individuals (Rauschmayer et al., 2017), but through the implementation of a complementary currency not just individual freedoms but the collective capability set of participants changes too. Much of the interest in CA literature lies on how social interaction is relevant to a person's capability development. Sen and Evans agree that collective capabilities derive from social interaction. The term „socially dependent individual capabilities" used by Sen expresses that social structures, such as a community currency group influence individuals. Evans states that "individual capabilities depend on collective capabilities" (Evans, 2002:56). Sen also sees people's commitment to the group as important and necessary for its existence, and uses the term „individually dependent collective capabilities" (Davis, 2015:9).

Davis (2015) applies Granovetter's (1985) social embeddedness framework to individual and collective capabilities, and distinguishes three different kinds of social groups. These are market activity, public deliberation, and community participation. Davis (2015) states that in the case of community participation social groups depend almost entirely on individuals' commitment to them and on strong identification with their overall goals and the role opportunities they create for members. That is, their collective capabilities are highly individually dependent. At the same time, individuals

and their individual capabilities are particularly “socially dependent” in being especially tied to their roles and relationships in such groups.

The purpose of local development is to “extend the capabilities, that is, to provide as many valuable opportunities as possible for the members of a local community” (Gébert et al., 2016:26). According to Faragó (1994) “internal structural changes are occurring, the corollary of which is the increase in opportunities for local individuals and the local society, there are more options to choose from and the same possibility becomes available for more sections of society” (cited by Farkas, 2002: 45).

“The capability approach views human beings as active agents, directing their own lives” (Alkire, 2008:7). “They can’t be regarded as passive recipients of development” (Gébert et al., 2016: 26). The main aim of the development process is to expand “the range of valuable states/activities that the members of a local community can actually do or achieve” (Gébert et al., 2016: 30). Capability approach states, that “having the resources and means alone does not ensure that people achieve the desired state of being” (Gébert et al., 2016: 33). G. Fekete (2005) stresses the need to “motivate and prepare actors for how to use these tools and how they can responsibly take part in a process leading to improvement” (G. Fekete, 2005: 46). Gébert et al. (2016) emphasize the combined use of expertise and local knowledge in development.

As the Capability Approach regards people as active actors, this framework is in harmony with the endogenous model of local development, which presumes that the key to a territory’s sustainable development lies in its own resources, that the force of development is the local community.

Lowe (2000) identified the sources, which were used as theoretical base for the concept of endogenous local development. The main driving force was the notion of self-reliant localities that could control their own development. In response to the intensifying processes of globalization many communities started to look for alternative, local solutions and implementing alternative currency systems is one of them.

COMPLEMENTARY CURRENCY IN THE CAPABILITY APPROACH

When describing currency systems, which operate alongside the national currency the terms complementary currency or community currency are the most widely used. Existing literature offers a variety of different interpretations of what distinguishes complementary currencies from national currency (Schroeder et. al, 2011). “According to Kichiji and Nishibe (2008) the four characteristics of complementary currencies are: (1) they circulate in relatively small geographical areas, (2) they are non-governmentally issued, (3) they are non-convertible, or have restricted convertibility, (4) they have zero or negative interest-bearing” (Schroeder et al., 2011:33).

They exist in many forms depending on their function and geographic delimitations (Preissing, 2009). Whilst local currencies serve a specific area e.g. a town, a city or a neighborhood, regional currencies are used in a wider geographical area. This paper does not examine the so called technical cash equivalents.

Complementary currencies are used around the world, attempting to provide answers to central questions of territorial development. The aims of CCs “include the creation or strengthening of a locally rooted resilient economy, giving value to skills and things not valued by the standard market, and creating social ties in neighborhoods” (Rauschmayer et. al, 2017). The following 1. Table shows its benefits and the capabilities a CC could expand.

60Table 1: Benefits of CCs and the related capabilities

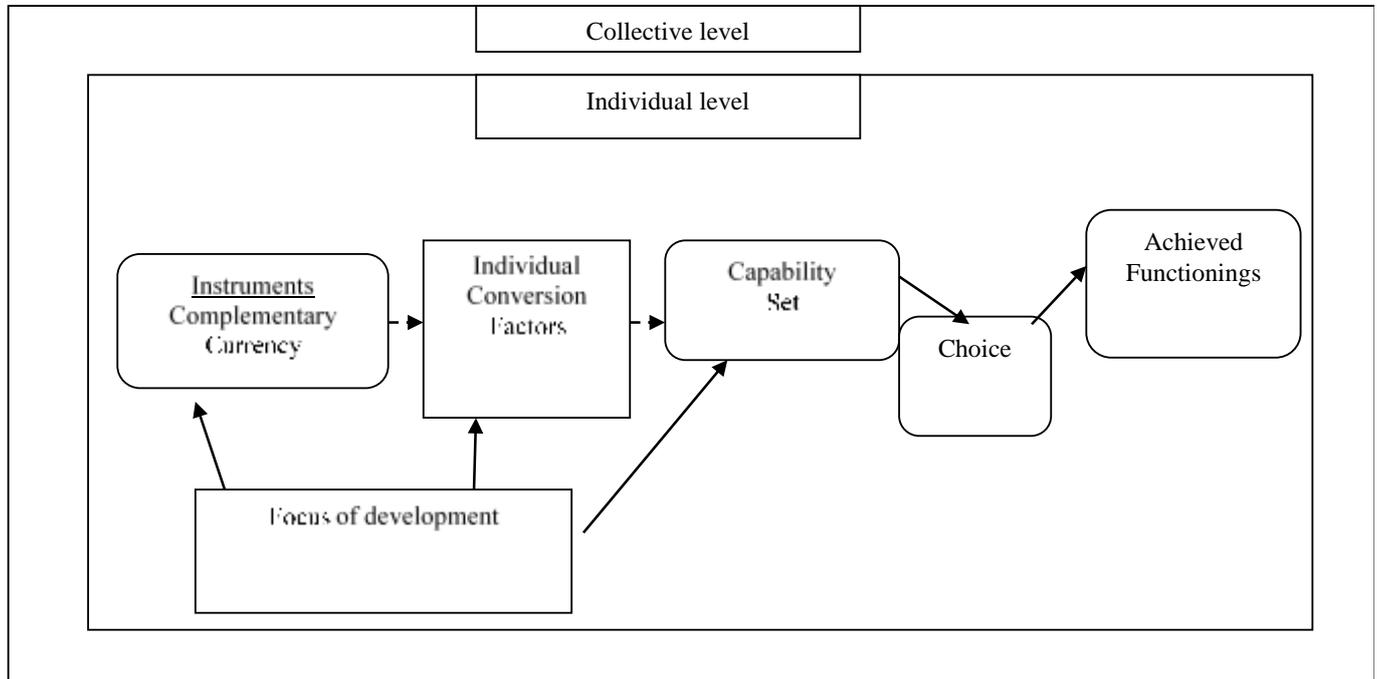
Area	Benefit	Capabilities/Functionings
Economic	Increased importance of undervalued activities	Self-sustainment, income generation, autonomy, learning new skills
	Increased alternative opportunities to fulfill basic or higher needs	Self-sustainment, obtain needed services or products
	Increased purchasing power	Access to more, higher level services, self-sustainment
	Increased access to the local market	Access to a more varied diet, self-sustainment
	Increased employment opportunities	Income generation
	Fostering self-reliance and individual self-esteem	Self-confidence, feeling useful
	Increased volume of currency in the local area	Autonomy, independence from government, large corporations
	Increased support for small enterprises	Autonomy, self-sustainment
Social-Political	Increased strengthening of social relationships	Social interaction, opportunity to participate, learning new skills
	Increased activity of local citizens	Express and act on personal values, experience new activities
	Disencouragement of the exclusion of disadvantaged people	Opportunity to participate, integration of disadvantaged people
	Increased awareness of alternative ecological values	Opportunity to learn, to participate
	Increased altruistic behavior of citizens	Feeling useful, contribute to the quality of life in the region

Source: own construction, based on Complementary Currency Resource Center, Retrieved April 27, 2018 from <http://complementarycurrency.org/helpdesk/benefits.html>

The traditional development approach considers the complementary currency as the main output of the process. The implementation of a complementary currency is the development program itself and is detached from the input-output interface of the Capability Approach. While in the Capability Approach the monetary innovation is a component of the development process. It is one of the ingredients or inputs for achieving the goal of development: a wider set of capabilities. In Capability Approach the development process does not end with the implementation of a complementary currency.

Since Capability Approach considers income as a capability, as a means of achieving the desired state of being, the end result of a development process is the achieved functioning. The following 1. graph shows complementary currency embedded into the model of Capability Approach.

Graph 1: The place of complementary currency in the Capability Approach



Zagata (2004) states, that “the establishment of complementary currency in a locality is per se unique”. The result depends on factors such as the needs of the community, on the ways of carrying out transactions, on the forms of exchange etc. In consequences of the diversity of complementary currencies and the wide range of designs and goals there have been many approaches, frameworks and models attempting to classify CCs, but there is no commonly accepted typology.

The major problem that arises is that CC schemes due to their diversity and dynamics escape from any rigid classification. In addition different objectives may lead to different categorizations (Blanc, 2011). The next section provides an overview of the existing typologies using Capability Approach attempts to classify CCs, through placing the focus on the involvement of a local community, the commitment of its participants and the set of capabilities they aim to widen.

EXISTING TYPOLOGIES

In English literature there are only a few classification systems on the subject and these are mostly proceeding from the traditional understanding of money, which is unable to capture the special features of complementary currency initiatives (Martignoni, 2012). To build a relevant system one must first review the theoretical and methodological contributions to the topic. According to Blanc (2011) the difficulty lies in creating a system that is flexible enough to let space for innovation. Building a new one should not have the aim of replacing existing typologies.

Kennedy and Lietaer (2004) tried to create a typology of CCs according to their purposes, but eventually discussed the way they are issued, their function and the way their costs are covered.

Blanc (2002) mentioned four rationales for monetary localism which frequently combine each other. The first is related to income collection mostly through seigniorage. The second is a change in the nature or conception of exchange and its context. A third is, to protect the local economic space against external monetary disruptions like a recession and/or inflation and finally, to increase local economic development (Blanc, 2006).

Blanc (2011) also proposed that one should not focus on items but rather on projects. In his article he introduces a distinction between three sorts of projects. There are territorial projects centered on a geopolitical space, community projects and economic projects centred on production and market exchange activities. He also emphasizes the importance of the project’s background. Implementers could be non-profit organizations, informal groupings, governments or firms. Schemes implemented by firms and national currencies are removed from his analysis. He sets ideal-types of currency schemes based on the space considered, on the purpose and guiding principle. He also proposes a second level of classification, distinguishing four generations that overlap and are progressively transformed.

Jerome Blanc and Marie Fare (2013) also presented a paper that concentrates on the role played by local governments and administrations in the development and differentiation of CCs. They explain the role of governments in the emergence of four generations. They also discuss the problems local governments have to overcome, and traps to avoid if they commit themselves to implement such schemes. The presented generations help to understand the relationship between complementary currencies and local governments. In the first generation of CCs e.g. LETS model the local administration does not play a role, they are not part of implementation process. Second generation schemes e.g. time banks have been used as tools to strengthen social ties at the community level. The third generation CCs e.g. Ithaca Hour seek advanced partnerships with local governments and authorities, also with local banking institutions. The fourth generation has a central role for local governments.

Marie Fare et al. (2015) also examined the impacts of complementary currencies in terms of sustainable territorial development. They identify three potentials in relation to sustainable development: the territorialization of economic, social and political activities, the revitalization and stimulation of exchanges and modifying practices, values and social representations.

The Talent Switzerland association classifies currencies by purpose and by sector (Dold, 2010). A spectrum between market/competition and relationships, gift economy is presented. Sectoral money that can be used for limited economic activities is also distinguished e.g. Fureai-Kippu for care in old age, or educational vouchers in Brazil.

As a conclusion they can either be very similar in their nature or very different, it depends on the circumstances in which they are implemented. A typology should not be built in order to classify the researcher's observations, and initiatives should not be forced into an existing framework.

BUILDING A TYPOLOGY

Blanc (2011) argues that the right way of building a typology is making first its purpose clear. This paper concentrates on how community and complementary currency schemes can support territorial development. In order to build a typology the paper focuses on projects and not on items e.g. the different bases for currency. The general philosophy, the guiding values serve as a major orientation point for the system. This section first reviews the objectives of CCs, from which a classification matrix is derived.

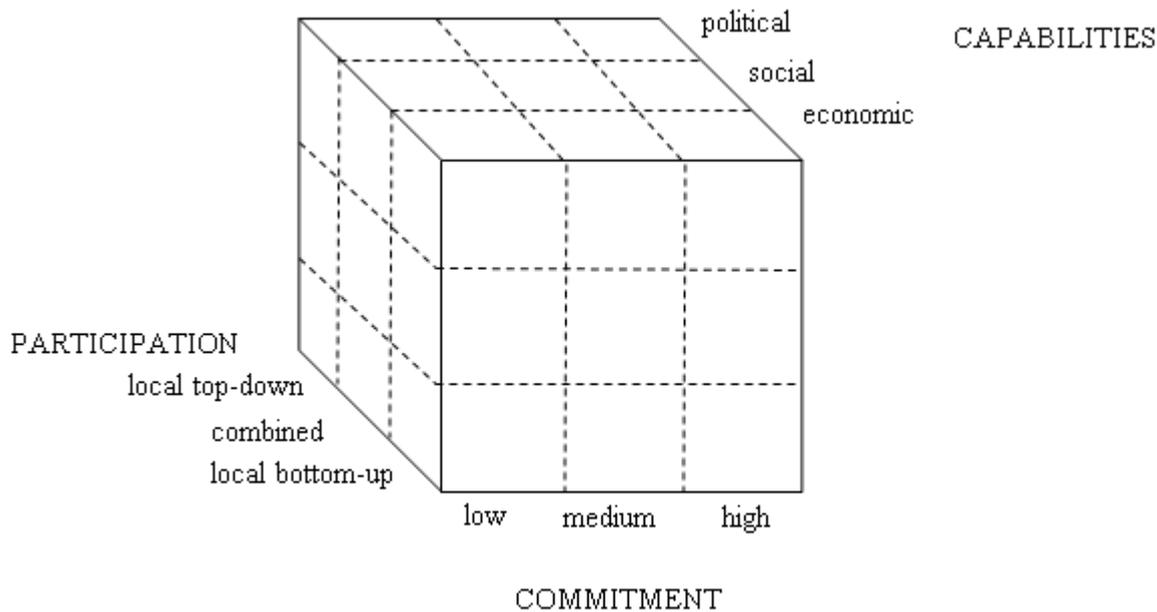
Most complementary currency systems seek to boost local economies and promote social integration by exchanging local services and production (Fare, Ahmed, 2017). Their aim is to redesign local social, economical and environmental relations. Studies analyzed and questioned their ability to achieve this. Leyshon et al. (2003) and North (1998) proposed an evaluation of their potential in terms of local economic development (job creation, self-employment, access to free credit) and social well-being or social inclusion (promotion of social bonds, social and human capital held by persons in a situation of exclusion, fairness, self-confidence, quality of life).

Recent reflections about intentional objectives name CCs as tools for "scale changes in sustainable local development through a collaborative and cooperative vector, innovative wealth valuation and the preservation of social protective systems" (Place, Bindewald, 2015:155). Dittmer divides CCs by their meso and macro objectives such as community-building, incentivizing eco-localization (Dittmer, 2013). Place and Bindewald also mention the typology made by Monnaie en Débat in 2011, which similarly focuses on meso and macro level objectives.

These authors - and others who followed - relied on different methodologies in assessing the impact of CCS, most of them differentiating between social, economical and environmental and political goals.

Under this respect this section proposes a typology, which would help to understand the interrelationships between goals, participation, commitment and freedoms. These separate but interrelated dimensions, each of which has at least three components can be visually linked together into a cube. This framework can be used to analyze the ways in which they contribute to local development according to the Capability Approach. The presented framework, the CC cube is shown on the 2. Graph below.

Graph 2 : The dimensions of the Complementary Currency Cube



Source: own construction

Each side of the cube is a dimension, but the blocks within the cube can be rotated and any side of the cube can be used as a starting point of the analysis. In this section we first begin with the dimension participation. It is seen as the opportunity for participation in the development and implementation process. The dynamic one must explore is how the complementary currency is created, what terms.

As any local development process, the development of a complementary currency can be a bottom-up/grassroots initiative or a local top-down initiative. Local top-down means that the starting point is the decision made by the local government. Supporters of this method state that any other way the local community would not be exposed to a monetary innovation like the complementary currency. The mixed method means that experts design the complementary currency, but integrate the local community in the process through knowledge-sharing. This way the complementary currency, its form will be designed according to the functioning the local people want to achieve.

The level of commitment is strongly related to how, and what terms is the currency created and to the freedoms the participants want to achieve. Depending on the formality or informality of the complementary currency individuals' commitment ranges across the full spectrum of commitment from very high to very low levels. Grassroots initiatives' existence depends almost entirely on the commitment of participants and their identification of its goals. The groups' collective capabilities, their opportunity to achieve the desired state of being are highly individually dependent. At the same time participants' individual capabilities are highly socially dependent in the way that the achievement of economic, social or political freedoms is closely tied to their participation in the group, to their roles and relationships in the group. Complementary currencies that are implemented through a top-down development process may not need such a high level of commitment. Because of the formal framework the organizations' collective capabilities are not as individually dependent. The formal operational system may make the wider use of a complementary currency possible, but the participants' commitment depends on the value (under value here we understand the freedoms they can achieve) they derive from these possibilities.

The development of a complementary currency and the commitment of its participants also depends on the freedoms its participants want to achieve. The motivation to participate may differ based on the functioning they want to obtain. Klandermans argues that movement participants are motivated by three fundamental reasons: "people may want to change their circumstances, they may want to act as members of their group, or they may want to give meaning to their world and express their views" (Klandermans, 2004:361).

Those who want to expand their economic freedom, those who join because of economic self-interest may have a higher level of commitment, because the functioning related to basic needs such as being well-nourished can only be achieved through their role in the group. Those joining out of economic necessity are more reliant on the use of a complementary and do engage in more transactions.

Those who join out of social reasons, to fulfill higher needs, such as the state of being a useful member of the local community may be more willing to give time and money to the organization of a complementary currency. The research on participation in community currency systems carried out by Ed Collom (2011) has results that prove the congruence between the motivations and individuals' involvement in a complementary currency system. The research also proves the members of the analyzed time bank joined to act on their values and to better the society.

A complementary currency may provide an opportunity to expand their political freedoms. As it is an alternative movement participants may join it to create an alternative wealth valuation system, an alternative market opposed to

the traditional economy. The extent to which they can express their alternative views defines the level of commitment they show. The interrelations between the dimensions are shown on the 2. Table below.

Table 2: Interrelations between the dimension of the CC cube

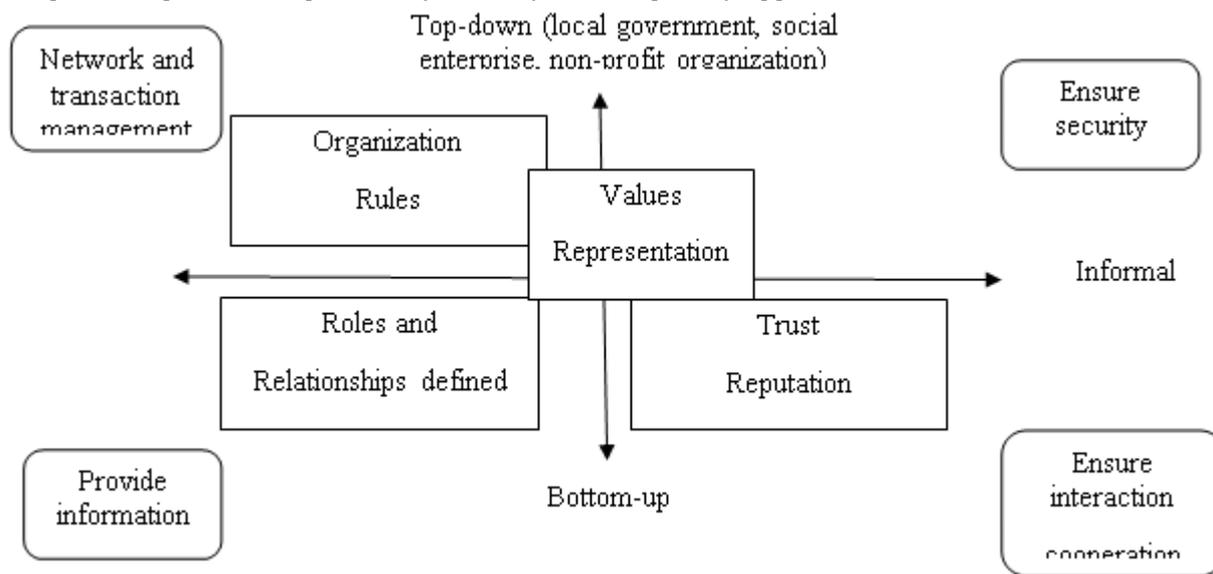
Commitment	low $\xrightarrow{\hspace{10em}}$ high	Capabilities
Participants capabilities	Socially dependent $\xrightarrow{\hspace{10em}}$	economic social political
Complementary currency scheme collective capabilities	Individually dependent $\xrightarrow{\hspace{10em}}$	
Participation	local top-down combined local bottom-up	

Source: own construction

This classification attempt appears to be flexible enough, and lets the possibility of combinations be analyzed. It could be a planning instrument, because implementers can plan its technical design, its circulation principle etc. according to the capabilities intended to be extended, to the participation and to the commitment needed. In order to develop and keep a CC operating in the long term implementers have to know if a CC has to be built around a democratic participation principle organized around non-profit organizations, if it needs a “technically demanding and expensive system” (Blanc-Fare, 2013: 70) or if it could work in a self-organizing way.

If its an informal, grass-root initiative the scheme’s collective capabilities are individually dependent. Participants need to build trust and reputation, the leaders of the scheme need to ensure the interaction and cooperation between the participants. If the scheme’s implementation is coordinated by experts, by the local government or by a non-profit organization with the involvement of the local community the implementers must ensure the representation of the citizen’s opinion. Participants only show commitment if it is provided and the value they derive from it is higher than their distrust against something new. If the norms are laid down, participants feel that their security is ensured. If it’s a bottom-up initiative formalized, the participants’ roles and relationships must be clearly defined; information must be provided about their roles and transactions, in short their network must have a formal framework. In top-down coordinated schemes great emphasis needs to be put on a sophisticated system of support, on network management to ensure the local community’s trust and commitment, to eliminate conversion factors that may appear. The 3. graph below illustrates the planning route they could take.

Graph 3: The place of complementary currency in the Capability Approach



Source: own construction

There are some limitations that have to be taken into account when using this framework. There is no single strategy or starting point, as CCs, their extent, their forms and overall their projects evolve rapidly, new combinations of existing schemes or basic items are spreading. One must understand the interrelations of the dimensions, how they are changing and has to build multiple strategies, based on the given starting point of analysis. One must keep in mind that it is not a checklist, it is an analytical framework which can be used to analyze how implementers of a complementary currency can support a change in the local community. It can be used by actors of change to reflect on how their work could contribute to local development, how they can change the individual and collective capabilities of local citizens.

CLASSIFICATION OF HUNGARIAN COMPLEMENTARY CURRENCIES BASED ON THE CC CUBE

In this section the paper attempts to classify Hungarian complementary currencies based on the above developed typology. From the operating complementary currency schemes I selected those with the most differences from each

other, to encompass the whole spectrum. To understand how CC schemes work in Hungary one must look at the first experiments in this area. "The confrontation of the theoretical presumptions and practical effects is quiet difficult under the conditions of the European post-communist countries" (Zagata, 2004: 482).

The traditional rural communities' element was the so called Kaláka, which is the form of mutual neighbor's help. The relative closeness of the communities and the lack of resources have given rise to this kind of circle of mutual help (Zagata, 2004). Also during wartime alternative currencies, emergency currencies were used to counter the negative effects that came from the lack of money.

The first still existing LETS scheme, the Talentum was established in Budapest in 1996. It was inspired by the LETS initiative in Austria. Talentum has around 150-200 members, who have meetings every second months. Most of the deals are made during these meetings or at club meetings. In the following years several similar initiatives have emerged, with mixed results e.g. the Zöld Forint Kör (Green Forint Circle) at Gödöllő, a city close to Budapest, as well as LETS in Szolnok, Miskolc (Óra Kör), Tiszaluc and Győr (North, 2004). It appeared that these schemes attracted mainly young people, but the older generation refused to join. Some believed that the complementary currency system tried to bring back the traditional elements of rural communities, which could not work "in the specific conditions of Hungary as a post-communist country" (Zagata, 2004: 483). Some of the early initiatives like Talentum are still operating, but most of them ceased to exist.

The second wave of CC schemes appeared with the Kékfrank in Sopron, in 2010. Shortly after the Balatoni Korona and Bocskai Korona were also introduced. Some other schemes discussed are the Alsómocsoládi Rigac, and the so called Kör initiatives (Jacsó, 2013). Following the discussion of these schemes I attempt to analyze them based on the presented framework.

SOPRONI KÉKFRANK

Kékfrank was created by a patriotic community, who wanted to reorganize the once organic social and economic relations. The inventor Tamás Perkovátz introduced some other vouchers in Sopron before creating the Kékfrank. The complementary currency was built on an existing community of patriots, who used Perkovátz's purchase vouchers (Perkovátz, 2010).

For the creation of Kékfrank a new European form of enterprise served as background. The European Cooperative Society is an entity that opens the door for cross-border cooperation. The "HA-MI Összefogunk/If-We Unite Limited Liability European Cooperative Society" was founded by 123 members, both entrepreneurs and individuals. Its strategic partners are the Rajka and Region Credit Union, Chamber of Commerce and Industry, Industry Corporation of Sopron and Its Environs, the CIG Pannónia Insurance Company and the University of the West Hungary Faculty of Economics (Szalay, 2011). Everyone can become a member through purchasing a minimum of 1 share. The complementary currency can be converted into the national currency.

Interesting fact that although the project fulfills multiplex goals, has the revitalizing of local economy as its purpose, the local government does not play any kind of role in its operation. Although the local government has a passive role, its attitude is not dismissive. It does not try to make decisions that are not favorable to them, but does not make any decisions to help them either. As it is a bottom-up initiative its existence depends on the use of the complementary currency, on the number of transactions carried out. Most of the members are local enterprises, whose dependence on the currency is not very high, as the income generated from it is only around 5% of their total income.

BALATONI KORONA

The complementary currency debuted in 2012, and is a result of a complex partnership between the local governments of Veszprém, Várpalota, Balatonfüred, Balatonalmádi, Litér, Nemesvámos and Tihany, the Kinizsi Bank and three other business partners.

In this case the local governments acted as initiators. They provided an appropriate legal framework, technical and financial support, and integrated it into specific public policies. The Balatoni Korona Ltd. founded by members of the partnership issued its currency in March of 2012.

Its main objective was to revitalize the economy of the region and to contribute to social cohesion through re-forming social ties (Sárdi et al., 2013). It meets various objectives and is used as a potential public policy tool by local governments. The "local governments are the largest issuers as they provide some other allowances, fees and premiums in Korona. The total amount of such payments is about 12-13 Million Forint, from which 9 Million is related to Nemesvámos, and Várpalota" (Sárdi et al., 2013:13).

General opinions about the system are positive, but the scheme is not without difficulties. The major problem lies in the permanent financial limitations, the erosion of social networks, and the lack of trust in each other. Generally members' commitment is quite low, and just in the case of Kékfrank their capabilities can not truly be expanded because of the currency's limitations.

BOCSKAI KORONA

The complementary currency was first introduced in 2012. Preparations began in the summer of 2011, when the local government of Hajdúnánás founded a holding company, the Hajdúnánási Holding Zrt. to ensure the scheme's financial

and institutional background. An interesting fact that at first it was intended to be used only locally, and just later on spread to the surrounding municipalities (Sárdi et al., 2013).

It is a project aiming to affect economic relations in a “geopolitically-defined space” (Blanc, 2011: 6). Local government uses it to achieve certain ends, namely the revitalization of local economic exchanges. The scheme focuses on the daily consumer behavior of local population, so its aim is to strengthen the relations between local businesses, and the local individuals. Its objective is to keep their purchasing power inside the municipality. “To keep it local means that first they even rejected the request to expand it to Debrecen” (Sárdi et al., 2013:14).

The acceptance of the Korona is very high. Participants’ capabilities are highly dependent on the use of the Korona. As it is a local top-down initiative the collective capabilities are not so highly individually dependent than in the case of Kékfrank.

ALSÓMOC SOLÁDI RIGAC

The Rigac is based on similar considerations as the Bocskai Korona. Its foremost purpose is to combat poverty and exclusion, to promote local consumption and to provide resources for the community. It is implemented only in Alsómocsolád; the local government is responsible for its issuance.

Among the discussed CC schemes it is the one most widely used as means of payment. Local governments provide allowances, fees and premiums in Rigac. Local government collects local taxes in the local currency, and companies tied to the local government also pay part of their employees’ salary in Rigac.

Inhabitants use around 90% of the local currency through the local governments system, because it also became possible to pay in Rigac for public services such as transport, home social care, culture etc (OFA Nonprofit Kft., 2015).

It is highly favored among local citizens, their commitment to the use of Rigac is very high, as their individual capabilities are highly socially dependent. The local community also took part in its planning and implementation.

TOKAJI DUKÁT

The latest in the line is the complementary currency of Tokaj wine region. It was born in March 2016 as a result of 27 municipalities’ partnership in the region. The idea of making a complementary currency to make the regions’ economy prosper again dates back to 2013. The local governments created the Dukát based on the example of Bocskai Korona (Parádi-Dolgos, 2016).

Its main goal is to strengthen the economic and social ties between the municipalities, and is designed to act as a tourist attraction. It is used to promote consumption of local or organic produce. As in the case of Bocskai Korona discounts are provided when purchasing local products (Parádi-Dolgos, 2016). Because of its relative newness there is little information available on the complementary currency.

The brief overview of the major CC schemes in Hungary illustrates how they are used in territorial development, how they are created, with what kind of goals. The 3. Table below summarizes the information about CC schemes in Hungary.

Table 3: Classification of Hungarian CC schemes

Issuer	Kékfrank Ha-Mi Összefogunk European Limited Liability Cooperative	Balatoni Korona Balatoni Korona Zrt.	Bocskai Korona Hajdúnánási Holding Zrt.	Alsómocsoládi Rigac Local government of Alsómocsolád	Tokaji Dukát Holding of 27 local governments in Tokaj wine region
Origin	founded in Sopron May 2010	founded in March 2012, cooperation between 7 local governments	founded in July in Hajdúnánás	founded in May 2013 in Alsómocsolád	founded in March 2016, cooperation of 27 municipalities
Scope	Sopron and its region, cross- border	7 municipalities around the lake Balaton	Hajdúnánás	Alsómocsolád	Tokaj wine region
Purpose	revitalizing local economy, strengthening cross-border cooperation and social ties	strengthening regional economy, and revitalizing social exchanges	strengthening local economy, protecting local businesses, stimulating local exchanges	strengthening local economy, revitalizing community ties	strengthening community ties, protecting regional economy
Capabilities	income generation, autonomy, opportunity to participate medium	access to more products and services opportunity to participate medium	income generation, opportunity to participate, autonomy high	self-sustainment, income generation, access to more, higher level services, autonomy high	social interaction, income generation, access to a varied diet
Socially dependent individual capabilities Individually	high	medium	medium	medium	low medium

dependent collective capabilities Participation	local bottom up, formal medium	local top-down low	local top-down medium	combined high	local top-down low
Commitment					

Source: own construction

CONCLUSION

This paper attempts to provide an analytical tool in order to make sense of the many forms, and contexts CCs appear. The author believes that this typology opens new perspectives to analyze complementary currencies, because it is based on the basis of individual and collective capabilities of local citizens. However the paper would not be complete without answering the question we identified in the introduction. The question is if it could have more impact than traditional development models? In order to answer this question we have to go back to the Capability Approach of local development. Applying this approach we move away from the classical view, which looks at a complementary currency as the end result of a development process. In Capability Approach complementary currency is regarded as an instrument to reach the desired state of being, so it is only the first step in the development process. This approach does not assume automatically a link between the implementation of a CC and well-being of the citizens, so it leaves more room for future adjustments based on the freedoms they wish to expand.

How applicable this framework is in practice, remains to be seen. The above shown Hungarian schemes can be the subject of further analyses based on the framework, and could illustrate the key factors, which lead to a successful change. It can be claimed that the success of a CC integrated into a local development project depends on the relationship between relevant actors, on the commitment its participants. The terms and the technical design should be established and managed to maximize the participation and commitment of its members.

REFERENCES

- Alkire, S. – Qizilbash, M. – Comim, F. (2008). Introduction. in: Alkire, S. – Qizilbash, M. – Comim, F. (eds). *The Capability Approach - Concepts, Measures and Applications*, Cambridge: Cambridge University Press
- Bennett, R.J. - Krebs, G. (1991). *Local Economic Development. Public-Private Partnership Initiation in Britain and Germany*. London-New York: Belhaven Press
- Blanc, J. – Fare, M. (2013). Understanding the role of governments and administrations in the implementation of community and complementary currencies. *Annals of Public and Cooperative Economics*, 84 (1), 63-81.
- Blanc, J. (2002). Formes et rationalités du localisme monétaire. *L'Actualité Économique* 78 (3), 347-369.
- Blanc, J. (2006). Local currencies in European History: an analytical framework. *Monetary Regionalisation. Local currency systems as catalysts for endogenous regional development*. International Scientific Conference, Sep 2006, Weimar, Germany. Bauhaus Universität
- Blanc, J. (2011). Classifying “CCs”: Community, complementary and local currencies’ types and generations. *International Journal of Community Currency Research*, 15 (D), 4-10.
- Collm, E. (2011). Motivations and Differential Participation in a Community Currency System: The Dynamics within a Local Social Movement Organization. *Sociological Forum* 26 (1), 144-168.
- Davis, J. B. (2015). Agency and the Process Aspect of Capability Development: Individual Capabilities, Collective Capabilities and Collective Intentions. *Filosofia de la Economia* (4), 5-24.
- Dittmer, K. (2014). Local currencies for purposive degrowth? A quality check of some proposals for changing money-as-usual. *Journal of Cleaner Production* (54), 3-13.
- Dold, U. (2010): Unpublished script about TALENT in Switzerland, Degersheim.
- Evans, P. (2002). Collective Capabilities, Culture, and Amartya Sen’s Development as Freedom. *Studies in Comparative International Development* 37 (2), 54-60.
- Faragó, L. (1991). *Local Economic Development*. in: Horváth, Gy. (szerk.): *Regional Policy and Local Governments*. Pécs: Centre of Regional Studies, HAS, 71-81.
- Faragó, L. (1994). Adalékok a területfejlesztéssel kapcsolatos fogalmak vitájához. - *Tér és Társadalom* (3-4), 23-39.
- Fare, M. – Ahmed, P.O. (2017). Complementary Currency Systems and their Ability to support Economic and Social Changes. *Development and Change* 48 (5), 847-872.
- Fare, M., de Freitas, C. - Meyer, C. (2015). “Territorial Development and Community Currencies: Symbolic Meanings in Brazilian Community Development Banks”. *International Journal of Community Currency Research* 19 (D), 6-17.
- Farkas, T. (2002). Vidékfejlesztés a fejlődésméletek és fejlesztési koncepciók tükrében. *Tér és Társadalom* 16 (1), 41-57.
- G. Fekete, É. (2005): Új esély a perifériáknak. *Falu Város Régió* (1-2), 44-46.
- Gébert J. – Bajmóczy Z. (2014): [The informational basis of local economic development according to the capability approach](#). SZTE GTK Műhelytanulmányok, Szeged: SZTE Gazdaságtudományi Kar
- Gébert, J. – Bajmóczy, Z. – Málóvics, Gy. – Pataki, Gy. (2016). Eszközöktől a jóllétig. A helyi gazdaságfejlesztés körvonalai a képesszeglétben. *Tér és Társadalom* 30 (2), 23-44.
- Granovetter, M. (1985). Economic Action and Social Structure: The Problem of Embeddedness. *American Journal of Sociology* 91 (3), 481-510.
- Jacsó, E. (2013). Helyi pénzek – Kisközösségi Program (Online text). Retrieved April 27, 2018, from http://www.humusz.hu/sites/default/files/Dokumentumok/kozossegek/helyi_penz_kiskozossegi_program.pdf
- Jouen, M. (2011). Local development in Europe - Assessment and prospects after the crisis. *Policy Brief* 21 (J), 1-6.
- Kennedy, M. - Lietaer, B. A. (2004). *Regionalwährungen: Neue Wege zu nachhaltigem Wohlstand*. München: Riemann Verlag
- Kichiji, N. – Nishibe, M. (2008). Network Analyses of the Circulation Flow of Community Currency. *Evolutionary and Institutional Economics Review* 4 (2), 267-300.
- Klandermans, B. (2004). The Demand and Supply of Participation: Social-Psychological Correlates of Participation in Social

- Movements. in: Snow, D. A. - Soule, A. S. - Kriesi, H. (eds.). The Blackwell Companion to Social Movements. Malden, MA: Blackwell Publishing, 360–379.
- Leyshon, A., R. Lee and C. Williams (eds) (2003). Alternative Economic Spaces. London: Sage Publications.
- Lowe P. (2000). The Challenges for Rural Development in Europe. In: From Production Agriculture to Rural Development: Challenges For Higher Education in the New Millennium- Proceeding of the 5th European Conference on Higher Agricultural Education conference 10-13 September, Seale-Hayne Faculty, University of Plymouth. UK, Plymouth, University of Plymouth, 19–31.
- Martignoni, J. (2012). A new approach to a typology of complementary currencies. *International Journal of Community Currency Research*, 16 (A), 1-17.
- Mezei, C. (2006). A helyi gazdaságfejlesztés fogalmi meghatározása. *Tér és Társadalom* 20 (4), 85-96.
- North, P. (1998). Exploring the Politics of Social Movements through “Sociological Intervention”: A Case Study of Local Exchange Trading Schemes. *The Sociological Review* 46 (3), 564–82.
- Országos Foglalkoztatási Közhazsnú (OFA) Nonprofit Kft. (2015). Helyi Pénz Tanulmány (Online text). Retrieved April 17, 2018, from [http://www.piactars.hu/uploads/files/documents/Helyi%20Penz%20Tanulmany%20\(2015\).pdf](http://www.piactars.hu/uploads/files/documents/Helyi%20Penz%20Tanulmany%20(2015).pdf)
- Parádi Dolgos, A. (2016). Az önkormányzatok szerepe a helyi pénz kibocsátásában és működtetésében. in: Kerekes Sándor (Ed.), *Pénzügyekről másképpen: Fenntarthatóság és közösségi pénzügyek*, Budapest: CompLex Wolters Kluwer, 147-160.
- Perkovátz, T. (2010). Complementary currency and the stimulation of local economy (Online text). Retrieved August 8, 2017, from http://kekfrank.hu/letoltes/Oizeto_eszkozunk_a_kekfrank.pdf
- Place, C. – Bindewald, L. (2015). Validating and Improving the Impact of Complementary Currency Systems through Impact Assessment Frameworks. *International Journal of Community Currency Research* (19), 152-164.
- Preissing, S. (2009). *Tauschen-Schenken-Geld? Ökonomische und gesellschaftliche Gegenentwürfe*. Berlin: Dietrich Reimer Verlag GmbH
- Puljiz, J. (2004). *Economic Development. - How to Improve Development on Local Level? Handbook with Best Practice Examples from South-East Europe*. Zagreb: Friedrich Ebert Stiftung, 9-24.
- Rauschmayer, F. – Polzin, C. – Mock, M. – Omann, I. (2017): Examining Collective Action Through the Capability Approach: The Example of Community Currencies. *Journal of Human Development and Capabilities*.
- Sárdi, G. - Varga J. - Parádi-Dolgos A. (2013). Comparative analysis of the Hungarian complementary currency systems. 2nd International Conference on Complementary Currency Systems (CCS), Rotterdam, 2013 (Online text). Retrieved April 17, 2018, from https://www.iss.nl/sites/corporate/files/Gabor_Sardi.pdf
- Schroeder, R. F. H. – Miyazaki, Y. – Fare, M. (2011). Community Currency Research: An analysis of the literature. *International Journal of Community Currency Research* (15), 31-41.
- Sekula, A. (2002). Local development – the definition aspect in the 21st century. *Company at the Turn of the 21st Century*, Rzeszów: Politechnika Rzeszowska, 59-64.
- Szalay, E. Zs. (2011). Kékfrank to boost the resilience of locality. *International Journal of Complementary Currency Research* (15), 52-56.
- Wilson, P.A. (1995). Embracing Locality in Local Economic Development. *Urban Studies* (4-5), 645-658.
- Zagata, L. (2004). Complementary currency systems as a source of endogenous development of localities. *Agricultural Economics*, 50 (10), 477–484.

1391 ARE WORKERS' COMMUTING SENSIBLE TO CHANGES IN THE SOCIOECONOMIC SCENARIO?

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ABSTRACT

One of the issues that are analysed in labour markets are the changes that occur in the patterns of workers' commutes as a result of changes in socioeconomic conditions. In this way, part of the literature finds certain degree of stability in labour commuting, while some authors argue that commuting is affected by workers' socioeconomic conditions. Thus, the present paper tries to find out, from the estimation of workers' commuting functions, what are the commuting determinants incorporating four types of variables, the characteristics of (i) the workers, (ii) the jobs (or hiring firms), and (iii) the municipalities where the workers reside and where firms are located. These functions are estimated based on the labour commuting microdata obtained from the Population Census of Spain for years 2001 and 2011, periods with clear socioeconomic changes, especially in terms of labour markets. Commuting functions are estimated by means of ordered probit functions. The results offer mixed evidence in relation to the initial antagonistic hypotheses, finding statistically significant changes in the sensitivity of commuting to working conditions between the indicated years, but that do not compensate for the important changes that have occurred in the labor markets.

Keywords: Workers' commutes, labour matching, socioeconomic conditions, microdata.

JEL: R12, R53

1 INTRODUCTION.

The economic literature includes a wide variety of empirical articles that, through the use of different statistical methodologies, raise an interesting debate regarding the stability over time of the duration of commutes, especially to the workplace. Thus, some papers (Reschovsky, 2004; McCuckin and Srinivasan, 2003; Kirby and Le Sage, 2009, among others) measure the increase in travel time to the workplace, associated to demographic changes and the increases in the size of cities and congestion. In particular, the most notorious change occurs, above all, in the percentage of workers who travel longer distances.

On the contrary, and despite these changes, Burchfield et al. (2006), Gordon, Ricardson and Jun (1991), Kim (2008), Sarzynsky et al. (2006) and Anas (2014), among many others, state that, once the levels of congestion are controlled by, the duration of commutes to workplace remains practically stable despite the increase in the size of cities, either because workers change their residences, or because there are other type of responses from workers, companies and public administrations oriented to keep these commutes times stable over time, i.e. construction of new infrastructures, changes in means of transport, alteration in the location of companies, selection mechanism of workers in firms' neighbourhood, modifications of schedules, etc.

In general, many of these studies ignore the effects that these factors may have on the labor market, specifically the existence of geographic segmentation. In fact, Thomas (1998) and Kunz (2011) argue that although there is a certain relationship between the duration of commutes and unemployment rates, it is not important enough to eliminate their differences in relatively close neighbourhoods.

As a result, there are still certain doubts, as it might seem a priori, about the radical influence that certain factors, such as the geographical configuration of the economic activity, the urban structure, as well as the socioeconomic determinants, may have over the configuration of commuting to workplace.

Spain, in particular, is a good case study of this phenomenon for at least three reasons. First, it is a country that is always pointed out for having problems of rigidity (including geographical rigidity) in the labour market (Sala and Trivin, 2014). In the second place, its economic conditions have drastically changed as a consequence of the great recession. Finally, it has abundant, detailed and similar information in two crucial moments of time, 2001 and 2011, that correspond to the moment before and during the economic crisis with a macroeconomic situation, and especially the one referred to the labour market, clearly different.

Thus, while Spain in 2001 was enjoying from economic expansion, the situation in 2011 was completely opposed, being beaten by both the internal economic crisis and the international one. As an example, of this drastic change suffered by the Spanish economy, it should be noted that the unemployment rate went from 10.5% in 2001 to double in 2011, reaching 21.4%. The economic changes in Spain have been so important that one could think that the analysed economy ten years apart correspond to totally different countries. In this changing context, it would be possible to give an answer to the question posed here, whether commuting patterns to workplace change or not over time, due to occurred socioeconomic and demographic changes.

The following section presents a review of the literature to contextualize the state of the art and the theoretical arguments pointed out, as well as the identification of the available empirical evidence. Next, the empirical model used to estimate the commuting functions to the workplace is presented. The fourth section describes the microdata employed from the Population Census of Spain for years 2001 and 2011 elaborated by the National Institute of Statistics (INE). The fifth section analyses obtained results. The paper ends with the usual conclusions and final considerations.

2. LITERATURE REVIEW.

There is previous empirical evidence that shows that the time that workers use to get to their jobs depends on different factors. These factors could be classified into three differentiated groups. On the one hand there would be the characteristics of the worker and the family environment (gender, living as a couple, children, age, nationality, education, means of transport, property of the home, etc.), on the other hand the characteristics of the job (size of the company, type of contract, qualification required, sector, etc.) and lastly the characteristics associated with the place of residence of the worker and the location of the firm (size, unemployment rate, infrastructure, etc.).

Within the characteristics of workers, one of the most analysed in this literature has been the gender. Thus, the results obtained conclude that there is clear evidence that it is women who spend less time in getting to their jobs (Lee and McDonald 2003; Fan, 2015; Neto, 2015, among others). MacDonald (1999) points out that this circumstance may be due to the fact that women usually perform more domestic tasks than men and assume a greater degree of responsibility in the care of the family and, therefore, tend to look for jobs closer to home (Chapple, 2001). In addition, the existence of a wage gap against women has also been evidenced, so this could be a cause of their lower willingness to move. Another characteristic of the workers, related to the previous one, is their family context. Thus, workers with small children make shorter trips to the workplace, especially in the case of women (Lee and McDonald 2003; Crane, 2007, among others). In addition, living as a couple also implies a reduction in the time taken to get to the job (Elliott and Joyce, 2004 and Fan, 2017). Another recurring characteristic of the worker in this literature is his nationality (or ethnic group), positively affecting the time of commutes when he or she is a foreigner or belongs to a minority ethnic group. The age of the worker has a negative effect on the time of commutes to the workplace (Green et al., 1986 and Matas et al., 2010). In turn, the level of studies of the worker also influences the time spent in reaching the workplace. Skilled workers show longer commuting times resulting from both higher salaries and more complex matching processes (Wang, 2003). The means of transport to reach the workplace is also important, this aspect is first subject to the distance to workplace (for example, if the distance is short, it is possible to go by foot), secondly to the existence of an adequate network of public transport, and the possession or not of a vehicle (Palma and Roachat, 2000).

With regard to the characteristics of the job, the variable working hours constitutes an important determinant. Workers with a full-time contract, are willing to travel longer (Giuliano, 1998; Lee and McDonald, 2003). The size of the firm, the sector in which operates, and the type of occupation are also frequently analysed (Lee and McDonald, 2003).

Finally, there are not many papers that analyse the characteristics associated with the place of residence of the workers and the location of the firms. Thus, the size of the cities could increase the time of commutes to workplace, although their urban structure seems even more relevant. In this sense, as cities become larger, the services offered by new infrastructures improve and, hence, commuting times are also reduced. With regard to the unemployment rate, there are few papers that have analysed the effect it has on the time of commuting to workplace. It is true that it would be expected that as the rate of unemployment in a city gets larger, commuting times could be expected to increase. However, some studies indicate that the existence of subsidies to unemployment, the ownership of housing, neighbourhoods where ethnical minorities are concentrated or with strong social conflict, can make commuting to this phenomenon indifferent.

3 THE EMPIRICAL MODEL.

The estimation of the commuting function to the workplace takes the form of expression (1).

$$y^* = x'\beta + \varepsilon \quad (1)$$

Where y^* is a latent variable and, therefore, not observable, that represents the time of commutes to work. x is the vector of characteristics that determine y^* . Although y^* is not observed, we have information about the time segment where the commute takes place, in this case 7 different time classes ($t < 10$; $10 \leq t < 20$; $20 \leq t < 30$; $30 \leq t < 45$; $45 \leq t < 60$; $60 \leq t < 90$ y $t \geq 90$) which are codified as follows $y \in \{0,1,2,3,4,5,6\}$. The independent variables are the determinants of these commutes, which are grouped into four different categories, (i) characteristics of the workers (age, sex, nationality, educational level, type of commuting, housing tenure regime, family structure), (ii) the characteristics of the job (activity sector, level of studies required, size of the company, working hours), and of (iii) the residence and (iv) work locations (size of the municipality, which captures the possible problems of congestion, unemployment rate, province, which controls for the urban structure and the provision of transport infrastructure).

Consequently, the estimation of this commuting function is carried out by means of an ordered probit model. The dependent variable, y , records the different times of travel to the workplace in minutes.

The regression model takes the form of expression (2).

$$y = 0 \text{ si } y^* \leq \mu_1$$

$$y = 1 \text{ si } \mu_1 < y^* \leq \mu_2$$

$$y = 2 \text{ si } \mu_2 < y^* \leq \mu_3$$

$$y = 3 \text{ si } \mu_3 < y^* \leq \mu_4 \quad (2)$$

$$y = 4 \text{ si } \mu_4 < y^* \leq \mu_5$$

$$y = 5 \text{ si } \mu_5 < y^* \leq \mu_6$$

$$y = 6 \text{ si } y^* > \mu_6$$

The estimation of the above model gives the values for both, the different intercepts β_i as well as the parameter estimates of vector β . The error term follows a normal distribution $\epsilon \sim N(0,1)$.

4 DATA.

We use data on daily mobility to estimate commuting functions to workplace. In this type of statistical databases, information is collected, in the form of microdata, including commuting times, the mode of transport and the characteristics of both the individual, his or her job, and their respective locations. In the case of Spain, the microdata samples of INE Population Census⁵⁰⁸ are appropriate, and hence, we use them for years 2001 and 2011. In both years, individuals who are not working and those who work either at home, or in several municipalities or abroad, have been excluded, since they do not offer commuting to workplace times. In addition, we have omitted people who reside or work outside of mainland Spain and people who take more than 90 minutes to arrive to their workplaces⁵⁰⁹. The final size of the samples used for the estimation of commuting functions, are of 656,748 individuals for the year 2001, and of 1,071,000 individuals for 2011.

Information on daily commutes to workplace is one of the variables available in the microdata of the Census. This is offered as a discrete variable in seven different time classes, less than 10 minutes, between 10 and 20 minutes, between 20 and 30 minutes, between 30 and 45 minutes, between 45 and 60 minutes, between 60 and 90 minutes and longer than 90 minutes. Table 1 shows the distribution of workers' commutes for each time class. More than a quarter of daily commutes to workplace occur in less than 10 minutes. It should be noted that this proportion has been reduced by just over 1% between 2001 and 2011. In addition, approximately 61% of commutes took less than 20 minutes in 2001, a value that is also reduced to 57.5% in 2011. On the contrary, 8.8% of the individuals were classified in 2001 along the two upper time interval classes, implying commuting times between 45 to 90 minutes. This proportion is increased to 9.6% in year 2011. It can be observed that commuting times to workplace have been slightly increased in 2011 compared to 2001. Thus, taking the upper value of each time interval class, while in 2001 the average time to arrive to the workplace was about 20' 36", this time has increased by just over one minute in 2011.

Table 1. Commuting to workplace. Summary statistics and the distribution by time interval classes

	2001	2011	Dif. 2011-2001
Observations	661,731	1,080,527	
Mean	20'36"	21'40"	01'04"
Median	16'48"	17'36"	49"
Standard deviation	16'04"	16'42"	38"
Asymmetry	1.48	1.36	-0.12
Kurtosis	2.21	1.73	-0.48
Percentage distribution by time interval classes			
0-10	27.08	26.03	-1.05
10-20	33.19	30.95	-2.24
20-30	19.79	19.83	0.04
30-45	10.5	12.82	2.32
45-60	5.7	6.01	0.31
60-90	2.98	3.48	0.50
> 90	0.75	0.88	0.13

Source: INE and own elaboration.

* Statistics have been calculated omitting commuting longer than 90 minutes.

Regarding the determinants of commuting, homogeneous characteristics have been taken into account. a) **characteristics of the worker** such as *sex*, *age* (four age groups: 15-24 years, 25-39 years, 40-54 years and 55 years or older), *level of studies* (measured by the number of schooling years, 6 years for primary school, 12 for secondary education and vocational training, 17 for University studies), *means of travel* (private using motor vehicles, public, by foot, and other means), *nationality* (Spanish and other), *housing tenure system* (own, rented, assigned free or at a low price, and other). b) **characteristics of the job** such as the *size of the firm* (approximated by the distribution of the following size classes, less than 10 workers, between 10 and 49 workers, between 50 and 199 workers, and more than 200 workers) in each municipality and sector according to the sample of firms used from SABI database (System of

⁵⁰⁸ For the 2001 Census, the microdata offered by the INE correspond to a representative sample of 5%. In 2011, a census was not carried out, but only a representative sample of 10% of the population was surveyed. This sample is precisely the one used here.

⁵⁰⁹ Individuals of the last time class considered in the census, with more than 90 minutes of commuting time, have not been taken into account, because they have no upper limit and hence impede the calculation of descriptive statistics. These cases only represent 0.75% of the individuals surveyed in year 2001 and 0.88% in year 2011.

Analysis of Iberian Balance Sheets), the *level of qualification required by the job* (corresponding to the mode of the three schooling basic levels registered for each occupation in the National Classification of Occupations, two digits CNO-94), the *type of employment*, either full or part-time employment, and the sector of economic activity of the firm. c) **characteristics of the municipalities where the company is located and the worker resides** such as the *size of the municipality* (the census have nine different size classes⁵¹⁰ that have been grouped into three categories: less than 20,000 inhabitants, between 20,000 and 250,000, and more than 250,000 inhabitants), the *province of the municipalities* where the worker inhabits and the *location of the company* (computed as indicator variables) and the *rates of unemployment of the municipality of residence and location of the company*.

Table 2 shows the descriptive statistics of commuting times for years 2001 and 2011 as a function of the variables just described. It can be highlighted, that workers who are between 25 and 40 years old, foreigners (presenting scores far apart from national workers), and skilled workers show longer commuting times to their workplace. With regard to sex, commuting times of women and men do not show very significant differences. Regarding the means of transport used to get to the workplace, workers who take the public transport are those who spend longer times, while workers who decide to commute by foot have the shortest commuting times. In addition, the individuals living in rented houses are those who spend more time in getting to their jobs, while lower commuting times are associated to those workers who have the house assigned free, usually by the company itself. As it would be expected, individuals living as a couple show lower commuting times.

Table 2.

		2001				2011				Dif. 2011-2001
		%	Mean	Median	Std. deviation	%	Mean	Median	Std. deviation	Mean
WORKERS' CHARACTERISTICS										
SEX	Women	39.76	20'39"	16'43"	16'17"	46.52	21'33"	17'30"	16'41"	00'55"
	Men	60.24	20'34"	16'50"	15'56"	53.48	21'46"	17'42"	16'43"	01'11"
AGE	years>25	12.43	20'43"	16'49"	16'13"	5.06	21'51"	17'48"	16'44"	01'08"
	25<=years<40	44.63	21'18"	17'18"	16'27"	36.67	22'38"	18'24"	17'07"	01'20"
	40<=years<55	32.77	20'02"	16'26"	15'39"	43.30	21'13"	17'16"	16'27"	01'11"
	55<=years	10.17	19'12"	15'41"	15'23"	14.97	20'30"	16'38"	16'15"	01'18"
YEARS OF SCHOOLING	6 years	51.9	18'57"	15'28"	15'21"	37.37	19'10"	15'23"	15'49"	00'13"
	12 years	26.89	21'24"	17'32"	16'14"	32.40	21'43"	17'44"	16'32"	00'19"
	17 years	21.21	23'37"	19'24"	17'03"	30.23	24'42"	20'30"	17'26"	01'05"
MEANS OF TRANSPORT	Private motor vehicle	62.71	20'15"	17'06"	14'36"	65.33	22'03"	18'10"	16'18"	01'48"
	Public	16.11	35'28"	20'39"	18'18"	14.76	29'33"	25'36"	19'03"	-06'13"
	By foot	20.10	10'03"	08'17"	07'20"	16.30	13'30"	09'59"	11'53"	03'27"
	Other	1.08	15'18"	13'23"	11'39"	3.61	19'19"	15'49"	15'18"	04'00"
NATIONALITY	Spanish	95.58	20'27"	16'42"	15'56"	94.76	21'32"	17'32"	16'34"	01'05"
	Other	4.42	24'03"	19'05"	18'24"	5.24	24'10"	19'05"	18'42"	00'08"
HOUSE OWNERSHIP	Own	83.43	20'30"	16'44"	15'59"	83.76	21'36"	17'35"	16'35"	01'05"
	Rented	11.01	22'18"	18'09"	16'56"	8.76	23'15"	18'49"	17'36"	00'57"
	Assigned free or low price	2.37	17'57"	14'17"	15'11"	2.18	19'16"	14'54"	16'31"	01'18"
	Other	3.19	19'10"	15'45"	15'21"	5.31	21'08"	17'02"	16'48"	01'58"
COUPLE	Living as a couple	57.74	20'01"	16'20"	15'45"	65.83	20'59"	17'04"	16'21"	00'58"
	Other	42.26	21'24"	17'26"	16'27"	34.17	22'59"	18'43"	17'17"	01'34"
JOB'S CHARACTERISTICS										
YEARS OF SCHOOLING	6 years	63.32	19'00"	15'32"	15'18"	45.18	19'12"	15'28"	15'46"	00'13"
	12 years	20.58	23'05"	18'51"	16'54"	33.72	23'11"	18'59"	17'03"	00'06"
	17 years	16.10	23'44"	19'31"	17'02"	21.10	24'30"	20'16"	17'21"	00'46"
EMPLOYMENT	Part-time	8.53	20'49"	16'46"	16'30"	14.98	20'28"	16'33"	16'18"	-00'24"
	Full-time	91.47	20'35"	16'48"	16'02"	85.02	21'53"	17'48"	16'46"	01'18"
CHARACTERISTICS OF THE MUNICIPALITY OF WORKER'S RESIDENCE										
SIZE	1	20.29	16'33"	12'20"	15'08"	36.22	19'22"	15'03"	16'36"	02'49"
	2	36.10	18'31"	14'55"	15'17"	28.82	20'45"	16'35"	16'32"	02'15"
	3	43.62	24'13"	20'17"	16'22"	34.96	24'47"	21'01"	16'28"	00'34"
RATE OF UNEMPLOYMENT	1 quartile		17'27"	13'51"	14'56"		24'40"	21'14"	16'56"	07'13"
	2 quartile		20'44"	17'09"	15'44"		21'22"	17'07"	16'54"	00'38"
	3 quartile		25'57"	21'42"	18'02"		21'55"	17'40"	17'01"	-04'14"
	4 quartile		18'32"	15'43"	14'07"		18'43"	15'08"	15'22"	00'11"
CHARACTERISTICS OF THE MUNICIPALITY OF FIRM LOCATION										
SIZE	1	19.02	15'26"	11'34"	13'55"	26.91	16'12"	11'58"	14'40"	00'45"
	2	34.62	17'42"	14'24"	14'44"	31.52	20'12"	16'29"	15'43"	02'29"
	3	46.36	24'53"	20'55"	16'44"	41.56	26'19"	22'21"	17'22"	01'26"
RATE OF UNEMPLOYMENT	1 quartile		17'15"	13'44"	14'49"		28'13"	24'18"	19'10"	10'58"
	2 quartile		24'59"	20'29"	18'07"		20'05"	16'43"	15'17"	-05'09"
	3 quartile		19'57"	16'54"	14'34"		20'08"	16'39"	15'28"	00'11"
	4 quartile		18'00"	15'34"	13'18"		18'16"	15'02"	14'42"	00'16"

This same Table also registers some important changes in commuting times between the two years of study for some of the considered characteristics. Thus, it can be observed that although the difference in time, between Spanish workers and foreigners, remains very large, it has been reduced by approximately one minute since Spanish workers have seen their commuting times increased. It is also worth mentioning that workers with higher qualifications have also increased

⁵¹⁰ Less than 2,000 inhabitants, between 2,000 and 5,000 inhabitants, between 5,000 and 10,000 inhabitants, between 10,000 and 20,000 inhabitants, between 20,000 and 50,000 inhabitants, between 50,000 and 100,000 inhabitants, between 100,000 and 250,000 inhabitants, between 250,000 and 500,000 inhabitants and more than 500,000 inhabitants.

their commuting times to a higher extent. On the other hand, the differences have been reduced considerably for the different means of transport used. While in public transport commuting times have been reduced, commuting by foot has increased. Finally, the descriptive analysis is surprising given that the relationship between workers' commuting times and the unemployment rates follow an inverted U shape in 2001, this shape being reverted in 2011, which could be interpreted as a consequence of geographic rigidity in the Spanish labour market.

5 RESULTS.

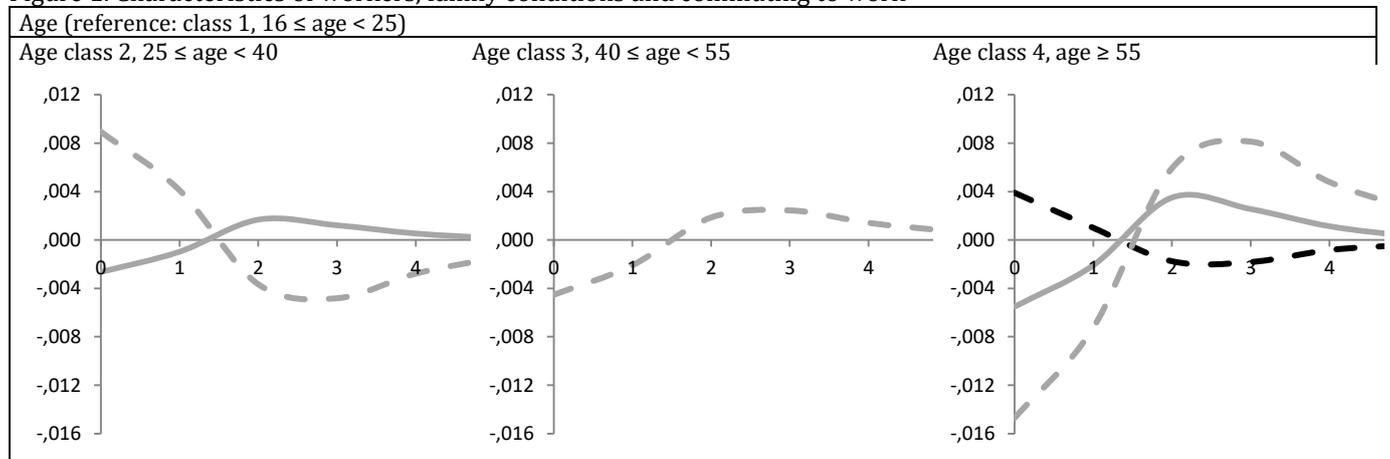
Once commuting functions are estimated by means of a multivariate ordered probit model for years 2001 and 2011, separately, we compute the relative probabilities for each characteristic and the different values that the dependent variable can take (1 to 6) in relation to each characteristic. The reference characteristics are, (i) in relation to the municipalities of residence and firm location, the first size class (up to 20,000 inhabitants), (ii) with respect to workers' characteristics, women, young workers (under 25 years old), Spanish nationality, using a privately owned car, living in an owned house and living as a couple, and (iii) in relation to the characteristics of the job, micro firms (less than 10 workers) and part-time employment. Both the years of education and the unemployment rate are included as continuous variables. The marginal effects of the regressors (except for sector and provincial indicators) on the probability of workers' commutes along each of the considered time interval classes are represented graphically.

When these variables are dichotomous, the marginal effect measures the loss or increase in the probability of commuting associated with the presence of the characteristic identified by the variable, conditioned to the fact that the rest of the regressors are evaluated in their mean values. When an independent variable has been coded as a set of dichotomous variables in different groups, one of them is eliminated in order to avoid perfect multicollinearity, and the marginal effects register the impact on the probability of commuting associated with the observation switching from presenting the characteristic identified by the omitted group to having the characteristic of the group for which the marginal effect is calculated⁵¹¹. In the case of continuous variables, the marginal effects measure the increase in the probability of commuting derived from a unit increase in the value of the corresponding regressor.

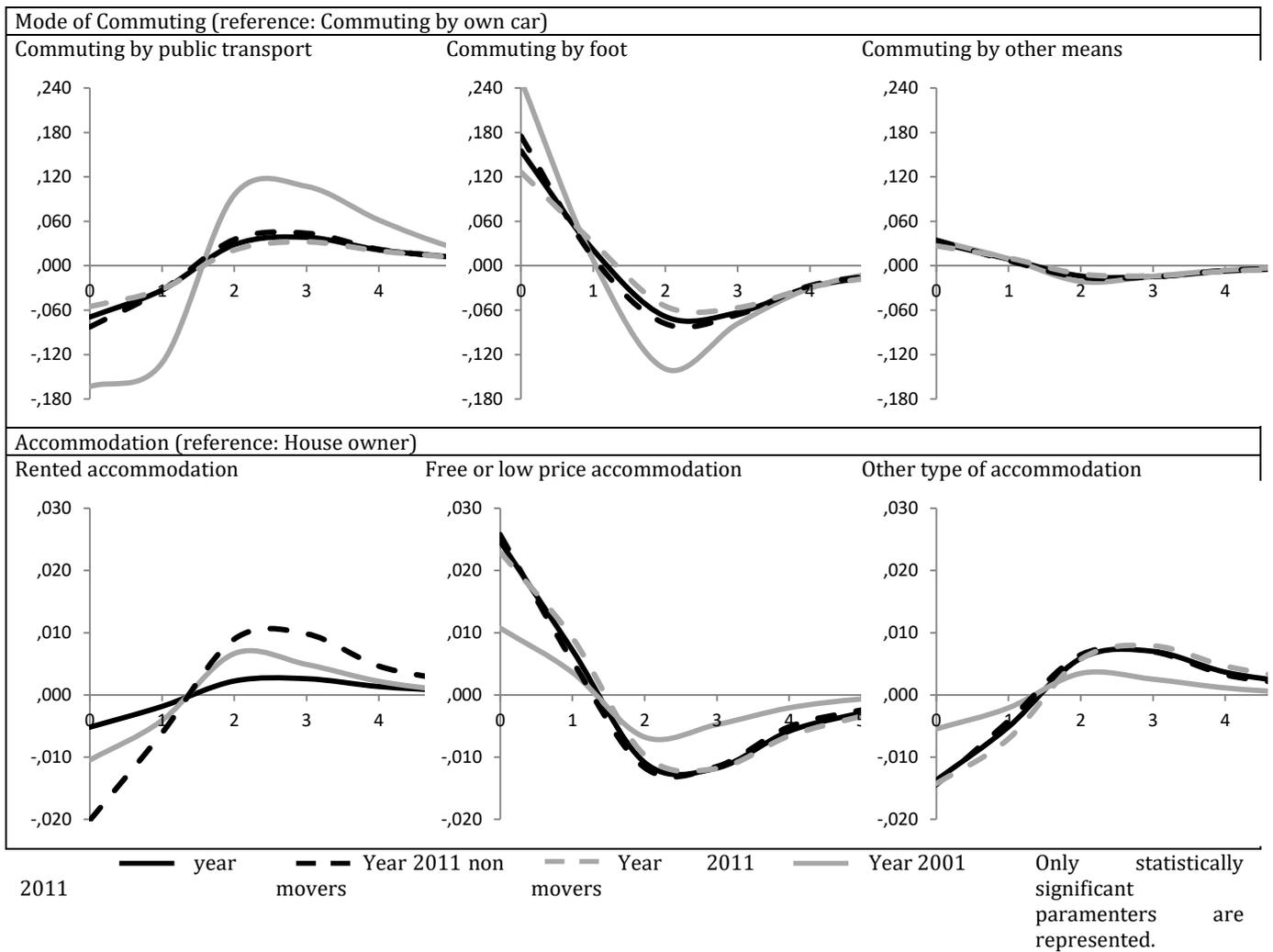
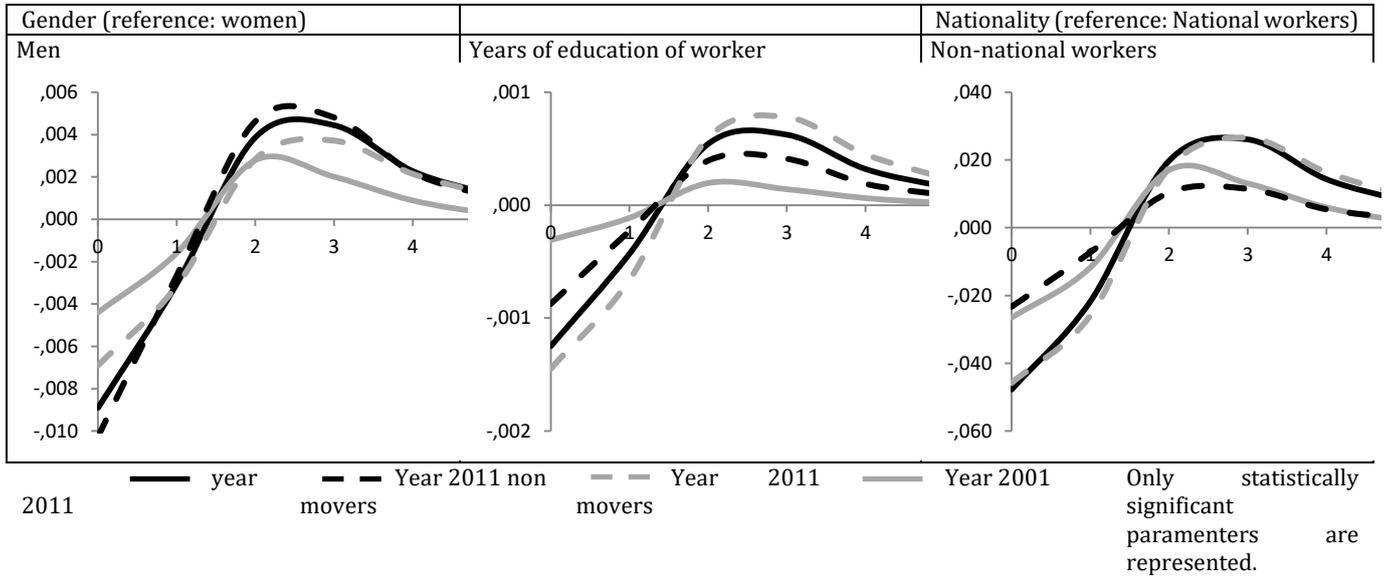
Figures 1 to 3 illustrate the marginal probabilities estimated for each characteristic at the different values that the dependent variable can take, conditioned to the fact that remaining regressors are evaluated at their corresponding mean values. Consequently, a convex (concave) probability curve from above for a given value of a characteristic will indicate that shorter commuting times are less (more) probable than longer ones. Likewise, that given characteristic shows longer (shorter) commuting times that the value set as the reference. Therefore, an increase in the curve convexity (concavity) between the two periods analysed will imply an increase of the difference with respect to the reference value. The analysis is symmetric for decreases in the degree of convexity or concavity. By construction, the area below the probability curve and the x-axis should be equal to the area above the probability curve and the x-axis. Finally, the estimation for year 2011, takes into account changes in workers' residence location along considered time horizon, estimating commuting functions for those workers changing location (movers) and those who remain located in the same address (non-movers). The distinction is made in order to evaluate the extent to which workers' choice of residence depends on job location, and if residence changes take place in order to minimise commuting times.

In relation to the characteristics of the workers (Figure 1), a notorious change in relation to age between 2001 and 2011 is observed. In the first period, the relationship seems to be positive with age, except in the 40 to 55 age class, a result that in principle is not consistent with previous evidence, but that surely responds to the combination of factors accounted by remaining variables. In year 2011 this observed relationship disappears and age no longer has a statistically significant effect. Interestingly, when the individuals of this second year are disaggregated into movers and non-movers, the former group shows a positive relationship with age, which could respond to a process of greater sub-urbanisation in the older group.

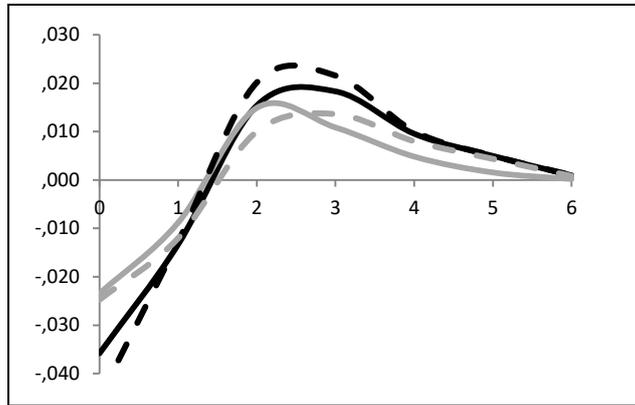
Figure 1. Characteristics of workers, family conditions and commuting to work



⁵¹¹ For example, in the case of age, four age groups are constructed and hence four dichotomous variables (less than 25 years old, between 25 and 40 years old, between 40 and 55 years old and over 55 years old). In this case, to avoid perfect multicollinearity, the first of the age groups is omitted, so the rest of the results must be interpreted with respect to it.



Type of family (reference: living as a couple)
Not living as a couple



year 2011 non movers ——— Year 2011 movers ——— Year 2011 ——— Year 2001 Only statistically significant parameters are represented.

Men show longer commuting times, a difference that increases over time, especially for non-movers. On the other hand, more skilled-workers also have longer commuting times, which, as in the case of men, increase over time, in this case as a consequence of the movers. The explanation behind this phenomenon is probably due to the fact that the population with higher education levels is precisely the one below 40 years old, which has changed residence from the family address to their own place along the considered intercensal period, by acquiring a residence in the peripheries of large cities, where housing prices have increased less than in the city centre along the years of the housing bubble.

Foreign workers also offer the same profile. Longer commuting times for year 2011 and especially in the case of movers, which perhaps identifies those workers who arrived after 2001 or those who are willing to move to improve their working conditions and acquired housing in the cheapest areas, while non-movers are identifying most integrated immigrants or those who came in along the nineties and settled in central areas in some depressed districts.

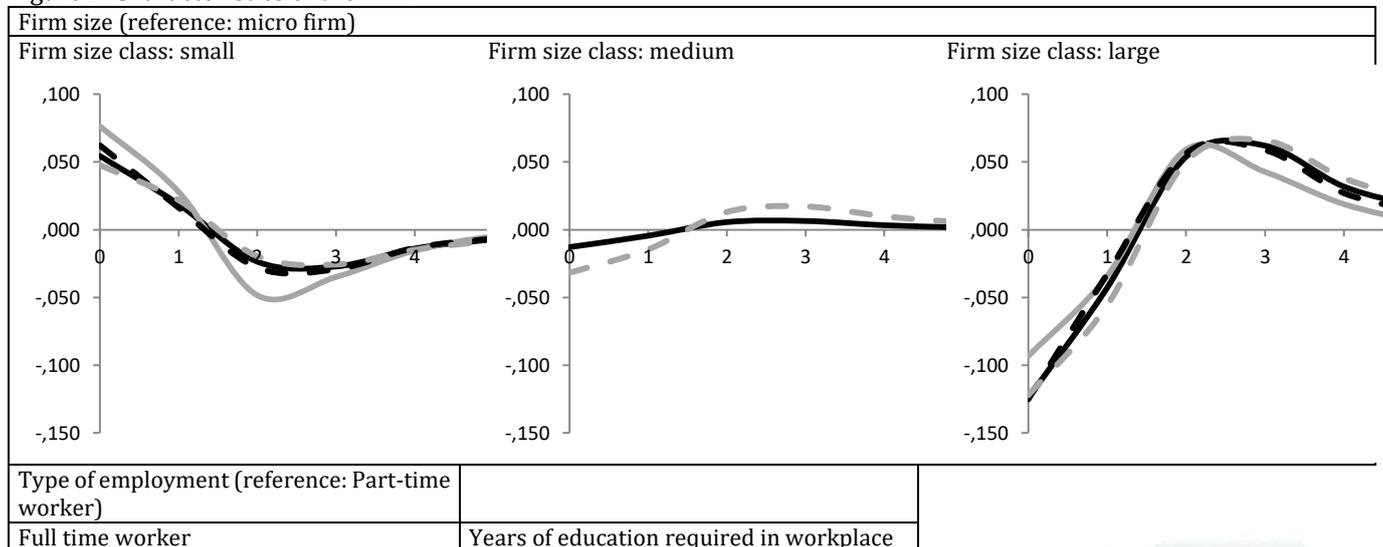
Precisely, people who live in rented houses show longer commuting times compared to those who own their houses, although a downward trend is observed mainly caused by movers.

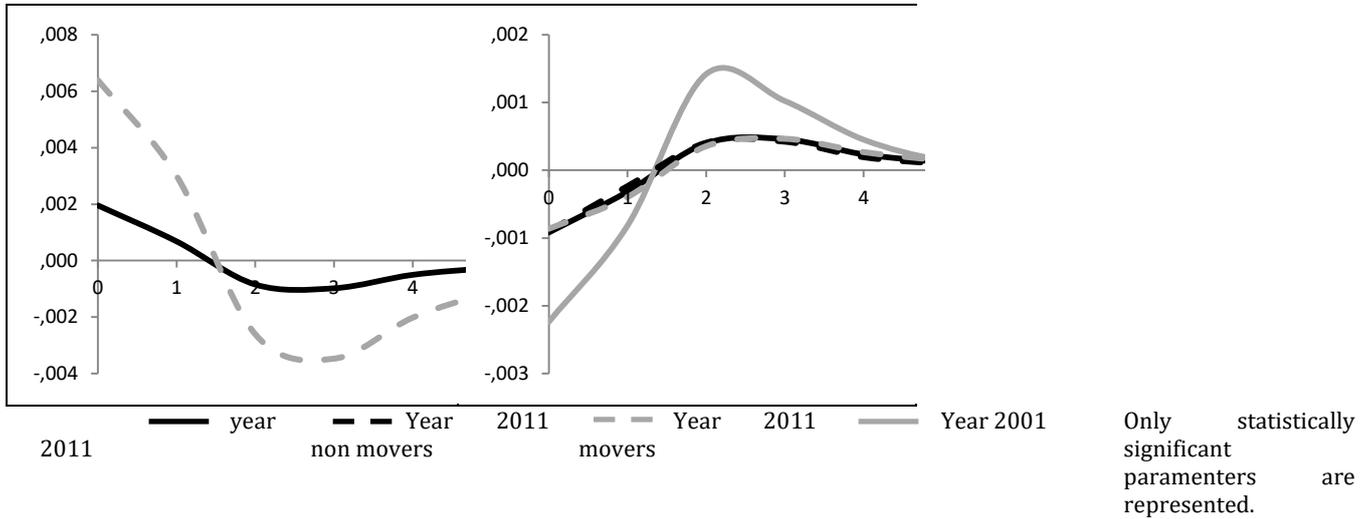
Family life is associated to shorter commuting times in relation to those who do not live with a partner and this difference increases especially through non-movers.

The chosen mode of transport also determines significant differences in the duration of commutes. Thus, the use of public transport increases the duration of commutes compared to the use of private vehicles, although a downward trend is observed in this mentioned difference. Just the opposite occurs with commuting by foot, that are related to shorter commuting times, and show an increasing trend over time.

Regarding the characteristics of the firm and the job (Figure 2), firm's size seems to show a positive effect on the duration of commutes, although some inconsistency in the medium-sized firms is observed. What does seem to be fulfilled is that the differences with respect to micro firms increase over time. Having full-time employment, as opposed to a part-time one, has no statistically significant effect in 2001, and turns to have a statistically negative effect over the duration of commutes in year 2011, possibly as a consequence of the fact that full-time employment is indicating more years of work experience and better working conditions. In fact, the change over time is observed for full-time movers. On the other hand, higher qualification levels imply longer commuting times, although this effect is moderating over time.

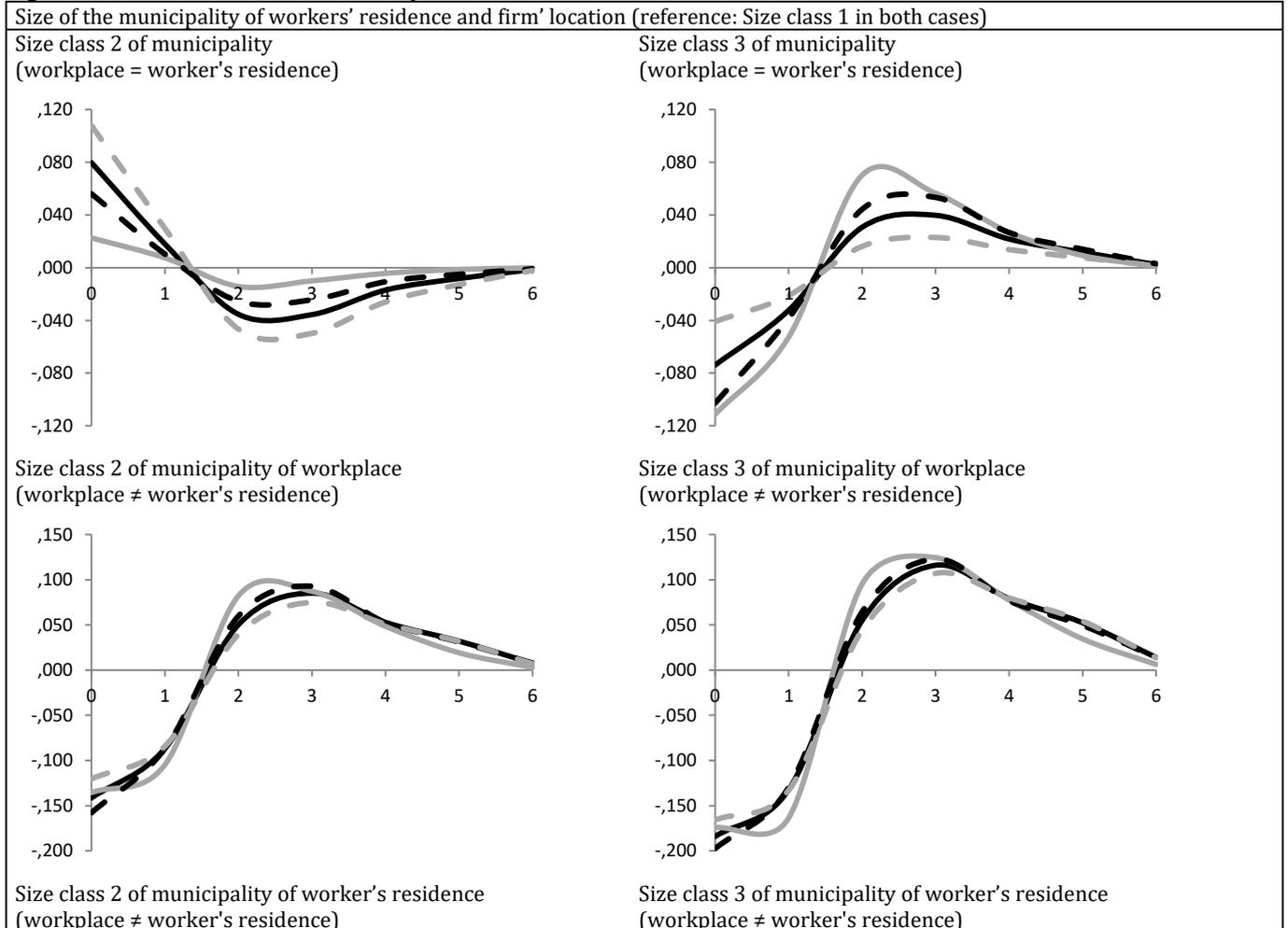
Figure 2. Characteristics of the firm

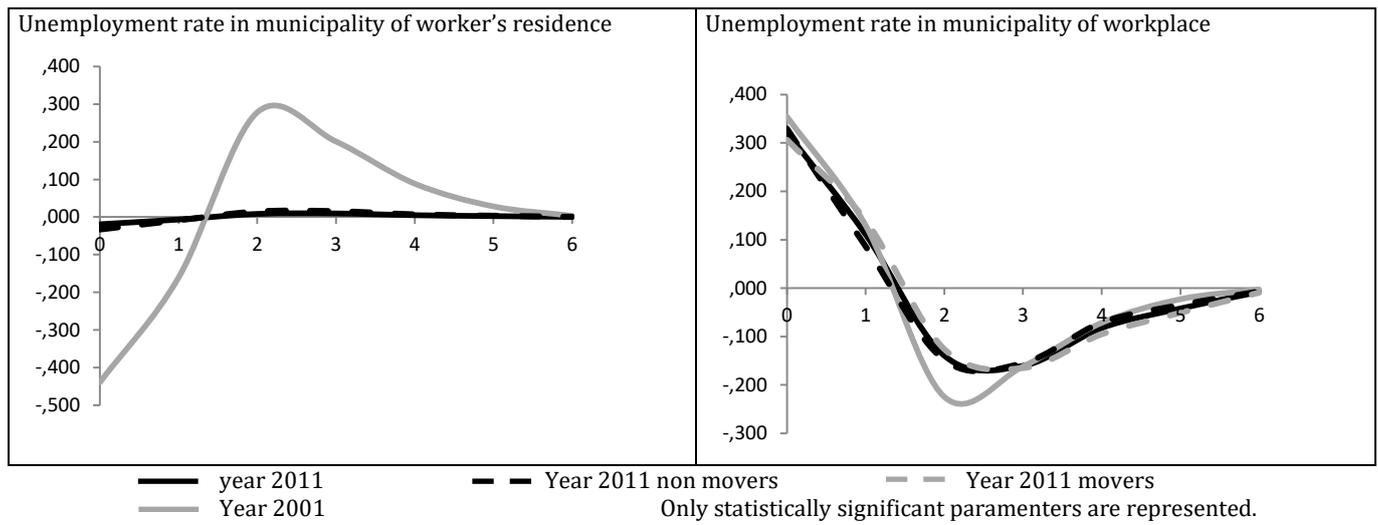
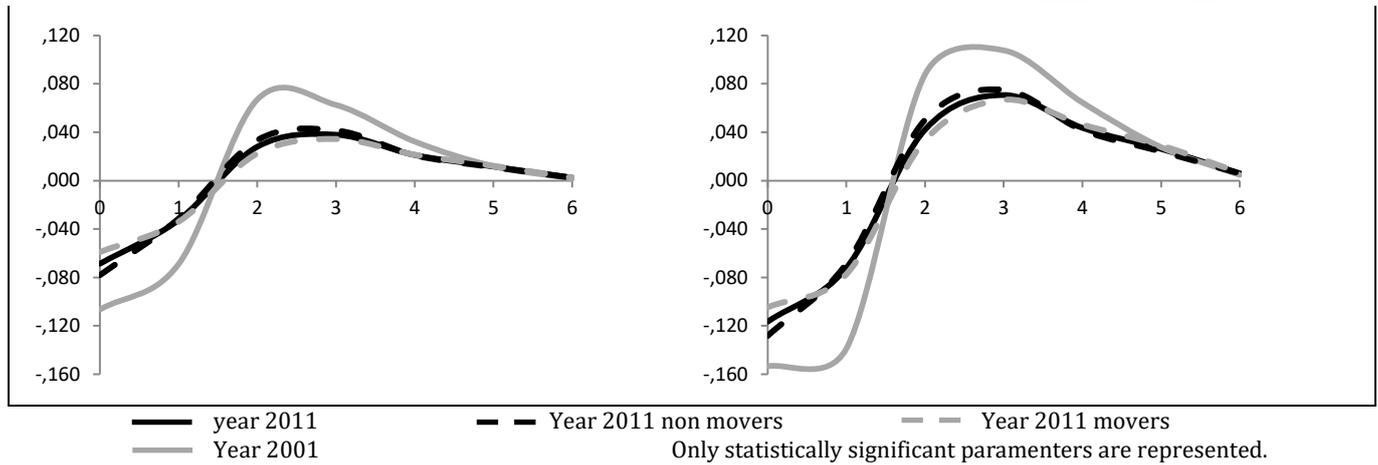




Finally, Figure 3 identifies some interesting effects regarding the characteristics of the municipalities where the worker resides and the firm is located. When residence and work takes place in the same municipality, while in the medium-sized municipalities the commuting times are shorter than in the small ones, in the large ones commuting times are longer. The effect observed on the medium municipalities is possibly due to the use of other modes of transport compared to the small ones that reduce commuting time. On the contrary, in the large municipalities commutes are of longer duration. In both cases the differences decrease over time with respect to the small ones.

Figure 3. Characteristics of the municipalities of workers' residence and firms' location





When the municipalities of work and residence are different, the effect in both cases is the same, commutes increase with size, although there seems to be a certain fall in this difference over time, possibly as a consequence of infrastructure development and efficiency improvement along the considered time horizon in the transport network between neighbouring municipalities.

The unemployment rate has a different effect depending on the municipality in which it occurs. It has a positive effect over commuting duration when corresponds to the municipality of workers' residence, favouring longer commutes of its inhabitants. Conversely, the unemployment rate of the municipality where the firm is located has a negative effect on commuting times and thus discouraging the search for workers across large areas. There is nonetheless an interesting change in the intensity between the two years analysed. Thus, in 2001 the positive effect observed for the unemployment rate of the municipality of residence of the workers was of greater intensity than the negative effect of the unemployment rate of the municipality where the firm was located, so that, in case of coinciding both municipalities, the net effect was positive. On the contrary, in 2011, the unemployment rate of the municipality of residence still shows a statistically significant positive effect but much smaller than in 2001, and the negative effect that the unemployment rate of the municipality of firm location has over commuting times is also reduced, therefore, in case of coincidence of both municipalities a negative net effect is observed.

This observed change is particularly interesting, especially in the case of the municipality of residence, which leaves almost no effect of the rate of unemployment over the duration of commutes. Possibly, this result, that provides evidence of the change in the sensitivity of commuting to changes in the socioeconomic conditions, has to be explained in terms of the important and systematic increase of unemployment in Spain between 2001 and 2011. The notorious geographical and functional rigidities of the labour market may have impeded further adjustments that could have occurred by moving to neighbouring areas.

6 CONCLUSIONS

This paper analyses the determinants of the duration of workers' commutes to their workplaces in Spain for the years 2001 and 2011. Thus the analysis is carried out in two periods under different socioeconomic scenarios, serving to evaluate the extent to which commuting functions are stable over time or, as argued by some previous evidence, these functions should only be used statically, given that changes in socioeconomic conditions, captured by relevant commuting determinants, imply changes in the values of estimated sensitivities.

Obtained results for the Spanish case appear to be in favour of the second hypothesis, as the duration of general commutes have not been modified drastically, but the changes in the socioeconomic conditions have altered the values

of estimated parameters. On average, the final impact seems to remain unaltered, as slight changes in the duration of commutes are often compensated by the changes in parameter values.

In this sense, the most important observed alteration is in the sensitivity of commuting to the rate of unemployment, especially the one occurring in the municipality where the worker resides. If the change in the value of this parameter between the estimations for years 2001 and 2011 would not have taken place, the duration of commutes would have changed very significantly.

Remaining results show greater propensity to longer commutes in the case of men, workers with higher educational levels, foreign workers, workers living in a rented house as compared to those owning the house or living as a couple, as well as those who use public transport as compared to those using a private car.

Those workers having worse working conditions and, in general terms, those who live in larger cities, commit longer commutes, except those who live and work in medium-sized cities, whose commutes durations are slightly shorter than in the case of workers living in small cities.

Finally, in order to account for the possibility of simultaneity between the decision of choosing the location of workplace and that of residence, commuting functions in year 2011 are estimated separately for the sample of individuals who have changed their municipality of residence along the intercensal period and the sample of workers who have not done so. The results seem to show a partial confirmation of this hypothesis, since in many cases it seems that the decision to locate their residence has been subordinated to the housing market bubble, at least until 2008, which has conditioned the indicated joint decision.

REFERENCES

- Anas, A. (2015): "Why are urban travel times so stable?", *Journal of Regional Science*, 55(2), 230-261.
- Burchfield, M.; Overman, H.G.; Puga, D. and Turner, M.A. (2006): "Sprawl: A portrait from space", *Quarterly Journal of Economics*, 121(2), 587-633.
- Chapple, K. (2001): "Time to work: Job search strategies and commute time for women on welfare in San Francisco", *Journal of Urban Affairs*, 23(2), 155-173.
- Crane, R. (2007): "Is there a quiet revolution in women's travel? Revisiting the gender gap in commuting". *Journal of the American Planning Association* 73: 298-316.
- Elliott, J.R. and Joyce, M.S. (2004): "The effects of race and family structure on women's spatial relationship to the labour market", *Sociological Inquiry*, 74(3), 411-435.
- Fan, Y. (2017): "Household structure and gender differences in travel time: spouse/partner presence, parenthood, and breadwinner status", *Transportation*, 44(2), 271-291.
- Giuliano, G. (1998): "Information technology, work patterns and intrametropolitan location: a case study", *Urban Studies*, 35(7), 1077-1095.
- Gordon, P.; Kumar, A. and Richardson, H.W. (1989): "The influence of metropolitan spatial structure on commuting time", *Journal of Urban Economics*, 26, 138-151.
- Gordon, P.; Richardson, H.W. and Jun, M.J. (1991): "The commuting paradox; Evidence from the Top Twenty", *Journal of the American Planning Association*, 57(4), 416-420.
- Green, A.E.; Coombes, M.G. and Owen, D.W. (1986): "Gender-Specific local labour market areas in England and Wales", *Geoforum*, 17(3), 339-351.
- Kim, C. (2008): "Commuting stability: A test of the co-location hypothesis", *Transportation Research Part A*, 42, 524-544.
- Kirby, D.K. and LeSage, J.P. (2009): "Changes in commuting to work times over the 1990 to 2000 period", *Regional Science and Urban Economics*, 39, 460-471.
- Kunz, M. (2011): "Regional unemployment disparities in Germany. An empirical analysis of the determinants and adjustment paths on a small regional level, Doctoral Dissertation, Universität Regensburg.
- Lee, B.S. and McDonald, J.F. (2003): "Determinants of commuting time and distance for Seoul residents: The impact of family status on the commuting of women". *Urban Studies* 40(8), 1283-1302.
- MacDonald, H.I. (1999): "Women's employment and commuting: Explaining the links". *Journal of Planning Literature* 13: 267-283.
- Matas, A.; Raymond, J.L. and Roig, J.L. (2010): "Job accessibility and female employment probability: the cases of Barcelona and Madrid", *Urban Studies*, 47(4), 769-787.
- McGuckin, N. and Srinivasan, N. (2003): *Journey to work trends in the United States and its major metropolitan areas 1960-2000*, Report, Department of Transportation, Federal Highway Administration, Office of Planning.
- Neto, R.S.; Duarte, G. and Páez, A. (2015): "Gender and commuting time in Sao Paulo Metropolitan Region", *Urban Studies*, 52(2), 298-313.
- Palma, A. and Rochat, D. (2000): "Mode choice for trips to work in Geneva: an empirical analysis", *Journal of Transport Geography*, 8(1), 43-51.
- Reschovsky, C. (2004): *Journey to work: 2000*. Census 2000 Brief. Mark 2004.
- Sala, H. and Trivin, P. (2014): "Labour market dynamics in Spanish regions: evaluating asymmetries in troublesome times", *SERIES*, 5(2-3), 197-221.
- Sarzynsky, A.; Wolman, H.L.; Galster, G.C.; Hanson, R. (2006): "Testing the conventional wisdom about land use and traffic congestion: The more we sprawl, the less we move?", *Urban Studies*, 43(3), 601-6126.
- Thomas, J.M. (1998): "Ethnic variation in commuting propensity and unemployment spells: Some UK evidence", *Journal of Urban Economics*, 43(3), 385-400.
- Wang, F. (2003): "Job proximity and accessibility for workers of various wage groups", *Urban Geography*, 24(3), 253-271.
- Weichselbaumer, D. and Winter-Ebmer, R. (2005): "A meta-analysis of the international gender wage gap", *Journal of Economic Surveys*, 19(3), 479-511.

1509 URBAN FURNITURE CHROMATIC PLANNING AS AN INCLUSIVE FACTOR FOR URBAN SPACES

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ABSTRACT

This paper aims to demonstrate how a coherent chromatic plan applied to urban furniture may contribute to improve the space within cities, as the different city's areas become different one from each other and, simultaneously, the urban furniture elements are converted into ergonomic factors, standing out from their background and contributing to improve the population inclusivity. In order to achieve this purpose, and because the existent methodologies weren't adequate to reach the aimed objectives, it was decided to develop a new methodology that would allow the determination of colour plans, with a higher scientific approach, as a strategy for the enlargement of urban chromatic plans perspective. The research focus has been the city of Lisbon, where the new methodology was applied to three of its neighbourhoods, which constituted the case studies, and the research and its results were tested and validated by three focus groups that included people with different ages and genders, Municipality authorities and Colour Experts.

Keywords: Urban spaces, Urban furniture, Inclusivity, Orientation and Identification, Chromatic planning



Figure 1: Colour in Urban furniture make it stand out from the environment (Source:authors)

INTRODUCTION

This paper presents the research and the case studies for a new urban furniture chromatic planning methodology, with the purpose of originating a system that would ameliorate urban furniture use, improving the visibility and legibility of its elements, transforming them in identification factors for the different city neighbourhoods, and contributing to a better orientation within the cities. This methodology is intended to be applied solely to urban furniture, which will become an ergonomic and inclusive factor, and not interfering with the city architecture or other elements of city signage, which are encoded by road legislation.

Contemporary cities, in their development, originated the necessity for complex traffic and network signage systems, that in addition to the abundance of multicoloured publicity contributes to a general confusion that causes difficulties to visitors and inhabitants orientation. Consequently, orientation within the cities can be a problem of difficult resolution, mainly on those with an architecture lacking differentiation and that don't have obvious reference points that could establish a base for wayfinding/wayshowing maps. Even tourist maps, that differentiate the cities zones through colours, don't have any correspondence in physical space, i.e., the concern to match these colours with a real use on its urban space does not exist. From this premise arose the necessity to identify the various city zones by means of specific colours that could differentiate them, considering that colour would be the most efficient mean to achieve this aim.

On this purpose Minah [1] states: "As a pedestrian, colours are experienced in a continually changing visual field. Planners have succeeded in achieving visual order in cities by implementing repetitive architectural typologies, zoning to form hierarchy in patterns of blocks and public spaces, and similar building heights". Craig Berger [2] also stresses that cities adapted themselves to tourism and convention centres, originating the necessity for urban orientation systems. These systems that gather tourism centres, maps, symbols and graphic indications, are intended to turn navigation within the city easier to their visitors and inhabitants.

The usual signage and directional systems, responsible for giving guidance to city dwellers, are designed for being perceived at a distant and fast vision of people driving motorcars on roads and highways. Within the cities, these signage systems are not appropriate to be seen by pedestrians or fulfil the needs of the entire population, because they tend to merge with the building colours and loose visibility. So, to solve this problem, it became necessary to design comprehensive directional systems that could help guiding people and, simultaneously, grant a better identification with the city.

Consequently, starting from these premises, the aim of this research grew into the creation of a chromatic plan system that would ally the city orientation to the identification of its different zones and would promote the inclusivity of its inhabitants. This chromatic plan should be applied to all the city quarters, without interfering with their architecture but giving to each zone its own identity.

URBAN FURNITURE

The denomination – urban furniture – covers all the elements, placed on the public space, with the aim to offer support and orientation to the cities occupants. These elements constitute a wide range that includes, among others, benches, litter bins, street lamps, bus stops, kiosks, cabinets, telephone booths, drinking fountains, bollards, signs, etc.

The urban furniture choice it is not a simple aesthetic condition, it must accomplish several functional requirements in order to fulfil the population needs, facilitating their lives and contributing to their comfort. So, as Águas [3] states, to assure its functionality, urban furniture must protect the health and well-being of the city inhabitants; facilitate the accessibility and use to people with visual or motor difficulties; reinforce the local identity, representing a formal family that is coherent and values the surroundings. However, while recognizing its necessity, the urban furniture functional possibilities have not been used to their complete extent, and the choice of its colour or form only rarely obeys to a logic thought.

As a mean to show the way, colour has been punctually employed successfully in interior and exterior spaces and, therefore, we could assume that a sensible and general application to urban furniture may be a way to the successful resolution of the orientation problem within the city. In fact, urban furniture systems usually present a shyness on colour application, with a dominant concern about environment integration, that makes its elements less visible and unable to accomplish their functional efficiency. This lack of visibility contributes for the exclusion of the visual impaired users, which constitute a wide percentage of the urban population

Being colour the objects characteristic which the eye first perceives, even before form or texture, we have found that colour is an efficient way to increase the visibility and legibility of urban furniture and signage systems. Therefore, an appropriate colour application improves considerably its visibility and, when the urban furniture chromatism is the same for a city area, it may be converted in an effective signage and identification component that will contribute for a better orientation within the city.

URBAN POPULATION AND INCLUSIVITY

“Inclusive Design is a way of designing products and environments so that they are usable and appealing to everyone regardless of age, ability or circumstance by working with users to remove barriers in the social, technical, political and economic processes underpinning building and design” [4].

The objective of inclusive or good design, as it is referred in Brown *et al.* [5], must be to erase, as much as possible, the differences between disabled and undised people, and contribute to the amelioration of everyone’s quality of life, that may be considered as an “interaction between the individual and the environment”, and “can be described in terms of personal control that can be exerted by the individual over the environment”. Even considering the impossibility to contemplate all the needs of people with high level of disabilities, adaptive environments should be designed in order to contemplate all people’s needs, being them with or without disabilities, and to ensure that a higher percentage of the population can enjoy all the environment facilities.

Despite these statements, the inclusive and ergonomic design, in their recent development issues, are primarily focused on people with motor limitations and tend to not include visual disabled people. Therefore, to have better visibility conditions, under an inclusive design perspective, all urban furniture elements must present a good chromatic and luminosity contrast, because urban population includes an extensive variety of people, with different visual acuities and limitations and, also a high proportion of elderly people. Effectively, as people grow older, they start to have vision limitations, because their ability to see small details decreases and eyes have a crescent difficulty of adaptation to sudden changes of light or a quick refocusing.

The estimation of Portuguese population, published by the *Instituto Nacional de Estatística* (Statistics National Institute) in December, 2016 (INE 2016) (Table1) [6], shows that Portuguese people live longer and, consequently, the ensemble of the population tends to age. So, their requirements must be taken in account because, despite their limitations, elderly and visual disabled people must be able to get out and about locally in order to age well and live independently.

Table 1. 2017 Instituto Nacional de Estatística estimates for the Portuguese population (INE 2017)

2015	
Existing population – 10 341 330	Women – 5 439 821 Men – 4 901 509
Births decrease – 8,3%	
Deaths decrease – 10,5%	
Life expectancy (2003/2005) – 77,7 years	Women – 80,93 years Men – 74,43 years
Life expectancy (2013/2015) – 80,41 years	Women – 83,23 years Men – 77,36 years
2003/2005 – 2013/2015	
People older than 65 years – increased	
People younger than 15 years – decreased	

Aging index: Older people / Younger people = 106,6-138,7 / 100

Previsions for 2060

Aging index: Older people / Younger people = 307 / 100

Also, in accord with the prescriptions of the Royal National Institute for the Blind (RNIB), UK, pedestrian paths must be easily identifiable and differentiate themselves from the adjacent walls. Likewise, every present object must detach itself from the background, in order to be recognized as an obstruction. Every urban furniture element – fences, bollards, lamp posts, litter bins, benches, etc. – must present a strong chromatic and light contrast with the environment, so that they can stand out and be more easily recognized, among other, by visual disabled people [7].

Effectively, the desire to get out does not diminish with old age and older people can continue practicing a large variety of outdoors activities whenever the environment allows it. On contrary, when it isn't easy or enjoyable to get outdoors, their quality of life will diminish as well as their physical health. Older and visual disabled people move about more frequently on foot and it presents big difficulties on poor design environments. Accessible open spaces, with good paths, safe crossings, plentiful seats, and visible signing will improve older people's perception of supportiveness and safety [8].

METHODOLOGY FOR URBAN FURNITURE CHROMATIC PLANS

The concern to establish a coherent urban image through colour studies and chromatic plans is relatively recent, despite some pioneer cases, and led to the conception of chromatic planning methodologies, gathering the necessary steps for the selection of a colour palette that would constitute the urban image. However, these plans are mainly intended for Architecture and do not take into account the presence of urban furniture, nor the importance that these elements can have in the orientation within the city

During the research it became clear that the existent methodologies weren't adequate to reach the aimed objectives of this study, and that we should develop a new methodology. This new methodology became the main focus of this research.

The research focus has been the city of Lisbon, where the new methodology was applied to three of its neighbourhoods – *Baixa*, *Campo de Ourique* and *Parque das Nações* – which constituted the case studies. Each one of these neighbourhoods is identifiable of a specific zone of Lisbon and, belonging or not to different architectural epochs, has characteristics and a history that singularize it. The first, *Baixa*, is the heart of Lisbon and was a candidate for world heritage (2004); the second, *Campo de Ourique*, is traditional and, both, commercial and residential; and the latter, *Parque das Nações*, is a recent urban zone, still under development.



Figure 2: Example of a sample area. (Source: authors)

On these city zones were applied an extensive direct observation, with the use of mechanical devices, including photographic mapping of both urban furniture and signage, in order to evaluate their visibility and legibility, as well as their colour applications. Also, in order to facilitate the study, samples routes were defined for each urban area, including the main streets and places and, also, some secondary ones, with the intention of encompassing the most representative zones, those with specific characteristics.

Along the chosen areas, an exhaustive record of all the environmental colours was made, including material samples not only from the buildings, but also from pavements, vegetation and any additional elements present with a relative permanence in the urban environment – *the non-permanent colours* – that should be taken into account for the spatial chromatic readings. All of them were then classified using the Natural Colour System (NCS), that was chosen because it allows the easy identification of every colour, even when they are located out of reach, and without needing additional equipment. Besides the NCS classification, whenever it was possible, the colourimeter was used for a more accurate measurement of colours.

All these recorded colours were completed with the background dominant colours, and with photographs of the environment elements and panoramic views from the different blocks using urban plans, architectural elevations and sections of the selected paths as well, which acted as elements of the environment colour components. The angle of the streets was also evaluated in order to determine the percentage of sky colour present in each street, because this colour interferes on the urban area colour and, therefore, must be included in the colour palette.



Figure 3: Percentage of sky, visible in different streets (Source: authors)

It must be underlined that the recorded colours were perceived colours, not always coincident with the inherent colours (the colours belonging to pigments and materials) and that the perceived colours may, also, be a partitive synthesis, particularly in the case of vegetation and tiles coated walls.

Also, when recording the environmental colours, we must take in account all the perceptive factors related with colour interactions, as well as the geographic and atmospheric conditions and the chromatic variations along the different climatic seasons. With this purpose, the palette was tested along the seasons' changes to judge the chromatic alterations aroused from the different colours of the vegetation as well as day light variations and sky colours according to weather changes to evaluate the chromatic plan pertinence.

All these colours were recorded on forms and maps, previously designed and tested, in order to create a data base that will allow the identification of the town dominant colours.

In order to guarantee the scientific rigor on each quarter chromatic plan determination, we considered the dominant colours, proportionally represented, choosing colours to the urban furniture which should establish an adequate chromatic and luminosity contrast with the dominant colours and, also, respect the traditions, culture, identity and history of the quarter. These contrasts must be observed under the possible local illumination variations, in order to be sure that they accomplish efficiently their functions.

These dominant colours, and the contribute of the local history and culture, led to the establishment of a very comprehensive urban furniture chromatic plan, based on scientific rigor.

This plan, which shall be different for every settlement, must stand out from the environment, contributing for a better legibility and identification of these elements and, in the same way, become a city's area identification element which may be used in different supports and facilitate the orientation and wayfinding within the city.



Figure 4. Examples of a possible colour plan for Lisbon three different quarters. (Source: authors)

CONCLUSIONS

As it was stated, with this project we aim to define and underline the importance of colour application to urban furniture, taking in consideration that a pertinent chromatic plan can contribute to improve the space within cities, as the different city's areas become different one from each other. Simultaneously, the urban furniture elements utilization will be improved, as they become more visible, and they are converted into ergonomic factors, standing out from their background and contributing to improve the population inclusivity.

This project empirical phase was focused in some case studies, where we implemented the use of colour plans to urban furniture as a strategy to achieve a better and inclusive design project, ameliorating this equipment visibility and use, contributing to city quarters identification and users' orientation.

For the validation of this new methodology, three sessions were organized with differentiated focus groups: the first group brought together ten people of different ages and genres, representing all users of urban furniture; the second group had nine people over sixty-five years of age, since it was in this age group that the majority of users with locomotion

or vision difficulties were found, and who would most benefit from the inclusion factor that is intended to be achieved in this group investigation; the third group, also composed of nine people, grouped specialists with work developed in the reflection on colour or who usually have in their charge decisions about urbanization that may include the installation of urban furniture.

The group of experts included five architects, two of whom worked in the town planning area of the Lisbon City Hall. The remaining participants of this group were four designers, all of them familiar, and working usually, with the problematic of colour, in its different aspects.

The validation process consisted in the presentation of a slide presentation, where the different steps of the research were reported, the need for the new methodology and its development, and the chromatic options applied to each of the studied districts were justified. Next, an example film of the chromatic applications was presented to the urban furniture, from the different districts studied and from the consequent modifications therein.

A questionnaire of six questions on the main issues addressed in this research was also distributed to each participant. The response to this questionnaire allowed the manifestation of personal opinions that were later discussed orally. Their feedback and contribution was incorporated in the colour plans model, as a recognition of the importance of taking in account urban furniture chromatic programs in urban colour plans, as a way of inclusive design implementation and city zones differentiation.

We expect that this methodology, which establishes the importance of a pertinent and structured colour application to urban furniture, will contribute to the enlargement of the urban chromatic plans perspective, allowing them to become more holistic and comprehensive.

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REFERENCES

- [1] Minah, G. 2005. *Memory Constellations: Urban Colour and Place Legibility from a Pedestrian View*, Proceedings of AIC Colour 05 – 10th congress of the International Colour Association 401–404. Granada, Spain.
- [2] Berger, C. 2005. *Wayfind: Designing and Implementing Graphic Navigational Systems* 121. Rotovision SA, Switzerland. p14
- [3] Águas Berger, C. 2005. *Wayfind: Designing and Implementing Graphic Navigational Systems* 121. Rotovision SA, Switzerland, pp10-11
- [4] Disabled Persons Transport Advisory Committee (DPTAC), *Inclusive Projects: A guide to best practice on preparing and delivering project briefs to secure access*, HMSO, London, 2003, <http://www.dptac.gov.uk/inclusive/guide/index.htm>
- [5] Brown, Bayer & MacFarlane in R. Brown (Ed.), *Quality of Life for People with Disabilities*, Stanley Thornes (Publishers) Ltd, UK, 1998, p34.
- [6] Instituto Nacional de Estatística (INE) – Serviço de comunicação e imagem, *Destaque, Informação à comunicação social*, www.ine.pt, (16 -06 – 2017).
- [7] P. Barker, J. Barrick, R. Wilson, *Building Sight, a handbook of building and interior design solutions to include the needs of visually impaired people*, Royal National Institute for the Blind (RNIB), London, 1995, pp7-51.
- [8] *Inclusive Design for Getting Outdoors*, <http://www.idgo.ac.uk/pdf/Intro-leaflet-2012-FINAL-MC.pdf>, 2012.

SS14.1. Revisiting rural-urban dichotomy for integrated regional development

1299 THE DEFINITIONAL AND ADMINISTRATIVE SHORTCOMINGS IN INDIA'S URBAN SPHERE: SOME ISSUES OF DIFFERENTIAL URBAN GOVERNANCE

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INTRODUCTION

India being a less developed country is predominantly rural. Its urban milieu has started to grow in a much feeble pace. As far as 2011 census is concerned, only 31.16 percent of Indians live in cities. This in absolute term is quite large and surpasses entire population of United States. In this scenario, the issues of urbanization need a deeper understanding. The country itself has no strict procedure for designating urban status to the city regions, and it is open to interpretation, which often leads to ambiguity. The paper tries to address these grey areas which are a cause of concern. Census data has been extensively used to demarcate these gaps and small primary survey has been done to understand the nature of the deep structure of the failure in governance. The nature of popular resentment in this process of politicization has been captured to some extent. The paper examines the need of redefinition and adoption of universal criteria in the context of the meaning of urban in the country. Therefore the principal objective of the paper is to pin point the shortcomings of the definition of urban in India. The categorization of the Census Towns and their varying nature of rural as well as urban governance from state to state have also been delved. Similarly studies were done to unearth the politics which acts behind the scene as a deep structure in these phenomena. The paper also suggests some of the alternative strategies pertaining to these issues of urban governance. This has become supreme important after the 74th 'Constitutional Amendment' in India and by inserting the 12th Schedule in the constitution ((D.D.Basu, 1960). This paper examines various alternative methods and suggests a newer dimension for analysis of this present problem. In the present milieu, the country's future lies in its urban areas. Thus in nutshell there has to have a uniform code of definition of the urban in the country. The gaps are enormous and could well trigger major mass revolt in the future when the question of municipal governance would emerge as a pivotal issue in whole of the nation. The paper addresses few of these issues of shortcomings and tries to present an alternative way to address each of these issues.

Keywords: census towns, urban definition, municipal governance

MUNICIPAL DEFINITION IN INDIA

In the country there are various sets of urban nomenclature. Indian towns are classified into two broad categories. A) Statutory Towns and B) Census Towns (Census of India, 2012). In case of statutory towns, the designation of a region being urban comes directly from the state government itself. It means that if a state government wants to make a rural area into an urban one, then simply with a government statute it can do so. Therefore any region can become urban as being designated by a competent authority. However the problem of the statutory towns is that it is of various types. These are being elaborated as follows:

- 1] Cantonment Boards: Mainly these are urban areas used for the defence purpose, mainly governed by the armed forces. Their laws and regulations are not similar to other municipal bodies, because in cantonment boards, the interference of the state is limited and elected members have restricted power which they are supposed to share with the defence personnel.
- 2] City Municipal Council/ Municipal Board/ Municipality/ Municipal Committee: These are the bulk of the urban areas of the country. These municipalities can be very small or very large in size class.
- 3] Municipal Corporation: These are the largest towns and cities of the country. All of these corporations ideally should have population more than one lack. Cities like New Delhi, Kolkata and Greater Mumbai fall in this category.
- 4] Notified Area/ Nagar Panchayat/ Township/Small Town Committee/New Towns/Industrial Townships/ Outgrowths: These are the smallest of the urban areas. Some of them are being designated as the future growth centres like notified areas, while others are at the fringe of rural and urban. Many such towns are directly governed by state governments or their various agencies and not through local level governance as is done for the municipalities or corporations.

On the other hand census towns are such towns which are not being designated by state governments as towns, but Indian census demarcate some of the rural areas as towns which satisfy certain clauses which are as follows: a]The population of such regions should be more than five thousand. b] At least seventy five percent of the main working population should be engaged in non agricultural activity. c] The region should be having a population density of more than 400 people per square kilometre. These towns are not being considered as urban by the government.

URBAN GOVERNANCE IN INDIA

India's urban governance achieved a new dimension when the 74th constitutional amendment was passed in the country. It gave local self governance to urban areas. Various new powers and functions were assigned to these local bodies like preparation of plans, implementations of schemes, urban planning and regulation, land use, roads, water supply, public health, slum, urban forestry and managing the waste materials (Kashyap, 1994). The 12th Schedule of Indian constitution has elaborated all the powers, functions and duties of such urban areas which are being differentiated from their rural counterparts (K.C.Sivaramakrishnan, 2000). Moreover these urban areas are subjected to separate electoral process at each five years interval managed by a state election commission and constitution of a separate state finance commission for managing their finances. Though these powers and functions are not universal for all these towns, especially the

powers enjoyed by the corporations have a bigger ambit than those of the small municipalities, and notified areas often are directly governed by the state government itself. Cantonment Boards functioning are completely different altogether. Census Towns are since considered to be rural areas; therefore they are not at all enjoying these urban privileges. It is under this differentiated power ambit, the main focus sets up in the definitional aspects of the urban areas in India. A closer look into this aspect would reveal that there are large discrepancies in delineating urban areas from a definitional point of view.

DEFINITIONAL AMBIGUITIES IN URBAN AREAS

As mentioned earlier that urban definition of various forms varies considerably from one state to another. In Indian context, defining urban area has become hegemony in itself. There is no hard and fast pan Indian norm of delineating urban civic body in different states of the country. The distinction between small and large civic bodies in context to governance is pretty vague. Different state government uses different parameters of denoting urban municipal status which are considered to be the 'Statutory Towns'. In this respect, politics play a major role in every level. Size of municipalities, notified areas, corporations and other entities are not at all clear. The situation becomes more complex by adding the notion of 'Census Towns' which are characteristically urban but in governance, still remain rural. All these just and not so just categorisation has added tremendous level of complexity as far as governance is concerned. All of these processes for categorization, delineation and giving municipal status are all depiction of power relation in India. In some states, rural areas are pretty larger and characteristically more urbane than so called municipalities in other states. All these issues are being juxtaposed to create a mesh of difficulties in governability and reflect discontent in popular aspirations.

Indian cities are classified as cities of various size classes. Class I towns are those which do have population more than 1 lac, class II ranges between fifty thousand up to one lac, class III between twenty thousand to fifty thousand, class IV between ten and twenty thousand, class V between five and ten thousand while class VI towns as areas below five thousand of population. It is thus evident that class VI towns can only be statutory towns and not the census towns. Through minute analysis of census data of 2011 reveals that there are large discrepancies in every size class of the cities with reference to their population in general. Municipal Corporations, which are supposed to be the largest urban areas and self sufficient to a greater extent as far as finances are concerned, has no definite population class. Though there are more than four hundred and fifty class I towns in India, only in twenty two of them, municipal corporation status was established. This would not have posed any problem, because corporation status may be given to a city which was big enough, meaning bigger than the biggest of towns, as well as self sufficient in finances. But giving corporation status is completely arbitrary in nature and based upon political situation. There are many towns in Chhattisgarh like Ambikapur, Raigarh and Rajnandgaon, as well as Gangtok in Sikkim, Panjim in Goa, Chandernagore in West Bengal and Shimla in Himachal Pradesh who have population less than two lac, enjoy the status of Municipal Corporation. On the other hand Jamshedpur in Jharkhand as well as Rajpur-Sonarpur and South Dum Dum both in West Bengal, though have population more than four lac, but still considered being only municipalities.

Class I towns, which are supposed to be the largest city class group, also does have thirty two towns which are neither Municipal Corporation nor not even municipalities. Among them twelve are either cantonment boards, town panchayat, Industrial Township or notified areas, which are essentially small towns or military establishment as far as their common definitional consensus is attached. Still at least twelve of them are as large as class I towns. The remaining twenty such towns are not statutory towns at all. All of these towns (mostly in the National Capital Region of Delhi like Karnal Nagar or Nangloi Jat) are all census towns. It means that as far as municipal affairs are concerned, these towns are actually rural or large villages in government statute. Similarly in Class II towns also there are twelve designated small towns (town panchayat, notified areas etc. or cantonment boards); or even further a large section of total forty nine census towns (Table 1). The case of census towns is really peculiar. There are one hundred and eleven class VI towns which have urban governance (mostly in Himachal Pradesh) by establishing any of the municipal forms. In general these are essentially rural areas, but still enjoy town status because of government's statutes (Table 2). On the other hand there are large census towns without municipal status. The best example being Noida in the outskirts of Delhi which has a population over six lac but as far as 2011 census is concerned, it was still a census town.

Another problem of definition arises when the central town is smaller but its suburbs and outgrowth becomes larger. At each census these outgrowth becomes more populated. This is true for the majority of the large cities in the country, but in most of those cases the central town is also large enough. For example in the case of Kolkata urban agglomeration, though there are thirty eight municipal bodies, but the largest one is the Kolkata Municipal Corporation itself. But the problem is mainly in the state of Kerala, where it is extremely difficult to differentiate towns from the villages. One town ends and another large village start without having any characteristic differences except the administrative boundary. Most of the Kerala towns are therefore large urban agglomerations with the central city remaining to be small. For example, Mallapuram Urban Agglomeration has a population over sixteen lacks but its principal city Malappuram is barely a class I town. Both Ponnani and Manjeri are pretty large than the Mallapuram town with respect to the population. Same is true for Kannur urban agglomeration. In fact many other Kerala urban agglomerations are very large like that in Kochi, Thiruvananthapuram, Kozhikode and Trissur where there are large suburbs which can easily be incorporated into central city, and large census towns are also present there. All these issues have complicated the urban scenario of the country. Therefore the definitional aspect of the Indian towns needs a total rephrasing for better governance.

DABGRAM AND BALLY: CASES OF LARGE CENSUS TOWNS

Number of census towns in between 2001 and 2011 has almost tripled and India's thirty percent urban growth occurred in these census towns in the last decade. Central Government has asked the states to raise their status to statutory towns because otherwise they are still considered to be rural areas in government records (K.C.Pradhan, 2013). Schemes like Atal Mission for Rejuvenation and Urban Transformation are encouraging such move. Still many such large census towns do exist in the country. In the state of West Bengal there are two Census Towns that have population over one lac each. One is Bally in Howrah District in the suburb of Kolkata and another is Dabgram in Jalpaiguri district in the outskirts of Siliguri Town in North Bengal. It is astonishing fact that a considerable section of the population (nearly about one third in each of these cases) in these two towns do not want to achieve municipal status. They still want to remain in the panchayat areas because once they become municipalities; they would have to shell out more tax in home mutation as well as have to pay more money for their house and property; which they are currently paying. Though they want the municipal services of roads and drainage, but still people do not want to get upgraded to the municipal status. Since vote bank politics is involved, thus government of the state does not want to change the status quo so abruptly. In case of Bally, the adjoining area was a separate Bally municipality, which has been amalgamated into Howrah Municipal Corporation and the planning as well as development in that area is pretty remarkable. People of the non municipal Bally region aspire to achieve that level of development for their region, but still they are not prepared to spend any extra money. They want these affairs by remaining in the panchayat areas itself. This is truer for the low income population, who constitute the majority section of people. A case for discussion is the garbage disposal. Since in that region, there are no municipal services, therefore garbage disposal gets a severe jolt. Poor people are not being affected by this environmental pollution because they are used to live with these issues, and they dispose heaps of garbage and live in those unhealthy surroundings. They are much more concerned about giving any little extra money for development purpose. However most of the people in those two towns want municipal services for their development and governance. Politics plays a bigger role in this context. Previous Left Front Government was sceptic to any change that was going to affect their vote bank in poor quarters, which were their solid vote banks. Similarly present Trinamool government is also playing a wait and watch game because these poor people are the one who are pivotal important in time of elections. In these cases, Government itself has to play an active role involving the local population. Neighbouring Dankuni has become a municipal town by such intervention. Otherwise these areas will continue to remain rural in government records and thus there will be discrepancies in governance.

CONCLUSION

In conclusion it can be said that there are discrepancies in the urban definition in the country. Thus for better governance reframing the urban issue is required. There should be universal laws applicable throughout the nation for designation of towns and cities. Following scheme can be applied:

1. After each census the status of the towns should be reconsidered. Their ward boundaries should be changed after perfect delimitation. Any outgrowth that has happened should be incorporated into the existing towns. All State Capitals as well as Class I Towns should get Corporation status. This also being reviewed after each census. They should be given more financial power so that they could become viable on their own without much depending on the state government.
2. Census Towns should be made statutory after each census. Either they should be incorporated into any existing towns, or they should be converted into separate municipal classes. These new towns also should get administrative and financial support from the government for their initial functioning.
3. Cantonment Boards should remain unchanged because they are important for defence purpose, but all the small towns of class III, IV and V should come under the category of Nagar or Town Panchayat, Notified Areas or Small Town Committees where direct control of the state government should be high enough for their future development. The category of Industrial Township also may come under this class.
4. All class II towns should get municipal status. They should remain considerably independent from state government's intervention. However their status also should be regulated after each census.
5. Class VI towns should not be considered as urban (except Cantonment Boards). Their urban status should be removed and they should be incorporated into Panchayat areas. Their main characteristics are much more similar to the rural areas, and not to the large cities of the country.

In the coming decades, India will become more and more urban in nature. Thus the pace of converting census towns as statutory towns should be done at a faster rate. Government has taken proper steps in this direction, but much more is still yet to be done in this regard.

Table I: Number of Class I and II Towns Those Are Census Towns or Notified Areas/Cantonment Boards and Other Small Town Categories

States/Union Territories	Class I Census Towns	Class II Census Towns	Class I Towns (Town Panchayat/Cantonment Boards/ Notified Areas etc.)	Class II Towns (Town Panchayat/Cantonment Boards/ Notified Areas etc.)
Delhi	12	20	1	
Maharashtra	1	4		
West Bengal	2	4		
Tamil Nadu	1	6	1	
Uttar Pradesh	3		3	3

Jharkhand	1	2	3	
Telangana		3	1	
Dadra and Nagar Haveli		1		
Meghalaya		1		
Gujarat		2	1	
Kerala		5		
Haryana		1		
Chhattisgarh				1
Assam				1
Mizoram				1
Punjab				1
Orissa			1	1
Bihar			1	1
Andhra Pradesh				2
Rajasthan				1
Total	20	49	12	12

Compiled by Author from Census of India Data 2011

Table II: Number of Class VI Statutory Towns

States/Union Territories	Number of Class VI Statutory Towns
Maharashtra	2
Tamil Nadu	8
Uttar Pradesh	2
Gujarat	12
Karnataka	3
Jammu and Kashmir	13
Chhattisgarh	11
Assam	3
Uttarakhand	9
Himachal Pradesh	26
Manipur	2
Mizoram	7
Punjab	2
Arunachal Pradesh	8
Sikkim	2
Orissa	1
Total	111

Compiled by Author from Census of India Data 2011

REFERENCES

- Census of India. (2012). *Some Terms and Definitions*. New Delhi: Government of India.
- D.D.Basu. (1960). *Introduction to the Constitution of India*. Nagpur: Wadhwa Publisher.
- K.C.Pradhan. (2013). New Census Towns in India: Unacknowledged Urbanisation. *Economic and Political Weekly*.
- K.C.Sivaramakrishnan. (2000). *Power to the People?: The Politics and Progress of Decentralisation*. New Delhi: Konark Publisher.
- Kashyap, S. (1994). *Our Constitution*. New Delhi: National Book Trust.

1335 DICHOTOMY IN PLANNING APPROACHES FOR RURAL AND URBAN AREAS: A CRITICAL REVIEW

ABSTRACT

Recent discussions on growth trajectory of India are dominated by a narrative of increasing urbanization accounting for 31 percent of population in 2011; eventhough majority of the population and growth is concentrated in rural areas. Significant share of the urban growth is taking place in the periphery of large cities, commonly referred as peri-urban or outgrowth areas. Also, Census 2011 has witnessed a quantum jump in the number of ‘Census Towns’, which has more than doubled. Though a large number of such Census Towns are near big urban areas, there is a sizeable number located away from the influence of any city. This clearly shows that multiple forces are responsible for transforming these settlements. Current research has shown that the development of these areas is generally unplanned and haphazard. In order to facilitate planned growth and development of these settlements an overarching institutional framework and support legislations are extremely important. Extensive institutional mechanism already exists for planning and management of both urban and rural areas. However there are differences in terms of their powers and functions. Similarly, elaborate spatialplanning exercises are undertaken for urban areas, which are absent in case of rural areas. These inequalities in terms of planning exercise is because the existing legislations consider urban and rural as separate categories, and does not see them as units requiring planner’s attention. This paper is based on a review of institutional framework and planning legislations of four States (Gujarat, Rajasthan, West Bengal and Madhya Pradesh). Detailed comparative analysis of these two aspects was carried out in regards to both rural as well as urban areas. Planning documents of these States were also studied to understand the scope and contents of the plan. Analysis reveals that the current stringent dualistic approach in regards to planning practices is not relevant in current growth and development pattern of India. The paper argues that there is a need to adopt an integrated approach and overall planning framework. The units (urban and rural areas) need to be analyzed in reference to their larger context, which should be the basis to determine the planning approach.

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1352 A HARD AND LONG ROAD TOWARDS URBAN-RURAL COOPERATION - INTER-MUNICIPAL LAND USE MANAGEMENT IN THE LEIPZIG-HALLE REGION (GERMANY)

ABSTRACT

In many urban-regional agglomerations in Germany land for larger commercial and industrial areas is short. The Leipzig-Halle region has been successful during the last 15 years in attracting large investments in the automotive, logistics and chemical sector. Meanwhile land for larger commercial and industrial areas in both cities is short, which might be a significant disadvantage for competitiveness in the future. At the same time many smaller municipalities are facing long-term vacancies among there fully developed commercial and industrial areas, which obviously – due to location, size or infrastructural development – do not meet the demand. These vacancies go along with severe fiscal constraints among these municipalities due to the absence of tax revenues and costs for maintaining infrastructure in these areas. An inter-municipal cooperation process has been initiated more than five years ago in order to 1) rise awareness for these issues, 2) clarify need and demand for commercial and industrial land, and 3) seek for inter-municipal options to develop new, commercial and industrial areas – and to redevelop long-term vacant areas into open space or agricultural land. This process has emerged as lengthy and difficult. Some of the smaller municipalities do not share the problem of the lack of commercial and industrial land. Others fear declining tax revenue or a political debate on the loss of jobs and declining competitiveness. Existing models such as an inter-municipal pool of commercial and industrial areas have proved not applicable so far due to lacking trust between municipalities. The paper will give insights into the genesis, successes and setbacks, and communication aspects of this urban-rural cooperation process towards integrated regional development.

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1524 BRIDGING URBAN RURAL DICHOTOMY FOLLOWING BUILDING MATERIAL FLOWS OF URBANIZATION

Georg Schiller, Tamara Bimesmeier, Han Thuc Tran

ABSTRACT

Urbanization and land use change are two global, closely related processes. However, their analytical framework as well as the available literature were largely developed separately so far. While land use change directly triggered by urbanization is fully realized, indirect, remote land use implications are mostly disregarded. Concepts such as urban-rural-linkages point to the diverse and close links between city and distant places due to linkages and flows of people, goods and services. Building materials contribute most to the anthropogenic material flow in terms of quantity. These are predominantly bulk non-metallic minerals like sand and stones, which are usually characterized by high transport costs and thus short transport distances. These material flows are closely linked to urbanization processes – and they manifest physical links between the urban built environment and the environment outside the cities, where mining dumping activities cause land use changes. The paper will discuss elements of a conceptual approach of a regional material flow analysis used to analyze the exchange of building material flows between urban and rural areas. It will be considered, how to distinguish between urban and rural. Third correlations between urbanization parameters and the extraction and use of building minerals will be presented in order to justify the importance of the building material flow topic within the urbanization debate. Using the example of the case study of the Hanoi metropolitan region, material flow exchanges between urban and rural areas will be presented. Doing this we will not only concretize an excerpt of urban-rural linkages, but also show examples associated references to areas of spatial planning. In the concluding chapter we summarize essential aspects, arguments and conceptual elements with which the urban - rural dichotomy can be bridged towards an integrated regional understanding of planning

Keywords: Material Flow Analysis, Urbanization, Urban Rural Linkages, Integrated Planning, Land use planning, Urban planning

1. INTRODUCTION

Urbanization and land use change are two closely intertwined processes with far-reaching consequences. However, the analytical framework for these phenomena and processes as well as the available literature have been largely developed separately (Seto et al. 2012). While land use change directly triggered by urbanization is fully realized, indirect, remote land use implications are mostly disregarded. Concepts such as "Urban-Rural-Linkages" (UN Habitat III, 2015), Urban Land Teleconnections (Güneralp et al. 2013) or the urban hinterland concept (Billen et al. 2012) rightly point to the diverse and close links between the city and the city distant places due to flows and connections of people, goods and services (fig.1).

According to the SDG 11a "positive economic, social and environmental links between urban [...] and rural areas [should be supported] by strengthening national and regional development" (unhabitat.org). With regard to physical flows, attention has focused on food energy issues so far (Fritsche et al. 2015). However, significant mass flows are non-metallic minerals (COM 2018) and 1/3 of the total Domestic Material Consumption (DMC) consists of bulk non-metallic building materials like stones, sand and soil (fig. 2). Generally these materials are traded within regional markets (low economic values in terms of weight and the high costs of transportation; Pacheco-Torgal 2014). This results in close physical urban and rural hinterland linkages.

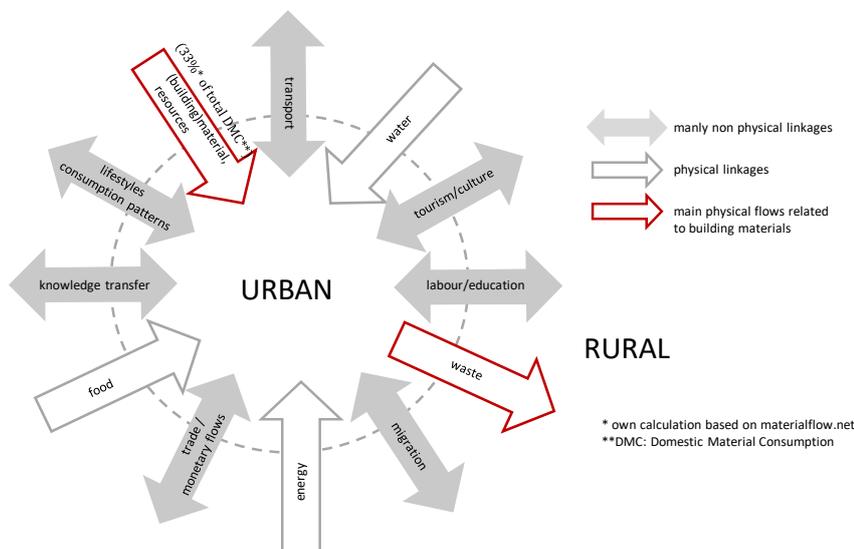


Fig. 1: Exchange relations of urban-land metabolism (altered image according to Repp et al. 2012)

UN-policy papers (e.g. UN Habitat and SDG) have addressed this issue globally and so in national policies e.g. of Vietnam (Urban Green Growth strategy, New Planning Law). The planning law is aiming to integrate Environmental Protection,

Construction Planning and Urban Planning in order to achieve national socio-economic development goals. At the city level, the main focus is on urban green growth strategies. The National Strategy for Green Growth and Action Plan for Urban Green Growth by 2030 provide indexes to define activities also towards urban green growth, but without considering of resource efficiency or building material consumption issues. The most serious gap, however, is the existing lack of implementation-oriented framework to embed urban-rural linkages in planning and thus to foster measures towards a greener urbanization.

The paper will discuss elements of a conceptual approach of a regional material flow analysis used to analyze the exchange of building material flows between urban and rural areas. It will be considered, how to distinguish between urban and rural. Third correlations between urbanization parameters and the extraction and use of building minerals will be presented in order to justify the importance of the building material flow topic within the urbanization debate. Using the example of the case study of the Hanoi metropolitan region, material flow exchanges between urban and rural areas will be presented. Doing this we will not only concretize an excerpt of urban-rural linkages, but also show examples associated references to areas of spatial planning. In the concluding chapter we summarize essential aspects, arguments and conceptual elements with which the urban - rural dichotomy can be bridged towards an integrated regional understanding of planning.

2 CONCEPTUAL APPROACH OF A REGIONAL MATERIAL FLOW ANALYSIS

There is a lot of existing knowledge on concepts suitable to analyze such physical flows induced by built environment (like buildings and infrastructure) using MFA (see e.g. Augiseau et al. 2016, Kennedy 2016, Schiller et al. 2017a), but urban-rural linkages aspects are only poor addressed so far. Exceptions are e.g. Binstock & Carter-Witney (2011) and Wernstedt 2000 who address the impact of urban growth on more distant land use conflicts following a regional concept. However, here too, only direct conflicts of use between settlement areas and extraction areas are considered. Schiller (2015), on the other hand, presents an approach that takes into account the indirect effects of construction on land use in the surrounding area. He takes into account the entire value chain of building materials, from the extraction of raw materials, their processing into building materials, their use in the construction of buildings and infrastructure to their disposal in landfills. This is where the concept outlined in figure 2 comes in.

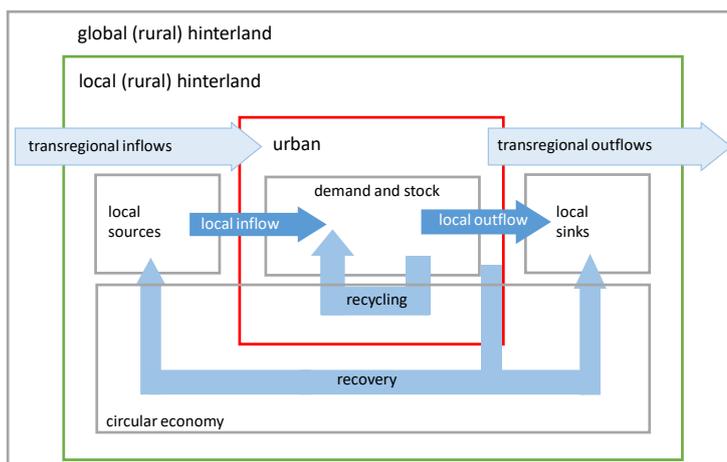


Fig. 2: concept of a regional MFA for analyzing bulk mineral building materials (own image)

According to Cramer (2017) “urban” is considered to be a material stock and a trigger for building material flows. At least in Germany, the majority of these stocks and flows are bulk non-metallic mineral building materials (Schiller et al. 2017a). It can be assumed, that this is true for urban structures worldwide. These materials are mainly taken from the region – the local (rural) hinterland. (local inflows), where also dumping sites are located (local outflows). Some of the outflows will be recovered and used for other technical purposes outside the built environment (e.g. recultivation of post mining areas or for the construction of necessary technical structures on landfills). The recycling flow describes materials that are circulated within the built environment. Recycling, recovery and disposal are key elements of circular economy. The “global (rural) hinterland” describes areas from which non-regionally traded material flows originate⁵¹² or are disposed.

3 HOW TO DEFINE URBAN AND RURAL?

Emerging and developing countries in particular are experiencing a huge surge in urbanisation (WBGU 2016). Definitions of urbanisation refer mainly to the transformation process of the rural population towards urban standards, which can be seen as an increase in the urban population, the spread of urban infrastructural development and changes in lifestyles of the rural population (Gu et al. 2012). This transformation is frequently fostered by urbanization strategies and approaches of “urban upgrading”.

⁵¹² e.g. in the case of resource scarcity - Singapore imports large quantities of sand, for example

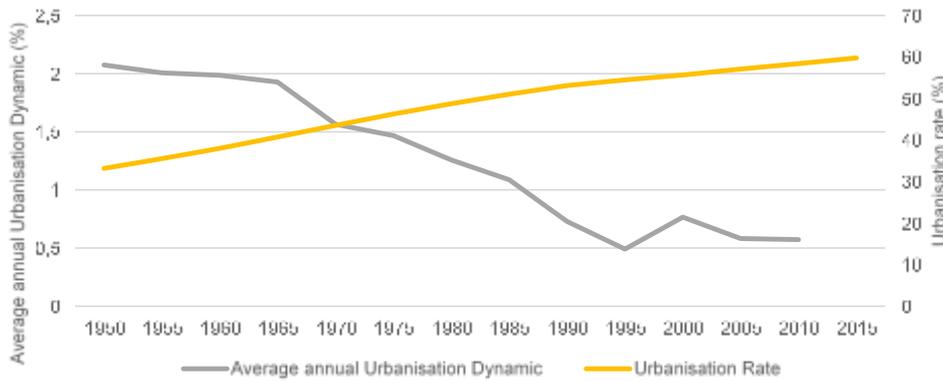


Fig. 3 Urbanization rate and dynamic from 1950 to 2015 – worldwide (own image using data from UN 2015a)

Although urbanisation is a multi-layered phenomenon of transformation, it is statistically recorded with the help of simple indicators defining “urban” and “rural” and expressed as “urbanization rate” or “urbanisation dynamic” (annual change in urbanisation rate) (fig. 3).

Akkoyunlu (2013) notes that most of the world’s nations use four different approaches when defining “urban centres”. The first option provides for a threshold value for the population according to which it is decided whether an area is urban or not. In the second option, other threshold values are additionally taken into account. The most common are those of population density and the proportion of the population employed in agriculture. The third definition refers to the administrative or political status of a municipality, through which conclusions can be drawn about urbanity. In detail, definitions of urban are quite inhomogeneous and hardly to be compared internationally (fig. 4).

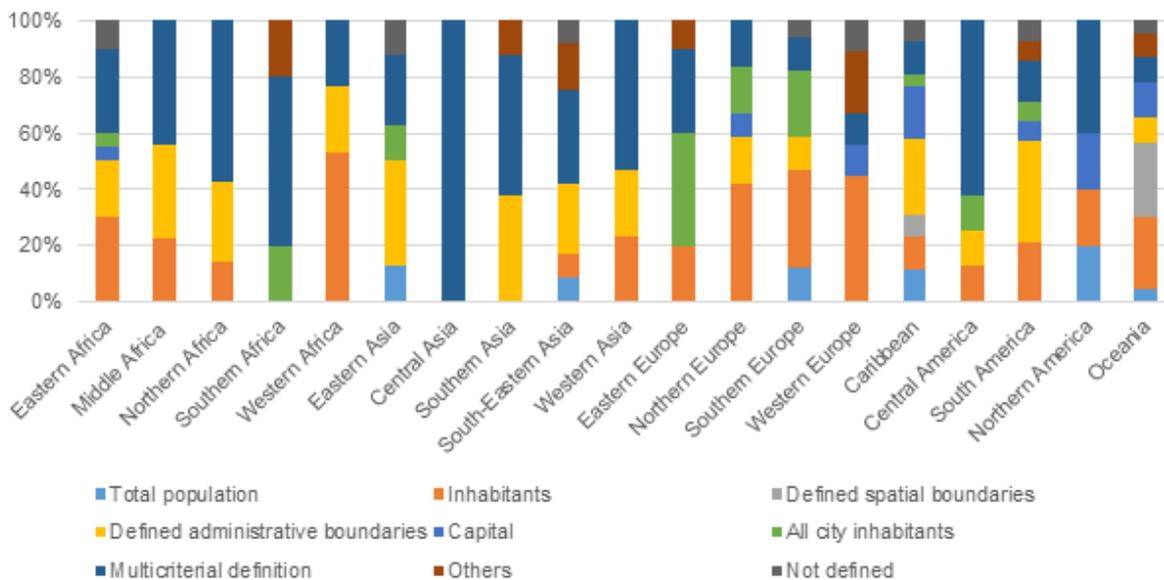


Fig. 4 Indicators for the definition of “urban” according to earth regions (own image using data from UN 2015b)

In addition to the difficulty of finding suitable indicators for the definition of “urban”, there is a problem of finding adequate spatial boundaries in order to record urbanity statistically. The authors of the World Urbanization Prospect (UN 2015b) point out that the setting of spatial city boundaries often cannot cope with population growth and note that there are basically three different approaches, which can be described as “City proper”, “Metropolitan Area”, “Urban Agglomeration” approach. In high dynamic urban regions a differentiation by administrative boundaries (“City Proper”) is problematic, since the entire urban area often extends too quickly to the surrounding area of the city. Whereas, in the “Urban Agglomeration” approach the inhabitants of the core city, suburbs and continuously populated commuter areas are counted as urban. In this way, large urban agglomerations often comprise several cities that are administratively separate but functionally interconnected. In the “Metropolitan Area” approach, the boundaries are defined according to the degree of economic and social integration of neighbouring areas. In addition to the city itself, a metropolitan region includes both the surrounding area with urban density and some additional low-density areas adjacent to and connected to the city (e.g. by frequent transport, road connections or commuting).

In the ESPON Report (2005), the authors come to the radical conclusion that the distinction between urban and rural is increasingly dependent on people's perceptions and cannot be covered by indicators that are defined from outside.

Research projects on material flow analyses in the field of urban metabolism usually consider when defining the city (and therewith urban by implication). The main focus of this research is on the built environment. Distinctions between urban and rural areas are made in particular with regard to the differentiation of building structures. In this respect, administrative definitions on the one hand and structural building features on the other are the main distinguishing features here (e.g. Curriea et al. 2017, Tanikawa et al. 2015, Condeixa et al. 2017). Schiller et al. (2017c) considered regional types in order to distinguish between urban and rural settings. The types where used to describe different

development dynamics of built environment and therewith to investigate recycling loops within these regions taking into account the potential demand and supply of secondary materials. The demarcation of the region types was based on settlement structural features, e.g. settlement density, as well as on features reflecting the population dynamics. However, links between the region type categories were not examined.

4. URBANIZATION AND BUILDING MATERIALS

The link between urbanization and the demand for building materials is repeatedly pointed out (e.g. Cramer 2017, Fritsche et al. 2015), but never quantified in a general, but has never been explicit quantified. The central question is which parameters should be used to measure urbanization. Urbanization is usually expressed in terms of the rate of urbanization. Capital 3 also presents urbanization dynamics as a further parameter. Figure 5 shows the relationship between extraction of construction minerals and the dynamics of urbanization (5a) or the annual rate of urbanization (5b), taken all countries worldwide into account marked by positive urbanization rates (taken from UN 2015b). The countries considered were combined into groups with clustered values for urbanization dynamics and urbanization rates. Within the groups, average values were calculated for the extracted quantities of tree minerals from all assigned country values, using data from Dittrich (2014).

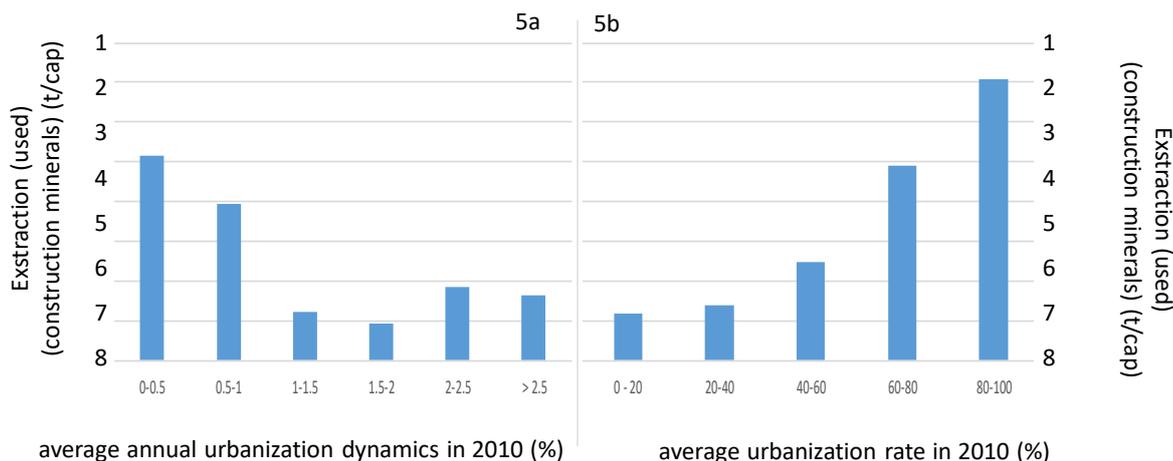


Fig. 5 Extracted and used construction minerals and urbanization (own image using data from UN 2015b and Dittrich 2014)

The figures show that there is a connection between urbanisation and the consumption of building materials. Contrary to expectations, it is not the dynamic of urbanization that correlates positively, but the rate of urbanization.

5. URBAN RURAL LINKAGES URBANIZATION CAUSED BY BUILDING MATERIAL FLOWS – A CASE STUDY

The case study introduced here refers to a research dealing with the management of mineral resource extraction in Hoa Binh Province, that is a hinterland province of the Metropolitan area of Hanoi, the capital of Vietnam (Müller et al. 2016). In this context, an MFA was used to calculate the future demand for building materials by the urban metropolis and to describe the framework conditions for the design of mining in the hinterland. The case study presented is essentially based on a publication by Bimesmeier and Schiller (2017).

A bottom up MFA approach was applied. This is based on an inductive principle. Buildings and infrastructures are described with regard to their material composition. On this basis, material composition indicators (MCI) for typical buildings and infrastructure are defined (fig. 6). These are multiplied by construction activity parameters (e.g. m² living space) to obtain information on the total building material requirements of a region.

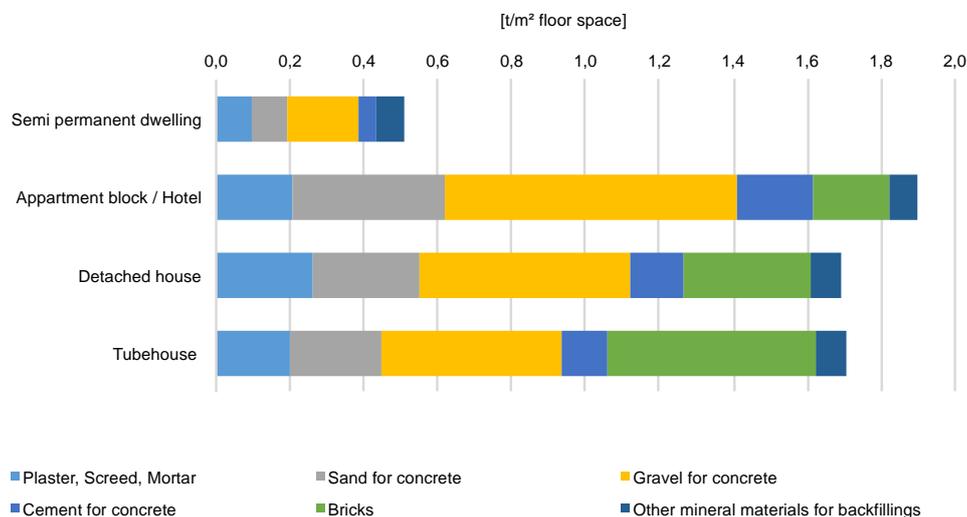


Fig. 6 Compositions of mineral building materials in typical building types in Vietnam based on metric tons per floor space (source: Bimesmeier and Schiller 2017)

Using these parameters, correspondingly also related to roads, and information on the planned development of floor space in buildings and estimates of road construction activity, the future demand for construction materials was calculated. This was done separately for Hanoi and Hoa Binh (figure 7). Assumed that each neighboring province of Hanoi and Hanoi itself covers 1/8 of its demand for mineral building, it can be estimated how much material Hoa Binh should provide annually to meet the demand (sum of black and blue columns). On the other hand, there is a supply of raw materials that is already secured by licenses.

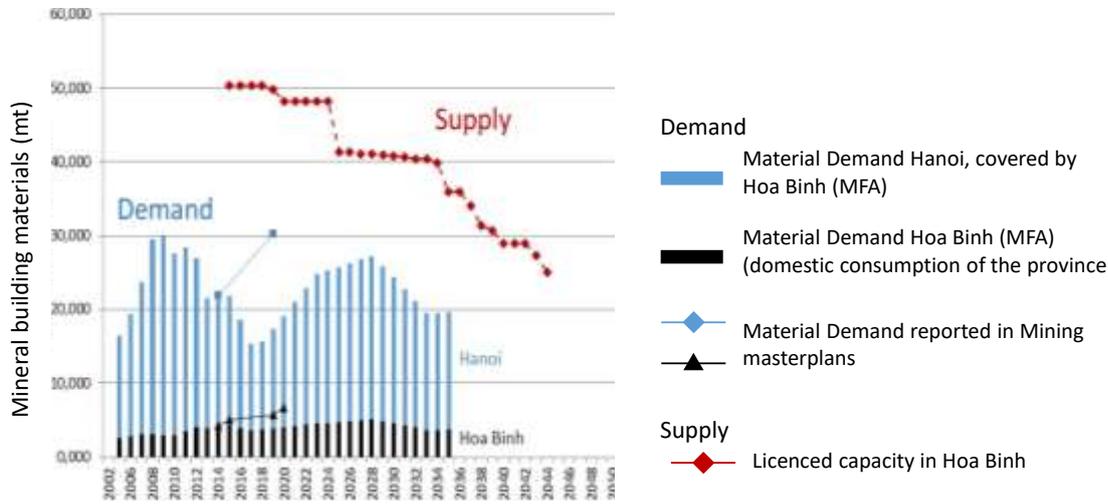


Fig. 7 Annual demand and supply of mineral building materials due to construction activities in the urbanization context (modified according Bimesmeier and Schiller 2017)

6. TOWARDS SUSTAINABLE URBAN REGIONS

The explanations in chapter 4 suggest that urbanization have a significant influence on the demand for building materials. It should be noted that it is not the increase in the rate of urbanization itself (the urbanization dynamic) that is decisive, but the degree of urbanization achieved. The hypothesis is that the largest specific consumption of building materials takes place within urban areas (not during the transformation process). Urban planning determines the urban layout as well as the urban equipment with infrastructures, and thus also the framework conditions for construction planning. Construction planning takes place within this framework. Here the construction method used in buildings and structures is determined. Depending on this, it is decided which materials are required and whether materials can be replaced by other, more efficient ones if necessary. All this has an impact on land and resource use in the hinterland. If one wants to counteract the increasing shortage of resources in the hinterland through settlement planning approaches, it is firstly necessary to know about the planning scope of action; secondly, a concept is needed with which effects on the hinterland can be represented. Due to the fact, that urban and regional planning issues are addressed, the most important indicator that is worth to be addressed is “land use”

A prominent concept addressing such “translating-issues” between resource consumption and land use figures is provided in the 90ies last century with the Ecological Footprint concept EF by Wackernagel and Rees (1996). It is an alternative idea of interpreting land as a basic resource to sustain our human needs. In the measurement of land area needed for different consumption categories, human impact can be visualised as the footprint based on the ecosystems that support us. In other words, it presents the resources removed from ecosystem to supply human needs, noting that the ecosystems are different for different areas as it depends on bio capacity of each area. However, with regard to building materials, EF is mainly focusing on energy and carbon footprint aspects associated with the manufacturing process (Bastianoni, Galli et al. 2006, Kissinger, Sussman et al. 2013, Sinha, Lennartsson et al. 2016). In addition, the built-up land footprint is calculated based on the area of land covered by built environment without mentioning the mining area for resource extraction (Global Footprint Network undated). Beyond this, however, there are certainly works that take into account land degraded by the mining process (using the example of copper mining) and land needed for waste disposal using the EF concept (Chicca, Vale et al. 2018). However, only the area directly used (extraction area) is taken into account although significantly larger areas are affected, which have to be taken into consideration (e.g. landscape consumption with a negative impact on tourism or other areal impacts). In addition to the quantitative measurement of the direct land use effect, methods must therefore be integrated that identify qualitative effects beyond these intervention areas. Possible access to this is offered by the ecosystem services approach.

Building material flows affect very different planning disciplines in urban-rural regions. This can only be managed sustainably in a holistic, comprehensive approach that overcomes urban-rural dichotomy. At first, it is of secondary importance how urban is separated from rural. Firstly, it is crucial to establish links with the areas of responsibility of the planning authorities and to work towards integrated planning approaches that are of benefit to all areas to be integrated. Thus, in terms of application oriented research, the definition of urban and rural should follow the local definitions.

In terms of basic research, the urban rural linkage approach should be used in a more generalized way as an analytical framework. The still existing lack of knowledge about correlations between urbanization and land changes in the hinterland in terms of resource consumption, in particular for building materials has to be addressed systematically. To highlight importance of the urban-rural linkages in policy papers (e.g. UN Habitat and Sustainable Development Goals (SDG)) is only the first step. The next step needed is a frame-work than an implementation-oriented support to embed urban-rural linkages in land-use and urban planning. MFA following the concept introduced in this paper has the potential to define entry points for that. These can be all the more effective and convincing if it is possible to link up with other planning discussions in the urban-rural context, such as linking infrastructure and settlement planning.

REFERENCES

- Akkoyunlu, S. (2013): The Potential of Rural-urban Linkages for Sustainable Development and Trade. Working Paper No 2013/37. nccr trade regulation.
- Augiseau, V., & Barles, S. (2017). Studying construction materials flows and stock: A review. *Resources, Conservation and Recycling*, 123, 153-164. doi:<https://doi.org/10.1016/j.rescon-rec.2016.09.002>
- Bastianoni, S., A. Galli, V. Niccolucci and R. M. Pulselli (2006). "The ecological footprint of building construction " *WIT Transactions on Ecology and the Environment* 93(The Sustainable City IV: Urban Regeneration and Sustainability).
- Billen, G., Garnier, J., Barles, S. (2012): History of the urban environmental imprint: introduction to a multidisciplinary approach to the long-term relationships between Western cities and their hinterland. *Regional Environmental Change* 12, 249-253. doi:10.1007/s10113-012-0298-1
- Bimesmeier, T., Schiller, G. (2017): Planning-Oriented Material Flow Analysis to support the management of mineral resources extraction in Vietnam. In: Ho, Pham Ngoc; Müller, Bernhard (Hrsg.) : *Proceedings of The International Conference on Environment and Sustainable Development in Mineral Resource Extraction*, 31.10.2017, Hanoi, Vietnam. Hanoi : Vietnam Academy of Science and Technology Press, 2017, S.20-28.
- Binstock, M., Carter-Whitney, M. (2011): *Aggregate Extraction in Ontario: A Strategy for the Future. Executive Summary*. Canadian Institute for Environmental Law and Policy [WWW Document]. URL <http://cielap.org/pdf/AggregatesStrategyExecSumm.pdf> (accessed 12.20.16).
- Chicca, F., B. Vale and R. Vale (2018). *Everyday Lifestyles and Sustainability: the environmental impact of doing the same things differently*. London, Taylor & Francis – Rutledge
- Commission, E. (2018). *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on a monitoring framework for the circular economy*. Strasbourg.
- Cramer, J. (2017): *The Raw Materials Transition in the Amsterdam Metropolitan Area: Added Value for the Economy, Well-Being, and the Environment*. *Environment: Science and Policy for Sustainable Development* 59, 14-21. doi:10.1080/00139157.2017.1301167
- Curria, P. K., Musango, J. K., May, N. D. (2017): *Urban metabolism: A review with reference to Cape Town*. *Cities*, Volume 70, October 2017, Pages 91-110.
- Dittrich (2014): *Global Material Flows Database*. Available at www.materialflows.net (access: 2.3.2018).
- ESPON (2015): *Urban-rural relations in Europe. Final Report*.
- Fritsche, U. R., Eppler, U., Iriarte, L., & Laaks, S. (2015). *Resource-Efficient Land Use – Towards a Global Sustainable Land Use Standard (GLOBALANDS)*.
- Gu, C., Wu, L. u. I. Cook (2012): *Progress in research on Chinese urbanization*. In: *Frontiers of Architectural Research* (2012) 1. S. 101 – 149.
- Güneralp, B., Seto, K.C., Ramachandran, M. (2013): *Evidence of urban land teleconnections and impacts on hinterlands*. *Current Opinion in Environmental Sustainability, Human settlements and industrial systems* 5, 445-451. doi:10.1016/j.cosust.2013.08.003
- Karina Condeixa, K., Haddad, A., Boer, D. (2017): *Material flow analysis of the residential building stock at the city of Rio de Janeiro*. *Journal of Cleaner Production*, 149 (2017), Pages 1249-1267.
- Kennedy, C. A. (2016). *Industrial Ecology and Cities*. In R. Clift & A. Druckman (Eds.), *Taking Stock of Industrial Ecology* (pp. 69-86). Cham: Springer International Publishing.
- Kissinger, M., C. Sussman, J. Moore and W. E. Rees (2013). "Accounting for the Ecological Footprint of Materials in Consumer Goods at the Urban Scale " *Sustainability* _ open access 5.
- Müller, Bernhard; Ho, Pham Ngoc; Wirth, Peter; Schiller, Georg; Vu, Anh Minh (Eds.) (2016): *MAREX – Management of mineral resource extraction in Hoa Binh Province – A contribution to sustainable development in Vietnam*. Conference documentation, 27.06.-01.07.2016. Dresden, Germany: IÖR [u.a.], 2016, S.115
- Müller, E., Hilty, L. M., Widmer, R., Schluep, M., & Faulstich, M. (2014). *Modeling metal stocks and flows: A review of dynamic material analysis methods*. *Environmental Science & Technology*, 48, 2102-2113. doi:10.1021/es403506a
- Repp, A., Zscheischler, J., Weith, Th., Strauß, C., Gaasch, N. u. K. Müller (2012): *Urban - rurale Verflechtungen. Analytische Zugänge und Governance - Diskurs*. Diskussionspapier Nr. 4. Leibniz-Zentrum für Agrarlandschaftsforschung (ZALF) e.V.. Institut für Sozioökonomie.
- Schiller, G., Müller, F., Ortlepp, R. (2017a): *Mapping the anthropogenic stock in Germany: Metabolic evidence for a circular economy*. In: *Resources, Conservation and Recycling* 123 (2017), S. 93-107.<http://dx.doi.org/10.1016/j.resconrec.2016.08.007> (Online First 2016).
- Schiller, G.; Gruhler, K.; Ortlepp, R. (2017b): *Quantification of anthropogenic metabolism using spatially differentiated continuous MFA*. In: *Change and Adaptation in Socio-Ecological Systems* 3 (2017) 1, S. 119-132. <https://doi.org/10.1515/cass-2017-0011>.
- Schiller, Georg (2015): *Using Material Flow Analysis to promote Regional Green Economy Strategies in Vietnam* In: *Taking Stock if Industrial Ecology*. ISIE Conference 2015, University of Surrey, Guildford, UK, 2015, 7th-10th July. Book of Abstracts . Guildford, 2015
- Seto, K.C., Reenberg, A., Boone, C.G., Fragkias, M., Haase, D., Langanke, T., Marcotullio, P., Munroe, D.K., Olah, B., Simon, D. (2012): *Urban land teleconnections and sustainability*. *Proceedings of the National Academy of Sciences* 109, 7687-7692. doi:10.1073/pnas.1117622109
- Sinha, R., Lennartsson, M., & Frostell, B. (2016). *Environmental footprint assessment of building structures: A comparative study*. *Building and Environment*, 104, 162-171. doi:<https://doi.org/10.1016/j.buildenv.2016.05.012>.
- Tanikawa, H., T. Fishman, K. Okuoka, and K. Sugimoto. 2015. *The weight of society over time and space: A comprehensive account of the construction material stock of Japan, 1945-2010: The construction material stock of Japan*. *Journal of Industrial Ecology*, Early View. doi:10.1111/jiec.12284.

- UN Habitat III (2015): United Nations Habitat III Issue Paper 10: Urban-Rural Linkages [WWW Document]. URL https://unhabitat.org/wp-content/uploads/2015/04/Habitat-III-Issue-Paper-10_Urban-Rural-Linkages-2.0.pdf (accessed 3.22.2017).
- United Nation (2015a): Transforming our world: the 2030 Agenda for Sustainable Development. Distr.: General, 21 October 2015. http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E (access: 2.3.2018).
- United Nations (2015b): World Urbanization Prospects - The 2014 Revision. esa.un.org/unpd/wup/Publications/Files/WUP2014-Report.pdfw York, (access 25.04.2018)
- Wackernagel, M., & Rees, W. E. (1996). Our ecological footprint : reducing human impact on the earth. Gabriola Island, BC; Philadelphia, PA: New Society Publishers.
- WBGU – Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen (2016): Der Umzug der Menschheit: Die transformative Kraft der Städte. Berlin: WBGU.
- Wernstedt, K. (2000): Plans, Planners, and Aggregates Mining: Constructing an Understanding. Journal of Planning Education and Research 20, 77-87. doi:10.1177/073945600128992618.

SS14.2. Revisiting rural-urban dichotomy for integrated regional development

1353 AIRPORT-ORIENTED DEVELOPMENT (AOD) - A POTENTIAL SOURCE OF ADHESION AND DRIVER OF GROWTH IN MAKING MORE EFFICIENT URBAN-RURAL SYSTEMS

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ABSTRACT

Principally, urbanisation is diffusion of the influence of urban centres to rural hinterland via peri-urban. Developing countries like India are witnessing an unparalleled movement of population and activities in the urban areas and thus, the existing cities have reached implausible dimensions of expansion. The fast growing and globalising Indian economy has produced an urban crisis marked by inadequate infrastructure and sharp socioeconomic divisions. India's urban growth is so dramatic that it unfailingly outshines every planner's vision. Under this globalization impulse, the cities are shaping new forms of urban growth. In most of the Indian cities, urban growth appears to have taken the form of urban sprawl. It appears as an unplanned and disordered pattern in the peri-urban areas, possibly emerged with the location of large infrastructure projects like information technology parks, ring-roads, airports, special economic zones, and real estate ventures. These peri-urban regions are the most vital as these acts as a litmus test of change and transition, not just locally at the interface of urban and rural, but in the shape of the whole city-region, or the 'rural-urban-region'. Among all the innumerable causes of urban sprawl, this research focuses on airports as, in India airports are massive multi-use occupiers of peri-urban land and have always been a reason for the expansion of urban areas.

Airports may be understood as a reflection of their respective cities. Due to three key developments in aviation sector – commercialization, privatization, and globalization – the economics of airports changed dramatically. Airports are actually reshaping physical, political, and societal landscapes. Today, airport is a relational socio-spatial process within the greater process of globalised urbanisation. The growth of air traffic has major implications for their immediate surroundings, as well as for the growth of the city-region. These dynamics produce externally well-connected and uneven nodes within global city-regions. As a result, the relationship between city and airport is undergoing modification, and airports have become an integral part of regional planning. Thus, airport is more than simply a large-scale piece of infrastructure on the urban periphery; and a better understanding of development and planning at the city-airport interface is needed. Given this large and increasing degree of interconnection, the challenge of planning and governing a socially and spatially cohesive yet globally accessible form of development is an important area of research. This research justifies airport-oriented development (AOD) as a potential source of adhesion and driver of growth in making more efficient urban-rural systems. It reviews the phenomenon of AOD in Indian scenario and examines the different models (Airport Corridor, Aerotropolis, Airea, Airport City, Airfront, Decoplex). It illustrates how institutional contexts, mainly intergovernmental relationships, and specific policy instruments give rise to distinct patterns of (AOD). Taking Tier-II Indian cities as test bed for reforms, the research attempts to propose innovative policies for coordinated and cooperative infrastructure moving away from the current inert and isolated decision making processes in the urban-rural dichotomy.

Keywords: Revisiting rural-urban dichotomy for integrated regional development; Transforming Metropolitan Regions: Ideas and Examples; Regional and Urban Policy and Governance

1 INTRODUCTION

With regards to urban-rural governance and planning concerning airports, its surroundings, and the greater region around, this paper aims to contribute to understand the geography of urban-rural regions by connecting regional planning and airport development to the literature on urbanisation within the context of global cities research. The study attempts to review the scope of airport-oriented development as a possible potential source of adhesion and driver of growth in making more efficient urban-rural systems. The research is divided among various sections where Section 0 discusses about issues related to urbanisation and sprawl and the linkage between sprawl and airports. Section 0 provides the relationship between airports and planning, justifies the need of airport-oriented development, and elaborates the concept in detail. Section 0 lists out the prevailing models of AOD along with their brief descriptions. A rational criticism is also provided in Section 0. The final conclusion of the study is provided in Section 0.

1.1 Urbanisation and Sprawl

Urbanisation as a phenomenon has existed since long and the rate of urbanisation is one of the highest in developing nations like India. By 2050, India will become world's most populous country and almost 50% of its population will live in cities (Brar, et al., 2014). By the year 2030, 590 million people will live in urban areas (Figure 132). Hence, there will be a huge demand for more efficient urban systems. While the Indian government is boosting for smart cities, the reality is a web of rising inequalities and powerless local authorities. The socio-spatial structure and hierarchy in the ever-expanding cities of India is growing every day. It has produced an urban crisis characterized by the deficiency of suitable infrastructure and growth management. "India's urban growth is so dramatic that it consistently outstrips even the most perspicacious planner's vision for it" (Roy, 2009).

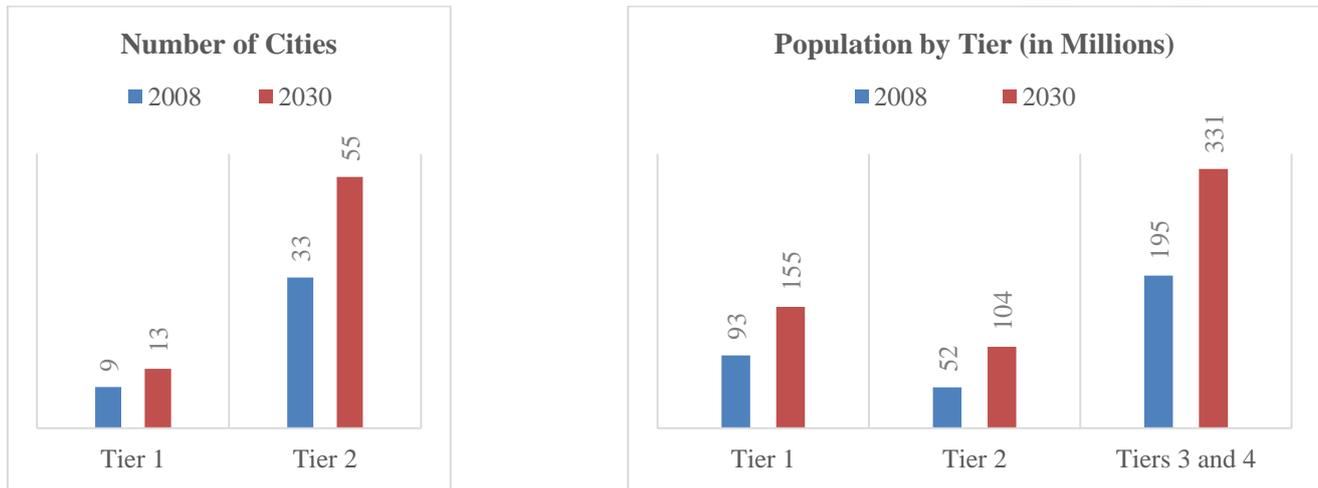


Figure 132: India's urban growth (2008 and 2030) (McKinsey Global Institute, 2010)

Urbanisation also denotes a diffusion of the influence of urban centres to rural hinterland in the form of urban sprawl. "Urban sprawl is a land use pattern with low levels of eight distinct dimensions – density, continuity, concentration, clustering, centrality, nuclearity, mixed uses, and proximity" (Glaster, et al., 2001). However, recently, it has become fashionable to compare sprawl with dynamic evolution of the synchronized spatial growth and urban areas scattering (Zeng, et al., 2015). Thus, the characterization and modelling of urban sprawl is an important activity, especially in countries like India with rapid urbanization (Habibi & Asadi, 2011).

There is also a big debate for what is formal and what is informal in India's urban planning. Roy (2009) states that "Informality does not lie beyond planning; rather it is planning that inscribes the informal by designating some activities as authorized and others as unauthorized". On the contrary, India's planning regime is itself a non-formalised unit, in a constant state of ambiguity and deregulation (Ambarwati, et al., 2014). Correspondingly, a new planning regime is in horizon in India, a shift from state-run set-up is to privately built and/ or managed infrastructure (Roy, 2009). Thus, the planning of Indian cities cannot be limited to forecasting and management of growth only. In its place, it should be the management of resources, like land, through dynamic processes of informality. Where the use, purpose, and ownership of land cannot be rigid and it is impossible to map with any set of regulations (Varghese, 2016). In this context, there is an urgent need for a more dynamic and decisive planning system to 'future-proof' Indian cities (OECD-CDRF, 2011).

Sprawl is contradictory with the characteristics and the projected idea of Indian city that stresses more on the concept of 'compact city'. But, India urban agglomerations are 'distributed' in shape. There is a diverse pool of small, medium, large, and very large cities spread all over the country. Reports from McKinsey (2010) Institute suggest that India should carry on with a distributed model of urbanisation but with intensive approaches to its different tiers of cities and foster the connectivity between these cities. Thus, narratives like 'connectivity' and 'shape' have a great role in urban development and it becomes vital to understand and enquire that which actors may employ both these narratives to help in positioning the urban areas in global economy (Coventz & Thierstein, 2014).

1.2 Sprawl and Airports

The spatial pattern of the urban growth is not easy to decipher as each city-region has its own unique array and most of the urban form for Indian cities emerged unplanned. There are certain questions to be pondered upon concerning the channelization of this sprawl like where will be the future growth centres, how will be the densities distributed, which urban form is likely to optimize deployment of investment, how to best link spaces via transportation networks and hubs, etc. (Brar, et al., 2014). To answer these question, the cause of sprawl needs to be determined and among the innumerable causes of urban sprawl, the paper focuses on airport infrastructure. This is because, in India, airports have always been a major reason for the expansion of cities. They attract certain land uses to their vicinity while discourage others. Existing neighbouring land uses affects airport's ability to expand. Extending airports, building new ones, and decentralizing airports may compromise the purity and sustainability of the peri-urban region.

Planned development in and around the airport is a relatively newer perception in India. With time it is felt that the airport can no longer be isolated from its surroundings. Now airport has become more than just a hub for human movement and its immediate subsidiaries. It is actually a driver of business location, urban economic growth, and global economic integration (Conway, 1993). Walker & Baker (2010) rightly says that an airport city is the ultimate transit oriented development (TOD) strategy, and thus, airport-centric or airport-oriented development (AOD) comes into picture (Freestone & Baker, 2011). To keep up with economic growth, increasing number of passengers, and expanding cargo volumes, many airports round the globe are already extending their reach and impact beyond the traditional airport boundaries and developing significant non-aeronautical commercial facilities, services, and revenues. Similarly, Indian airports are also gradually transforming from mere air transport infrastructure to multimodal multi-functional enterprises and are generating substantial commercial development.

In nutshell, airport oriented development has two prominent effects – urban sprawl at regional level and economic development at global level (Erro! A origem da referência não foi encontrada.). Airport fuelled growth is touted as an innovative urban development solution but little concrete research has been done on the airport-oriented development for Indian cities. This is because the planning literature has not yet truly addressed the concepts and models of airport-oriented development (Freestone & Baker, 2011). This paper attempts to review the literature based on airports and urban planning and airport-oriented development models with special emphasis to Indian scenario.

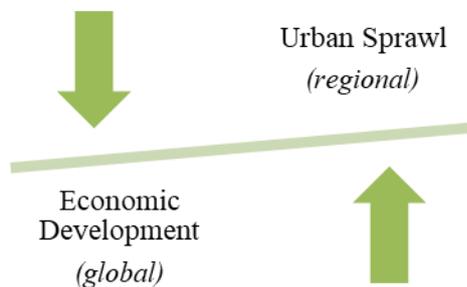


Figure 2: Prominent Impacts of AOD

2 AIRPORT-ORIENTED DEVELOPMENT

In most of the world, urban growth appears to be in the form of sprawl. The catalyst for this unplanned and disordered patterns are generally the location of large infrastructure projects such as airports, highways, industries, etc. (Lovera, 2015). Similarly, Indian megacities are also witnessing significant changes in their peri-urban regions due to the location of projects like information technology (IT) parks, ring-roads, airports, special economic zones (SEZs), and other real estate ventures (Ramachandraiah, 2014). This study specifically focusses on the role of airports and their better management.

2.1 Airports and Planning

It is strongly believed that airport-oriented development could cure the malaise of haphazard planning and boost the economy of a region. If properly designed, an airport can actually brand the city or region globally. Regional economy has always been a key factor for the growth in air service demand. And vice-versa also holds true, as air transportation itself can be a strategic cause and facilitator of a region’s economic growth. Air services have a substantial positive effect on the growth of a region and its magnitude varies by region’s size and industrial specialization (Blonigen & Cristea, 2012). India sees a great potential in aviation sector. The annual growth rate for revenue-passenger-kilometres in India is 19.2% for the year 2014-15 which is the highest in the world (IATA Economics, 2015). Some of the airports in India like New Delhi and Hyderabad airport are consecutively getting high rankings in the world in their categories. The contribution of aviation sector in Indian economy is creditable as it contributes INR 330 billion (0.5%) to the national GDP annually (Oxford Economics, 2011). Besides the direct contribution, major catalytic impacts caused by airports on its region include generation and improvement of regional economic competitiveness and augmentation of the accessibility of the region. It also has influences on the social development and has patterns of spatial effects (Halpern & Bråthen, 2011). However, a well-functioning airport and growth in passengers is one thing but the overall growth of the region is another.

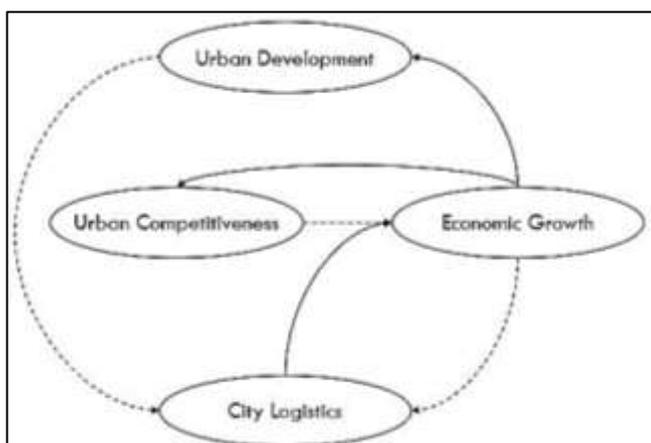


Figure 133: Relationship between City Logistics and Urban Economic Development (Boloukian & Siegmann, 2016)

The rigorous airport-oriented development is a comparatively newer spatial phenomenon around the world. Along with the growth in air traffic, the related commercial activities and the subsequent spatial development clusters around its immediate settings, and at times, in the further locations linked efficiently to the airport (Zepezauer, 2012). As a consequence, airport zones have started attracting urban central functions and have attracted investments and subject to intensified spatial development as shown in Figure 133. The relationship between airport and planning has always been argumentative because of the concentration and localisation of the negative impacts. But the wave of globalisation, non-aeronautical revenues, and deregulation of the industry has unleashed new economic potential forces (Freestone &

Baker, 2010). This has transformed the scale of planning from just the airport towards the broader region (Kasioumi, 2015).

Significant amount of research has been done till date to identify and examine the determinants of regional development but the contribution of aviation sector in it is still sparsely explored. The interaction between airport infrastructure and spatial planning remains a crucial area to explore. Spatial impacts of airports at local, corridor, and regional level and their assessment is critical (Federal Office for Spatial Development, 2003). Today's airport presents an almost insoluble planning puzzle in its nexus of benefits and costs over varied spatial scales. Particularly, the combination of locally concentrated dis-benefits and diffused regional benefits is unique to airports. Therefore, the larger airport region is "recognised as an increasingly unsettled space caught in the crossfire of different ambitions and is posing considerable challenges for regional planning governance" (Freestone & Baker, 2010). This becomes more interesting in Indian scenario where the airport design and planning is controlled by the Airports Authority of India, a public sector undertaking and owned by the union government of India. While the surroundings are managed by the local development authorities, municipalities and village *panchayats*.

2.2 Need for AOD

Airports may often be understood as a reflection of their respective cities. Indian airport industry has seen a tremendous growth in the last few years owing to three key developments in the sector – commercialisation, privatisation, and globalisation. The economics in and around airports have changed dramatically since then. The internal airport management, which was more of welfare oriented, is now focussing on operational efficiency along with significant revolution in the relationship with other airports. With the change from the point-to-point to the hub-and-spoke system, today airlines offer more connections, making flying affordable and more attractive (Zepezauer, 2012). Today, airport is more of a relational socio-spatial development within the greater course of 'globalised urbanisation' (Dey & Grappi, 2015). The growth of air traffic has major implications for their immediate surroundings, as well as for the growth of the city-region. The dynamics around airports produce externally well-connected but uneven nodes within the potential global city-regions.

As a result, simultaneously, the relationship between city and airport underwent a modification, and airports became an important factor for urban planning (Hesse & Rodrigue, 2006). An emphasis on airports has the latent power to reveal the complex and multifaceted dynamics between the urban-global contexts (McDonough, 2015). Airport is both, an object and a catalyst in the process of 'globalised urbanisation', rather than the outcome of a binary 'local' or 'global' influence (Cidell, 2004). Thus, airport is more than simply a large-scale piece of infrastructure on the urban periphery; and a better understanding of development and planning at the city-airport interface is needed. Given this large and increasing degree of interconnection, the challenge of planning and governing a socially and spatially cohesive yet globally accessible form of development is important (Wijk et al, 2014).

2.3 AOD Concept

The concept of airport-oriented development has evolved gradually but still has not found a common universal definition or specifications. A number of researches are being carried out for the enhancement of the whole notion. Kasarda (2010) refers to airport-oriented development as bringing together airport planning, urban-regional planning, and economic development in a synergistic fashion. Development of non-aviation activities and transformation of airport into places of innovation, entertainment, relaxation, and business blends the airport into the fabric of cities, and 'airports in cities' transforms into city-airports (Cyrek & Weltrowska, 2013). Certain desirable conditions allow the formation of areas like large industrial areas with a high concentration of commercial activities in the proximity of airports (Flores-Fillol & Nicolini, 2006). The planned industry around the airport can be divided into three broad layers – core, dependent, and related as in Figure 134.

AOD planning principles generate 'economies of speed' and boost aviation- facilitated trade activities by improving air connectivity (Kasarda & Appold, 2014). 'Aero-regionalism' is another related concept conceived by Addie (2014). It explores the relationship among globalization, airport industry and city-regionalism. It further relates the infrastructural and political integration of airports with the possibly varying local institutional and policy frameworks. A number of business models exists and can be examined for the airport cities for formulating regional development strategies (Appold & Kasarda, 2011). The key factors and trends for the conceptualization of AOD models may vary from region to region and can be analysed accordingly (Wang, et al., 2011). A successful airport-oriented development requires co-ordinated investments and strategies. It may have various types of governance structures namely, market-driven, hierarchy-driven, and network-driven and their hybrids too (Appold & Kasarda, 2009).

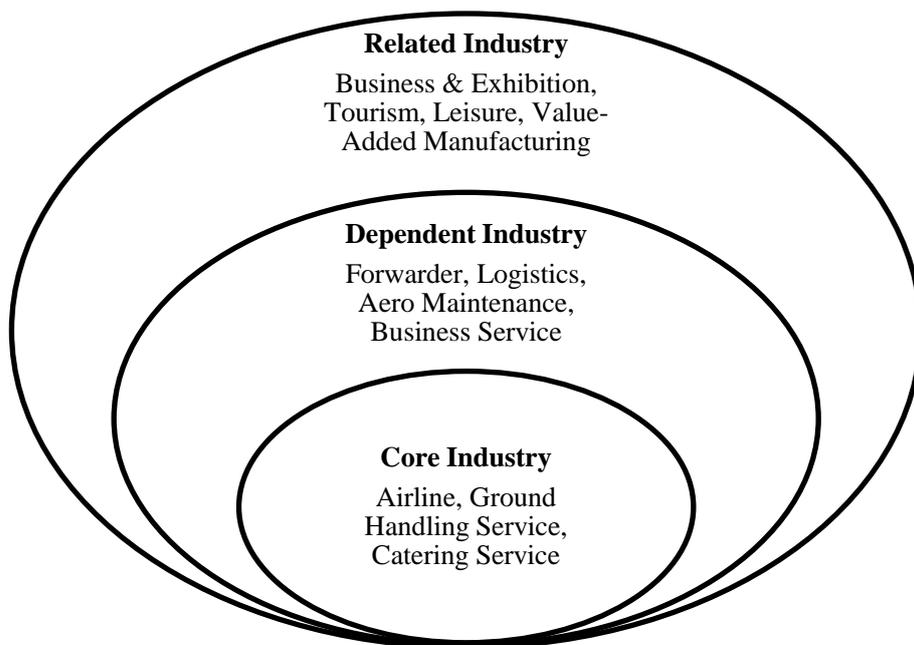


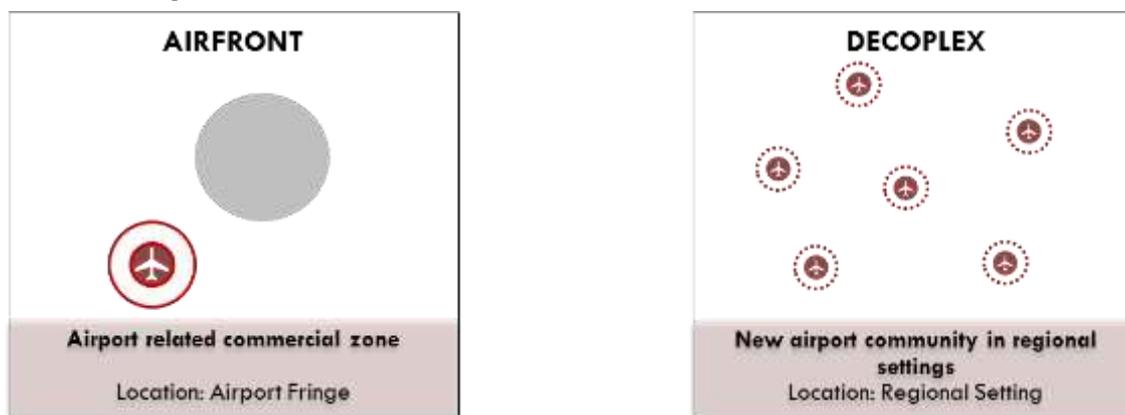
Figure 134: Spatial zoning of airport-oriented industries (Wang & Hong, 2011; Kasarda, 2010)

There are three layers of spatial impacts instigated by an airport on its region (Federal Office for Spatial Development, 2003; Stangel, 2011; Halpern & Bråthen, 2011).

1. *Local*: There is an impact at local level because of AOD as the airport needs land, leads to fragmentation of urban and natural areas, causes emissions, harms flora and fauna, and affects development of residential and recreation zones. It also catalyses growth stimulus, area redevelopment, logistics hubs expansion, and linking of service locations.
2. *Corridor*: It promotes the creation of infrastructure corridors or spatial concentration of workplaces as there may be functional fragmentation or consolidation of land-uses, such as the shift of service locations. However, the structure of centres may change (centralization or decentralization of activities).
3. *Regional*: Regional economic development may be encouraged or hindered by alteration of spatial networks, i.e. the relation between centres and rural areas, between residential and recreational areas, between the towns themselves and with neighbouring towns.

3. AOD MODELS

Several planning models are created which all highlight the airport as an economic gateway. To understand the know-how of the concept of AOD, a detailed study of different planning models and their conception is conducted and represented in Figure 135. **Erro! A origem da referência não foi encontrada.** (Freestone & Baker, 2011; Freestone & Baker, 2010; Kasioumi, 2015; Zepezauer, 2012; Stangel, 2011; Peneda, et al., 2011). Brief concepts and impacts of the six models are also presented below.



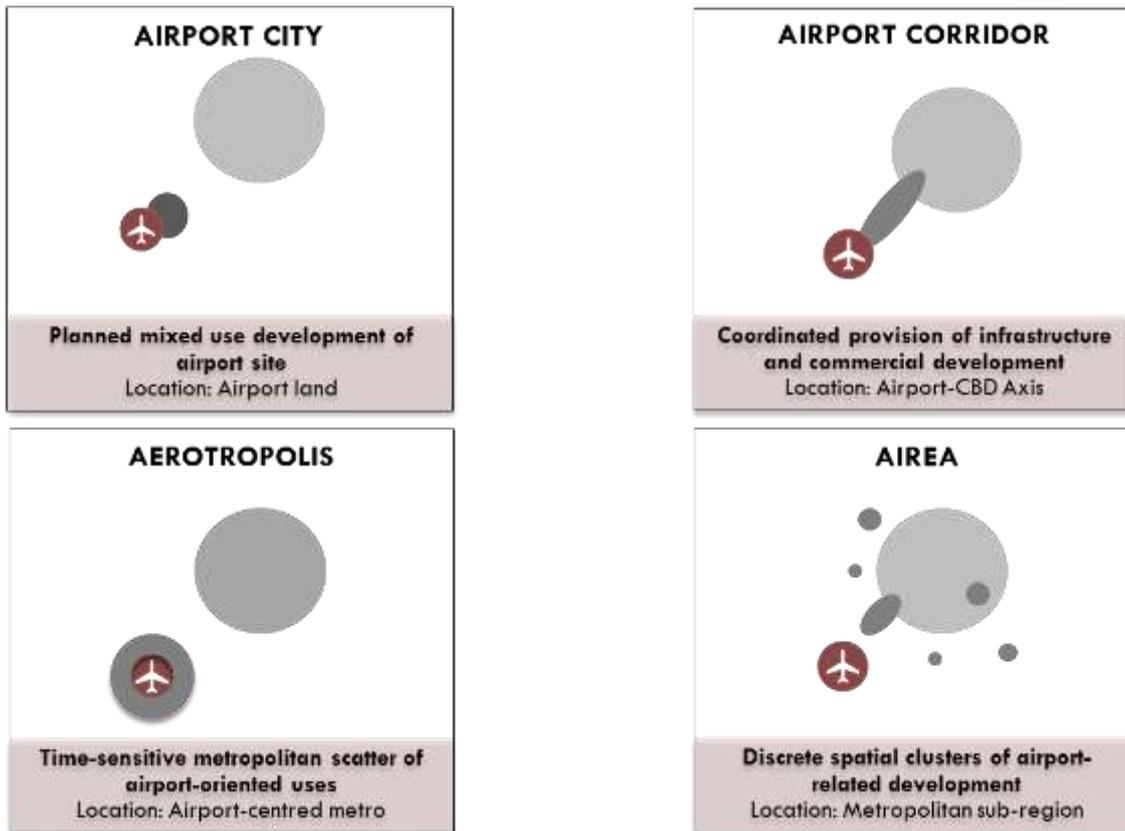


Figure 135: Planning Models of AOD (Freestone & Baker, 2011; Freestone & Baker, 2010; Kasioumi, 2015; Zepezauer, 2012; Stangel, 2011; Peneda, et al., 2011)

1. *Airfront*: It is the basic airport-related commercial zone located at the airport fringe. The key stakeholders are the local inhabitants in the form of public-private partnerships. It is generally on the scale of business district model and may be governed by special planning organisation.
2. *Decoplex*: It is conceived by the master developers in the master plans where the new airport community is scattered in the regional setting. The model takes the form of a regional industrial-leisure complex.
3. *Airport City*: Airport City refers to the planned mixed-use development of the airport site generally by the airport authorities. Such a development is seen near Delhi airport. It has a number of high density and compact mixed-use centres with non-aeronautical activities.
4. *Airport Corridor*: This is the most common type of model in major Indian cities. It occurs along the main axis that joins airport with the city core area by provision of coordinated infrastructural facilities and related commercial development of mixed densities. This may be developed by public or private developers (or both). The corridor is developed as per mutual airport and city development strategies.
5. *Aerotropolis*: It is the most elaborate form of airport-oriented model which is an airport-centred metropolis and has time-sensitive logistics, commercial, and leisure activities linked with the airport in the best possible hierarchy. Aerotropolis provides a number of competitive advantages to the urban form
6. *Airea*: Discrete spatial clusters of airport-related development in the greater metropolitan region is called Airea. The major advantage is the multiplicity of economic development and market nodes as it has polycentric urban form.

4 AOD CRITICISM

The positive impacts of airport-oriented development are innumerable, but there are major challenges involved too. Unlike transit-oriented development, the process and impacts are much complicated and intricate for airport-oriented development because air traffic as a mode can be highly disruptive. Peneda, et al. (2011) and (Kasarda, 2010) identify few critical factors for airport-oriented development – connectivity of the airport and its surroundings; economic potential of the region; availability of other related infrastructure in the region; sustainable development; commercial attitude by the airport operator; demand for air travel and much more. However, having all these in place may still not guarantee success (Figure 136).

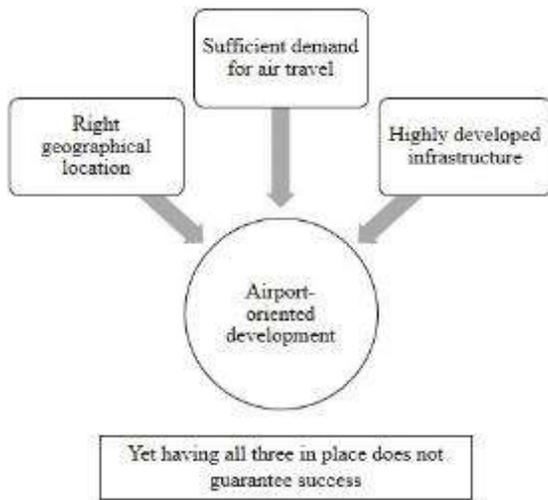


Figure 136: Issues related to airport-oriented development

Clearly, the scenario will vary depending on the airport and the region and their functions. In many cases, airport-related activities may choose the airport surrounding area because of the airport's image and its air connectivity. However, Stangel (2011) identifies that the land-price and surface connectivity are the key factors in locating certain activities in the vicinity of airport and not the air traffic. Also, it is speculated that air transport might not replace the existing components of international economic development to much extent. AOD also raises concerns regarding its long-term sustainability in terms of future energy provision, security, and upcoming export pathways (Charles, et al., 2007).

Taking the case of existing airports, a number of local and regional planning constraints exist at and around them which are incoherent with the AOD principles. In such physically constrained areas, bounded by ages of prior development, application of airport-oriented development may not be possible as variety of problems is experienced during the enlargement and development of existing airport facilities (Saldiraner, 2013). Spatial effects and developments generated by airports may not fit well with local or regional comprehensive plans and master plans in many cases. Airport-oriented development might also intensify urban sprawl, which might not be desirable in many cases. It may pose serious environmental risks too. Putting airport at the centre of thinking and 'facilities first' approach might also not work for all situations (Zhang, 2015).

Re-orientation from airport-centred to region and economy-centred and from a focus on facilities to a focus on fundamentals is required (Appold, 2013). Given the non-stop global growth in air traffic, local and regional planning authorities shall prepare better and in advance for the growth around airports. This can be done by planning efficient connections and zoning to control the haphazard and unfettered growth in favour of airport-oriented development.

5 CONCLUSION

Airport-oriented development is a recent phenomenon for developing nations like India. Given the pace of urbanisation in India and the growth in airport industry, a huge potential is seen in bringing airport planning and urban and regional planning together as discussed in Section 0. Also, the potential of each region and its airport may vary and has to be addressed accordingly. Kasarda (2010) acknowledges that "neither the presence of an airport nor planning alone makes for a successful airport-oriented development". As conveyed in Section 0, conventional and rigid planning approaches seem more and more problematical for the dynamism that airports and its region share. Fundamental principles towards planning for a more efficient urban-rural systems may be listed as follows:

- Realistic economic impacts including the effects at local, regional, and global level;
- Synergised integration of airport planning with local or regional comprehensive plans and master plans and visions of the community;
- Collective sense of responsibilities and duties among the involved stakeholders;
- Efficient governance framework to facilitate coordination and communication among all the concerned authorities;
- Concern for the immediate and long-term environment impacts at local and regional level;
- Strategies for economic development and marketing for the airport region and tools to attract and retain investment.

The paper strongly recommends the urgency to review and revise the current approaches and policies that take airport as an alien unit and always placed it out of the city-core. An innovative approach is required for bringing together airport planning and urban-regional planning in a combined synergised manner. Need of the hour is to develop more meaningful and efficient ways of reading airports and airport-oriented development. This will eventually lead to more ways of understanding contemporary urban-rural agglomeration processes and their planning and governance in the context of the global city-region. Under these conditions, airport-oriented development can surely act as a potential source of

adhesion and driver of growth in making more efficient urban-rural systems. This will lead to a development of more visually pleasing, economically proficient, and sustainable urban and rural India.

REFERENCES

- Addie, J.-P. D., 2014. Flying high (in the competitive sky): Conceptualizing the role of airports in global city-regions through 'aero-regionalism'. *Geoforum*, Issue 55, pp. 87-99.
- Ambarwati, L., Verhaeghe, R., Pel, A. J. & Arem, B. v., 2014. Controlling Urban Sprawl with Integrated Approach of Space-Transport Development Strategies. *Procedia - Social and Behavioral Sciences*, Volume 138, pp. 679-694.
- Appold, S. J., 2013. *A Short Primer on Aerotropolis and Airport City Planning*. Chapel Hill: University of North Carolina.
- Appold, S. J. & Kasarda, J. D., 2006. The appropriate scale of US airport retail activities. *Journal of Air Transport Management*, Issue 12, pp. 277-287.
- Appold, S. J. & Kasarda, J. D., 2009. *Governing the aerotropolis*. s.l.:Global Airport Cities.
- Appold, S. J. & Kasarda, J. D., 2011. Seeding growth at airports and airport cities: Insights from the two-sided market literature. *Research in Transportation Business & Management*, 1(91-100).
- Blonigen, B. A. & Cristea, A. D., 2012. *Airports and Urban Growth: Evidence from a Quasi-Natural Policy Experiment*. Eugene, USA: University of Oregon.
- Boloukian, R. & Siegmann, J., 2016. Urban Logistics; a Key for the Airport-Centric Development - a Review on Development Approaches and the Role of Urban Logistics in Comprehensive Airport-Centric Planning. *Transportation Research Procedia*, Volume 12, pp. 800-811.
- Brar, J. et al., 2014. *India's economic geography in 2025: states, clusters and cities - Identifying the high potential markets of tomorrow*, New Media Australia: McKinsey & Company.
- Charles, M. B., Barnes, P., Ryan, N. & Clayton, J., 2007. Airport futures: Towards a critique of the aerotropolis model. *Futures*, Issue 39, pp. 1009-1028.
- Cidell, J. L., 2004. *Scales of Airport Expansion: Globalisation, Regionalization, and Local Land Use*, Minneapolis: University of Minnesota.
- Conway, H. M., 1993. *The airport cities 21: the new global transport centres of the 21st century*. Norcross, GA: Conway Data Inc..
- Coventz, S. & Thierstein, A., 2014. Hub-airports as cities of intersections: The redefined role of hub-airports within the knowledge economy context. In: S. Coventz, B. Derudder, A. Thierstein & F. Witlox, eds. *Hub Cities in the Knowledge Economy*. Farnham: Ashgate Publishing, pp. 77-94.
- Cyrek, D. & Weltrowska, J., 2013. Aerotropolis – the city of the future. *Research Papers of Wrocław University of Economics*, Issue 283, pp. 130-138.
- Dey, I. & Grappi, G., 2015. Beyond Zoning: India's Corridors of "Development" and New Frontiers of Capital. *South Atlantic Quarterly*, 1 January, pp. 153-170.
- Federal Office for Spatial Development, 2003. *The spatial impact of transport infrastructures «Learning from the past»*, Bern: Federal Office for Spatial Development (ARE).
- Flores-Fillol, R. & Nicolini, R., 2006. *Aerotropolis: an aviation-linked space*. s.l.:s.n.
- Freestone, R. & Baker, D., 2010. The planning of airport regions and National Aviation Policy. In: *Airports in Cities and Regions - Research and Practise*. Karlsruhe: KIT Scientific Publishing, pp. 69-84.
- Freestone, R. & Baker, D., 2011. Spatial Planning Models of Airport-Driven Urban Development. *Journal of Planning Literature*, 26(3), pp. 263-279.
- Glaster, G. et al., 2001. Wrestling sprawl to the ground: defining and measuring an elusive concept. *Housing Policy Debate*, 12(4), pp. 681-717.
- Habibi, S. & Asadi, N., 2011. Causes, results and methods of controlling urban sprawl. *Procedia Engineering*, Volume 21, pp. 133-141.
- Halpern, N. & Bräthen, S., 2011. Impact of airports on regional accessibility and social development. *Journal of Transport Geography*, Issue 19, p. 1145-1154.
- Hesse, M. & Rodrigue, J.-P., 2006. Global production networks and the role of Logistics and Transportation. *Growth and Change*, Volume 37, pp. 499-509.
- IATA Economics, 2015. *Air Passenger Market Analysis - December 2015*, Montreal, Canada: International Air Transport Association (IATA).
- Kasarda, J. D., 2010. *Airport Cities and the Aerotropolis: The Way Forward*. London: Insight Media.
- Kasarda, J. D. & Appold, S. J., 2014. *Planning a Competitive Aerotropolis*. Chapel Hill, USA: Center for Air Commerce, Kenan-Flagler Business School, University of North Carolina.
- Kasarda, J. D. & Green, J. D., 2005. Air cargo as an economic development engine: A note on opportunities and constraints. *Journal of Air Transport Management*, Issue 11, pp. 459-462.
- Kasioumi, E., 2015. Emerging planning approaches in airport areas: the case of Paris-Charles de Gaulle (CDG). *Regional Studies, Regional Science*, 2(1), pp. 408-414.
- Lovera, C. A. S., 2015. Urban sprawl and infrastructural lands: Revamping internal spaces in Santiago de Chile. *Geoforum*, Volume 67, pp. 36-40.
- McDonough, E., 2015. *Global flows, local conflicts and the challenge of urban governance: Managing the city-airport interface in London, UK*. Eindhoven, Benelux Interuniversity Association of Transport Researchers.
- McKinsey Global Institute, 2010. *India's urban awakening: Building inclusive cities, sustaining economic growth*, s.l.: McKinsey & Company.
- OECD-CDRF, 2011. *Trends in Urbanisation and Urban Policies in OECD Countries: What Lessons for China?*, s.l.: Organisation for Economic Co-operation and Development & China Development Research Foundation.
- ONS, 2010. *Measuring the economic impact of an intervention or investment - Paper One: Context & rationale*, Newport, South Wales: Office for National Statistics.
- Oxford Economics, 2011. *Economic benefits from Air Transport in India*, Oxford: Oxford Economics.
- Peneda, M. J. A., Reis, V. D. & Macário, M. d. R. M., 2011. *Critical factors for the development of airport cities*. Lisboa, Portugal, Instituto Superior Técnico, Universidade Técnica de Lisboa.
- Ramachandriah, C., 2014. Urban Mega Projects and Land Conversion in Peri-urban Areas—Impact on Vegetable Production Due to Outer Ring Road in Hyderabad, India. *Environment and Urbanization Asia*, 5(2), pp. 319-335.

- Roy, A., 2009. Why India cannot plan its cities: Informality, Insurgence and the Idion of Urbanisation. *Planning Theory*, 8(1), pp. 76-87.
- Saldiraner, Y., 2013. Airport master planning in Turkey; planning and development problems and proposals. *Journal of Air Transport Management*, Issue 32, pp. 71-77.
- Stangel, M., 2011. *Airport-related spatial development - Global tendencies and Katowice Airport Area perspectives*. Gliwice, Poland: The Silesian University of Technology.
- Varghese, P., 2016. Exploring Other Concepts of Smart-Cities within the Urbanising Indian Context. *Procedia Technology*, Volume 24, pp. 1858-1867.
- Walker, A. R. & Baker, D. C., 2010. *A planning support system for airport city development*. Porto, Portugal, 14th Air Transport Research Society Conference.
- Wang, K.-J. & Hong, W.-C., 2011. Competitive advantage analysis and strategy formulation of airport city development - The case of Taiwan. *Transport Policy*, Issue 18, pp. 276-288.
- Wang, K.-J., Hong, W.-C., Chen, S.-H. & Jiang, J.-T., 2011. Strategic development trend and key factors analysis of Airport City in Taiwan. *Journal of Transport Geography*, Issue 19, pp. 807-820.
- Zeng, C., Liu, Y., Stein, A. & Jiao, L., 2015. Characterization and spatial modeling of urban sprawl in the Wuhan Metropolitan Area, China. *International Journal of Applied Earth Observation and Geoinformation*, Volume 34, pp. 10-24.
- Zepezauer, F., 2012. *Regional Airports and Urban Development of Small Cities in the U.S.*. Florida: NEURUS Program Spring 2012.
- Zhang, B., 2015. *This abandoned ghost airport in India cost \$17 million to build*. [Online] Available at: <http://www.businessinsider.in/This-abandoned-ghost-airport-in-India-cost-17-million-to-build/articleshow/49588470.cms> [Accessed 17 November 2015].

1552 THE ROLE OF URBAN PROXIMITY IN THEIR PERIPHERAL AREAS: A STUDY OF THE RURAL AREAS AND CENSUS TOWN IN WEST BENGAL, INDIA

ABSTRACT

The urban proximities means the spatial proximity of rural areas to the urban center. The major objectives of the study is showing the impact of an urban center to their peripheral areas. The spatial dimension of inequality in India has been shown through the income differential across states and gap between rural and urban area. But another dimension of inequality that intra-rural inequality has to be examined, which is an indicative of how the growth benefits have penetrated into the catchment area. It is very challenging for the residents further away from the city to take the high speed, service driven and globalization-linked economic growth. Even in the case of public policies, “villages located at greater radial distances have been under-provided with paved roads, irrigation facilities, electricity supplies, telephone links and the like”. This phenomenon supposed to deepen the “close to urban bias” trends of the developmental dynamism. As a consequence, poverty use to go down in the umbra village vis-a-vis increased within penumbra villages. In this theoretical ambience, it is interesting to study how the spatial proximity to cities and town has an impact on the housing, basic amenities and household quality of living in the peripheral rural area. The role of urban proximity have been shown in two level; firstly how the urban area affecting the peripheral rural area, on the other hand, how the statutory town affecting their peripheral census town. For showing the urban proximity, the data of distance from the nearest urban center for every village have taken from District census handbook of Census of India for 2011. Then the distance has been categorized as per the IHDS divisions. An unequal range have been taken for categorizing the distance from nearest town. Buffer around the statutory town have been taken as a tool of showing the influence of statutory town to their peripheral census town. The radius of the buffer around the statutory town have been taken as “0-15km.”, “15-20km” and “20-25km.” These findings show that the rural household in the peripheral rural areas actually receives better housing, basic amenities and household quality of living compared to the distant villages. This fact is also true for the neighbour census town of the statutory town where there is a linear declination of accessibility of household quality of living. So, it is observable that, within such long period of adopting modern development theory, trickling down is still limited only within the peripheral areas. The distant rural place from the rural areas is in the shadow of modern developmental paradigm. Though the government is responsible for minimising spatial inequality through the progressive distributional functioning of growth outcome, still it is far away from achieving that goal. So, the spatial manifestation of developmental activities and provision of basic services to the citizens showing a “close to urban bias” tendency.

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1570 IS INDIA'S DEFINITION OF URBANIZATION CONSERVATIVE? SOME EVIDENCE

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ABSTRACT

In this paper, I examine what would happen if India were to be a little more liberal in its definition of urban areas, similar to that of other countries. Using Census of India 2011 at the village level, I find that if both male and female 75% main non-agricultural employment were to be considered, along with criteria relating to population and population density, India would be 33% urban. If 50% male main non-agricultural employment were considered, along with population and density, 36% of India would be urban. But if male and female 75% non-agricultural employment were to be considered as the only criterion, 78% of India would be urban. If only the population criterion were to be considered alone, 47% of India will be urban, and if the population density criterion alone were considered, 74% of India will be urban. Further, I posit a behavioral model of the characteristics that predict the level of urbanization – the population, population density and non-agricultural employment, in line with existing studies, using cross-country data from the World Bank, making an attempt to understand if the predicted levels of urbanization for countries, are different from their actual levels. For India and several other countries, I find that the predicted level of urbanization is significantly higher.

JEL Classification: R10, R58

Key words: Urbanization—definition, Urbanization—Cross-national, Urbanization—India, Urbanization—conservative, Urbanization—liberal

INTRODUCTION

Cities and towns have emerged as centres of domestic and international investments where most of the commercial activities take place globally. A large number of papers have been written on urbanization and comparing various aspects cross-nationally (Brueckner (1990); Hofmann and Wan (2013)). However, definitions of what is urban vary greatly across countries, as confirmed by Cohen (2004).

Until we make our definition comparable to that of other countries, it is extraordinarily difficult to make cross-country comparisons of urbanization and their various consequences.

We hear quite often that India is a country of villages and only 31.2% of India is urban as of Census 2011, with the remaining 69% residing in rural areas. This is largely an artifact of the definition and is relative.

The Census of India defines settlements having the following characteristics as urban areas:

- (a) a population of five thousand or more;
- (b) a minimum density of 400 persons per sq km or 1,000 people per square mile; and
- (c) at least 75% of male main work force outside agriculture.

By contrast, other countries' definition of what is urban is much more liberal –it is just based on population. Only a few countries in the world – such as Japan (which stipulates that 60 per cent or more of the population (including their dependents) have to be engaged in manufacturing, trade or other urban type of business as a criterion for urbanization), Botswana (the criterion being 75 per cent of the economic activity is non-agricultural), Malaysia (which specifies 60 per cent of their population (aged 10 years and over) engaged in non-agricultural activities to be considered urban) and Zimbabwe (the criterion being more than 50 per cent of the employed persons to be engaged in non-agricultural occupations) -- define urbanization based on the pursuit of non- agricultural employment, which is restrictive.

OBJECTIVES

In this paper, I examine what would happen if India were to be a little more liberal –in its definition of urban areas, similar to that of other countries.

Further, I posit a behavioral model of the characteristics that predict the level of urbanization – the population, population density and non-agricultural employment, in line with existing studies (Alkema et al (2013)), using cross-country data from the World Bank, making an attempt to understand if the predicted levels of urbanization for countries, are different from their actual levels.

Using Census of India 2011 at the village level, I find that if both male and female 75% main non-agricultural employment were to be considered, along with criteria (a) and (b), India would be 33% urban. If 50% male main non-agricultural employment were considered, along with (a) and (b), 36% of India would be urban. But if male and female 75% non-agricultural employment were to be considered as the only criterion, 78% of India would be urban. If only the population criterion in (a) were to be considered alone, 47% of India will be urban, and if the population density criterion alone were considered, 74% of India will be urban.

While a behavioral model of urbanization takes into account GDP, importance given to agriculture as reflected in subsidies, rural-urban income ratio, commuting costs, and so forth, in this paper, I take a deterministic approach and estimate the urbanization across countries as a function of the criteria based on which most countries typically define their urban areas. I estimate urbanization across countries as dependent upon their non-agricultural employment, population and population density.

This paper is organized as follows. First, I review relevant literature. Then, I review the definitions of urbanization across representative countries of the world. Following this, I describe the methodology of the paper and data sources. The following section presents the interesting findings of the research, describing how urban India would be, if we were to use various assumptions. This section also contains the results of the econometric regressions cross-nationally, which are used to 'predict' the level of urbanization, given common characteristics which are used as criteria almost everywhere. A final section summarizes the paper and concludes with policy implications.

EXISTING STUDIES

There are a large number of studies which study the determinants of urbanization in a cross-national context since the 1980s (Firebaugh (1979); Kasarda and Crenshaw (1991); Brueckner (1990)). Many of them study the urbanization and urban primacy in many contexts, Pandey (1977) studies this in the context of India. More recently, Sridhar (2016) studies urbanization and its drivers in the Indian context. Moomaw and Shatter (1996) study urban primacy. The thrust in many papers is that while urbanization is a natural process, urban primacy, the extent to which a country's urban resources are concentrated in one or two large cities as opposed to more evenly spread, is much more directly affected by policies and politics (see Davis and Henderson (2003) and Henderson (2003)). Here in this paper, I argue that even urbanization is determined by policies and politics.

Seto et al (2011) reported a worldwide observed increase in urban land area of 58,000 km² from 1970 to 2000, with India, China, and Africa having experienced the highest rates of urban land expansion. However they found that much of the observed variation in urban expansion was not captured by either population, GDP, or other variables in the model, which suggested that contemporary urban expansion is related to a variety of factors difficult to observe at the global level, including international capital flows, the informal economy, land use policy, and generalized transport costs.

Table 1 summarizes how urbanization is defined by various countries of the world.

Table 1: Summary of Definitions of Urbanization, Selected Countries

Country	Definition of urbanization
Australia	Urban centres with 1,000 inhabitants or more.
Botswana	Agglomerations of 5,000 inhabitants or more where 75 per cent of the economic activity is non-agricultural.
Canada	Since the 1981 census, areas with 1,000 inhabitants or more and a population density of at least 400 inhabitants per square kilometre. The definition of urban has changed slightly between 1951 and 1981.
China	For the 2000 census, the urban population was composed of population in City Districts with an average population density of at least 1,500 persons per square kilometre, other population in suburban-district units and township-level units meeting criteria such as contiguous built-up area, being the location of the local government, or being a Street or having a Resident Committee. For the 2010 census, urban population included all urban residents meeting the criterion defined by the National Bureau of Statistics of China in 2008, i.e., the criterion used in the 2000 census plus residents living in villages or towns in outer urban and suburban areas that are directly connected to municipal infrastructure, and that receive public services from urban municipalities.
Germany	Communes ('kreisfreie Staedte' and 'Kreise') with population density equal or greater than 150 inhabitants per square kilometre.
Japan	Cities defined as 'shi'. In general, 'shi' refers to a municipality that satisfies the following conditions: (1) 50,000 inhabitants or more; (2) 60 per cent or more of the houses located in the main built-up areas; (3) 60 per cent or more of the population (including their dependents) engaged in manufacturing, trade or other urban type of business.
Malaysia	Gazetted areas with their adjoining built-up areas and with a combined population of 10,000 persons or more. Built-up areas were areas contiguous to a gazetted area and had at least 60 per cent of their population (aged 10 years and over) engaged in non-agricultural activities. Areas had also modern toilet facilities in their housing units.
UK	Settlements with 10,000 inhabitants or more. For the censuses up to 1971, administrative boundaries were used.
USA	Densely settled territory that meets minimum population density requirements and with 2,500 inhabitants or more. A change in the definition for the 2000 census from place-based to density-based affects the comparability of estimates before and after this date.
Zimbabwe	Places officially designated as urban, as well as places with 2,500 inhabitants or more whose population resides in a compact settlement pattern and where more than 50 per cent of the employed persons are engaged in non-agricultural occupations.

Source: World Urbanization Prospects (2014)

DISCUSSION OF URBANIZATION DEFINITIONS ACROSS COUNTRIES

As may be seen in Table 1, most advanced countries including the USA, UK, Canada, Australia, and Germany define their urban areas based on population or population density only. Asian countries including Japan, Malaysia, and African

countries such as Zimbabwe define urban based on non-agricultural pursuits. Even in these countries, the proportion of population in non-agricultural pursuits varies from 50%-60%.

India and China are two very comparable countries in terms of their trajectory of growth and the importance of urbanization post-reforms, which is 1978 for China and 1991 for India. Given the comparisons, a comparison of China's definition of urbanization is in order. As Brezzi et al (2012) point out, the current standards for designating cities and towns in China include total population, population density, economic scale, fiscal income, and infrastructure. According to these standards, a county can be designated a **county level city** if it is in line with the following requirements: *i)* when the population density is over 400 persons per km², the number in non-agricultural employment is more than 80 000, and the percentage in total employment is more than 30%; *ii)* when the population density is between 100 and 400 persons per km², the number of non-agricultural employment is more than 120 000 and the percentage in total employment is more than 25%. When a city at county level needs to upgrade itself into a **city at prefecture level**, it has to meet the following requirements: its total non-agricultural population needs to be more than 150 000 while the non-agricultural population in the resident place of government must be no less than 120 000, and the percentage of the tertiary industry in total GDP needs to be no less than 30%.

Hence, as we see, China defines its urban areas a lot more liberally than India or the advanced countries. It is important to understand the way in which urbanization is defined, given it has ramifications for the scale of economic growth, given few countries of the world have reached a per capita income of \$10,000 without reaching 60% urbanization, as Annez and Buckley (2009) point out.

METHODOLOGY

This paper is primarily based on rich and extensive secondary data available from the Census of India at the village level. There are two different data sets from the Census –the Primary Census Abstract -- the B tables (which report data on workers by industrial category) at the village level for all Indian states) and the Village directory, which were used to compute possible urbanization percentages, based on the current definition, with variations in the proportion of non-agricultural employment, and various combinations of population and population density, given the international evidence discussed.

We had discussions with the Karnataka Census directorate as to how one could merge the Census PCA and the village directories, since the village directory contained data on the geographical area of the place, and the PCA contains data on the population and agricultural employment by category, such that we could compute non-agricultural employment. As per suggestion from the Census, the village codes were matched across these two files. Once this was done for every state, then we had the population, population density (which was computed by dividing the population by the geographical area) and non-agricultural employment for every village, of which there are 6,40,947, in all the states of the country. Assuming that the urban areas were rightly designated, I confined my analysis to only the villages.

While the Census defines urban areas, based on a combination of population, density and non-agricultural employment, I considered various scenarios examining various assumptions regarding population engaged in non-agricultural pursuits and also considering what would happen if just one of the criteria were to be used for defining urban. Then, I relaxed the criteria/assumptions in various combinations, which can be used to define a place as urban, and examined the effect of definition on the extent of urbanization in various scenarios as described below.

- a. Scenario 1: First I applied the standard Census definition of urban to villages, assuming they do not satisfy the criteria (which is why they are classified as rural), along with population and population density criteria specified;
- b. Scenario 2: Instead of confining one to just male non-agricultural employment, I included **both male and female full time non-agricultural employment in the 75%**, along with population and population density criteria specified;
- c. Scenario 3: Another scenario in which I included both **male and female both full and part time non-agricultural employment in the 75%**, along with population and population density criteria specified;
- d. Scenario 4: **Only male part time and full time non-agricultural employment in 75%**, along with population and population density criteria specified;
- e. Scenario 5: Here I considered the criterion of **male full time employment in non-agricultural occupations and assumed this to be 50%** for a place to be considered urban, along with population and population density criteria specified (the same as the current Census definition, except that the 75% is replaced with 50%);
- f. Scenario 6: Here I considered the criterion of **male full and part time employment in non-agricultural occupations and assumed this to be 50%** for a place to be considered urban, along with population and population density criteria specified;
- g. Scenario 7: Next I considered the criterion of **male and female full time employment in non-agricultural occupations and assumed this to be 50%** for a place to be considered urban, along with population and population density criteria specified;
- h. Scenario 8: Next I considered the criterion of **male and female full and part time employment in non-agricultural occupations and assumed this to be 50%** for a place to be considered urban, along with population and population density criteria specified;

- i. Scenario 9: Here I considered the criterion of **male full time employment in non-agricultural occupations and assumed this to be 60%** for a place to be considered urban, along with population and population density criteria specified (the same as the current Census definition, except that the 75% is replaced with 60%);
- j. Scenario 10: Here I considered the criterion of **male full and part time employment in non-agricultural occupations and assumed this to be 60%** for a place to be considered urban, along with population and population density criteria specified;
- k. Scenario 11: Next I considered the criterion of **male and female full time employment in non-agricultural occupations and assumed this to be 60%** for a place to be considered urban, along with population and population density criteria specified;
- l. Scenario 12: Next I considered the criterion of **male and female full and part time employment in non-agricultural occupations and assumed this to be 60%** for a place to be considered urban, along with population and population density criteria specified;
- m. Scenario 13: Here I considered **only male plus female main non-agricultural employment of 75%** to be the sole criterion, and dropped the population and population density criteria;
- n. Scenario 14: Here I considered **only population of greater than or equal to 5000** as the sole criterion, and dropped the non-agricultural employment and population density criteria;
- o. Scenario 15: Here I considered **only population density of greater than or equal to 400 persons per sq km** as the sole criterion, and dropped the non-agricultural employment and population criteria;

As discussed, while (a) is being used by the census of India with a cut-off of 75%, several of the scenarios are much more liberal definitions of when a place should be considered urban. Indeed it should be mentioned that some scenarios which take into account women may be more restrictive than the current definition being used.

Once the above was done, I estimated the deterministic model of urbanization in which the proportion urban is dependent on criteria used by India.

The model used was

$$\text{Urbanization} = \alpha_0 + \alpha_1 \text{ population} + \alpha_2 \text{ population density} + \alpha_3 \text{ Non-agricultural employment} + e \tag{1}$$

This was done using a cross-country data set from the World Development Indicators (WDI) Online for 2016, where data were available for 186 countries.

The next section presents the findings from this research.

Findings: How urban would India be?

Using the procedure explained, we arrived at estimates of how urban India would be under each of the 15 assumptions highlighted in scenarios (a)-(o). Table 2 summarizes this for all India.

Table 2: Alternative Assumptions and India’s Urbanization

Assumption	India’s urbanization rate
Scenario 1 (the current census definition)	33%
Scenario 2	33%
Scenario 3	33%
Scenario 4	33%
Scenario 5	36%
Scenario 6	37%
Scenario 7	36%
Scenario 8	36%
Scenario 9	35%
Scenario 10	35%
Scenario 11	35%
Scenario 12	34%
Scenario 13	78%
Scenario 14	47%
Scenario 15	74%

Source: Census of India PCA, Village Directory and Author’s computations

Econometric Regressions

Equation (1) was estimated econometrically for the cross-country data set to understand which criteria predict urbanization best. First, Table 3 presents summary statistics for the cross-country data set.

Table 3: Descriptive Statistics, Cross-Country Sample

	N	Minimum	Maximum	Mean	Std. Deviation
Urban	214	8	100	59.83	24.225
Total Population	216	11,097	1,378,665,000	34,300,000	134,800,000
Population Density	215	0	20,204	443.72	2028.966

% Employment in Services	186	6	88	55.07	18.874
% Employment in Industry	186	2	54	19.09	8.643
% Non-agricultural employment	186	9	100	74.16	23.589
Valid N (listwise)	185				

On average, the countries in the data set are nearly 60% urban. Countries such as Singapore, the special administrative region of Macao and Hong Kong in China, Gibraltar, and Bermuda, among other countries, are 100% urban. At the other end of the spectrum, Caribbean countries such as Trinidad and Tobago are only 8% urban. In terms of population, China is the most populous, and the least populous country is Tuvalu in the Pacific.

The average population density (persons per sq km of land area) is greater than the 400 persons specified by India. Nonetheless, the country with the maximum population density is the Macao SAR in China, with the least one being Greenland, which doesn't even have 1 person per sq km of its land area.

On average, nearly three fourths of the 185 countries' population is in non-agricultural employment, of which more than half is in services, and about a fifth is in industry, on average. The country with all its employment in non-agricultural pursuits is Guam, and the country with the least proportion in non-agricultural employment is Burundi in the African sub-continent.

Table 4 summarizes the cross-country regression for the model indicated in equation (1). The table shows that clearly population density and non-agricultural employment have a positive and significant impact on urbanization, which is natural to expect. What is new about this result?

Table 4: Cross-Country Regression of Urbanization

Parameter	Coefficients	t
(Constant)	7.48	1.86
Total Population	0.00	-0.28
Population Density	0.00	2.08
Non-agricultural Employment	0.68	13.26
R-squared	0.52	
Model F value	64.23	
Number of observations	185	

We predicted the level of urbanization based on the above model, which we call as restrictive. Whenever the predicted level of urbanization for a country is higher than the actual level, we define the country as being restrictive in its definition. We find that of the countries for which we had all data, about 44% countries had restrictive definitions in the sense that their predicted level of urbanization was greater than the actual level of their reported urbanization. The country which is the most restrictive is Trinidad and Tobago in the West Indies, whose actual urbanization is only 8%, but the predicted urbanization for this country is 75%! The reverse is also true, there are many countries whose actual level of urbanization is much higher than their predicted level of urbanization. The most prominent among these are the Virgin Islands, whose actual urbanization is about 95%, but their predicted urbanization is only 69%. Table A1 in the appendix to this paper contains the actual and predicted urbanization levels for all the countries.

As demonstrated in the first part of this paper, India certainly belongs to the restrictive category, since its actual urbanization is 33%, but predicted urbanization is 43%. Clearly, as Sridhar (2011) indicates, there are several factors which could lead a country to making its definition more restrictive. India has been perceived to be a country of villages for a long time, hence policies have proliferated with regard to appeasing the rural voters, villages and farmers. There are a large number of programs which address their infrastructure and service needs such as Bharat Nirman (in irrigation, rural electrification and rural telecommunication connectivity), Pradhan Mantri Gram Sadak Yojana (for rural roads), rural housing (Indira Awas Yojana), water supply (the Rajiv Gandhi National Drinking Water Mission) and sanitation programs (the Swacchh Bharat Mission). Besides there is also the flagship Mahatma Gandhi National Rural Employment Guarantee scheme (MGNREGS).

If we take urban areas, there are also a large number of programs that address their infrastructure needs. First, apart from the smart cities mission for the chosen 100 cities, there is the Urban Infrastructure Development Scheme for Small and Medium Towns (UIDSSMT). The objectives of the UIDSSMT are to improve infrastructural facilities and help create durable public assets and quality oriented services in cities & towns, and to enhance public-private-partnership in infrastructural development. The components for assistance under the UIDSSMT include all urban infrastructure development projects such as water supply, roads, parking space, drainage, solid waste management, sewerage, urban renewal, preservation of water bodies and prevention of soil erosion.

Further, at the beginning of the decade in 2000-01, the Government added a new clause in the Income Tax Act of 1961, exempting interest income from bonds issued by local authorities. Funds raised from tax free municipal bonds are to be used only for capital investments in urban infrastructure for providing potable water supply, sewerage or sanitation, drainage, solid waste management, roads, bridges and flyovers; and urban transport (if this is a municipal function under the respective state legislation). Thus far, very few smaller cities (such as Nagpur and Vishakapatnam) have been able to utilize this.

Besides, regional centres for urban and environmental studies (RCUES) have been established with the purpose of meeting the training and research needs in the urban sectors in various states. These centres assist the state governments in disseminating information about the various policies and programs in the field of urban governance and also undertake

research activities and organize training courses, seminars, workshops and conference, on topics relating to local self government, urban development, urban management, water supply & sanitation, property tax, municipal audit and accounting, public housing, low cost sanitation and urban poverty alleviation programs.

It should be clear that the objectives of all programs, whether rural or urban, are to improve the infrastructure and service provision in those areas so that they can contribute to the country's overall productivity in a better way and to improve the lives of the residents in those areas. In this, there is no question that the urban areas are ahead of the rural areas, hence the rural areas of the country stand to benefit with better public services (despite the plethora of rural and urban programs) if they were to be reclassified as urban, since there are a large number of benefits associated with being eventually urban.

Table A1: Actual and Predicted Levels of Urbanization

Country	Pred. urbn	Actual urbn	Pred-Actual	Restrictive defn
Afghanistan	33.79	27.13	6.66	Yes
Albania	47.41	58.38	-10.97	
Algeria	68.24	71.30	-3.06	
Angola	72.92	44.82	28.10	Yes
Argentina	74.38	91.89	-17.51	
Armenia	51.85	62.56	-10.71	
Australia	73.93	89.55	-15.62	
Austria	72.75	66.03	6.72	Yes
Azerbaijan	50.96	54.90	-3.94	
Bahamas, The	73.22	82.95	-9.73	
Bahrain	77.93	88.84	-10.91	
Bangladesh	48.84	35.04	13.80	Yes
Barbados	74.91	31.42	43.49	Yes
Belarus	69.31	77.05	-7.74	
Belgium	75.54	97.90	-22.36	
Belize	64.77	43.85	20.92	Yes
Benin	46.21	44.40	1.81	Yes
Bhutan	36.55	39.38	-2.83	
Bolivia	55.38	68.91	-13.53	
Bosnia and H	63.48	39.94	23.54	Yes
Botswana	58.12	57.71	0.41	Yes
Brazil	65.00	85.93	-20.93	
Brunei Darus	75.53	77.51	-1.98	
Bulgaria	71.33	74.27	-2.94	
Burkina Faso	21.14	30.69	-9.55	
Burundi	14.02	12.36	1.66	Yes
Cabo Verde	57.02	66.19	-9.17	
Cambodia	46.40	20.95	25.45	Yes
Cameroon	33.40	54.94	-21.54	
Canada	74.31	82.01	-7.70	
Central Afri	26.34	40.33	-13.99	
Chad	23.45	22.62	0.83	Yes
Channel Isla	73.71	31.58	42.13	Yes
Chile	69.26	89.70	-20.44	
China	53.88	56.78	-2.90	
Colombia	66.48	76.71	-10.23	
Comoros	34.02	28.41	5.61	Yes
Congo, Dem.	31.06	43.02	-11.96	
Congo, Rep.	47.68	65.80	-18.12	
Costa Rica	67.82	77.68	-9.86	
Cote d'Ivoir	37.20	54.87	-17.67	
Croatia	69.57	59.28	10.29	Yes
Cuba	67.08	77.18	-10.10	
Cyprus	73.21	66.84	6.37	Yes
Czech Republ	74.23	72.98	1.25	Yes
Denmark	74.38	87.85	-13.47	
Djibouti	59.75	77.43	-17.68	
Dominican Re	66.97	79.84	-12.87	
Ecuador	58.59	63.98	-5.39	
Egypt, Arab	58.32	43.22	15.10	Yes
El Salvador	63.42	67.19	-3.77	
Equatorial G	63.38	40.10	23.28	Yes
Estonia	73.27	67.47	5.80	Yes
Ethiopia	27.35	19.92	7.43	Yes
Fiji	61.00	54.10	6.90	Yes

Finland	72.97	84.36	-11.39	
France	74.01	79.75	-5.74	
French Polyn	69.86	55.80	14.06	Yes
Gabon	64.62	87.37	-22.75	
Gambia, The	55.41	60.22	-4.81	
Georgia	45.09	53.83	-8.74	
Germany	75.04	75.51	-0.47	
Ghana	46.63	54.68	-8.05	
Greece	66.90	78.33	-11.43	
Guam	76.14	94.59	-18.45	
Guatemala	53.94	52.03	1.91	Yes
Guinea	28.16	37.65	-9.49	
Guinea-Bissa	34.64	50.09	-15.45	
Guyana	63.05	28.66	34.39	Yes
Haiti	44.13	59.79	-15.66	
Honduras	55.63	55.32	0.31	Yes
Hong Kong SA	86.23	100.00	-13.77	
Hungary	72.96	71.67	1.29	Yes
Iceland	72.96	94.23	-21.27	
India	42.64	33.14	9.50	Yes
Indonesia	53.50	54.47	-0.97	
Iran, Islami	63.82	73.88	-10.06	
Iraq	62.34	69.59	-7.25	
Ireland	72.50	63.54	8.96	Yes
Israel	75.65	92.21	-16.56	
Italy	73.54	69.12	4.42	Yes
Jamaica	63.85	55.03	8.82	Yes
Japan	73.53	93.93	-20.40	
Jordan	74.60	83.91	-9.31	
Kazakhstan	63.56	53.23	10.33	Yes
Kenya	33.26	26.06	7.20	Yes
Korea, Dem.	35.83	61.05	-25.22	
Korea, Rep.	73.01	82.59	-9.58	
Kuwait	74.31	98.36	-24.05	
Kyrgyz Repub	55.90	35.85	20.05	Yes
Lao PDR	21.86	39.65	-17.79	
Latvia	70.81	67.36	3.45	Yes
Lebanon	71.09	87.91	-16.82	
Lesotho	48.45	27.84	20.61	Yes
Liberia	44.72	50.10	-5.38	
Libya	61.67	78.75	-17.08	
Lithuania	69.80	66.51	3.29	Yes
Luxembourg	75.21	90.43	-15.22	
Macao SAR, C	106.11	100.00	6.11	Yes
Macedonia, F	64.80	57.20	7.60	Yes
Madagascar	25.05	35.74	-10.69	
Malawi	28.30	16.45	11.85	Yes
Malaysia	67.63	75.37	-7.74	
Maldives	72.52	46.54	25.98	Yes
Mali	36.85	40.68	-3.83	
Malta	77.06	95.53	-18.47	
Mauritania	48.21	60.45	-12.24	
Mauritius	71.70	39.55	32.15	Yes
Mexico	66.40	79.52	-13.12	
Moldova	56.32	45.09	11.23	Yes
Mongolia	56.55	72.82	-16.27	
Montenegro	70.63	64.22	6.41	Yes
Morocco	53.31	60.69	-7.38	
Mozambique	24.55	32.51	-7.96	
Myanmar	58.81	34.65	24.16	Yes
Namibia	55.45	47.63	7.82	Yes
Nepal	26.37	19.00	7.37	Yes
Netherlands	74.98	91.03	-16.05	
New Caledonia	73.80	70.74	3.06	Yes
New Zealand	71.74	86.32	-14.58	
Nicaragua	59.21	59.11	0.10	Yes
Niger	33.22	19.01	14.21	Yes
Nigeria	56.57	48.60	7.97	Yes

Norway	74.33	80.73	-6.40	
Oman	72.42	78.09	-5.67	
Pakistan	46.51	39.22	7.29	Yes
Panama	65.71	66.90	-1.19	
Papua New Gu	29.08	13.04	16.04	Yes
Paraguay	62.30	59.92	2.38	Yes
Peru	58.84	78.92	-20.08	
Philippines	56.70	44.29	12.41	Yes
Poland	68.34	60.53	7.81	Yes
Portugal	70.43	64.02	6.41	Yes
Puerto Rico	75.10	93.57	-18.47	
Qatar	75.26	99.32	-24.06	
Romania	58.07	54.75	3.32	Yes
Russian Fede	70.93	74.10	-3.17	
Rwanda	25.13	29.78	-4.65	
Samoa	72.31	18.96	53.35	Yes
Sao Tome and	60.62	65.65	-5.03	
Saudi Arabia	71.67	83.33	-11.66	
Senegal	40.37	44.07	-3.70	
Serbia	62.53	55.67	6.86	Yes
Sierra Leone	29.35	40.32	-10.97	
Singapore	87.47	100.00	-12.53	
Slovak Repub	73.73	53.47	20.26	Yes
Slovenia	69.82	49.63	20.19	Yes
Solomon Isla	43.18	22.78	20.40	Yes
Somalia	26.62	40.03	-13.41	
South Africa	71.60	65.30	6.30	Yes
Spain	73.12	79.80	-6.68	
Sri Lanka	57.28	18.41	38.87	Yes
St. Lucia	66.08	18.54	47.54	Yes
St. Vincent	60.87	50.90	9.97	Yes
Sudan	53.21	34.01	19.20	Yes
Suriname	73.44	66.02	7.42	Yes
Swaziland	60.97	21.32	39.65	Yes
Sweden	74.54	85.96	-11.42	
Switzerland	73.66	73.99	-0.33	
Syrian Arab	63.36	58.06	5.30	Yes
Tajikistan	36.67	26.89	9.78	Yes
Tanzania	29.79	32.32	-2.53	
Thailand	52.15	51.54	0.61	Yes
Timor-Leste	40.96	33.40	7.56	Yes
Togo	33.10	40.46	-7.36	
Tonga	53.22	23.80	29.42	Yes
Trinidad and	73.35	8.35	65.00	Yes
Tunisia	67.84	67.05	0.79	Yes
Turkey	62.13	73.89	-11.76	
Turkmenistan	63.39	50.40	12.99	Yes
Uganda	26.56	16.44	10.12	Yes
Ukraine	64.90	69.92	-5.02	
United Arab	73.51	85.80	-12.29	
United Kingdom	75.26	82.84	-7.58	
United State	74.11	81.79	-7.68	
Uruguay	69.83	95.46	-25.63	
Uzbekistan	55.70	36.48	19.22	Yes
Vanuatu	33.82	26.44	7.38	Yes
Venezuela, R	67.88	89.04	-21.16	
Vietnam	46.81	34.24	12.57	Yes
Virgin Islan	68.68	95.46	-26.78	
West Bank an	71.14	75.48	-4.34	
Yemen, Rep.	56.29	35.19	21.10	Yes
Zambia	38.30	41.38	-3.08	
Zimbabwe	29.92	32.28	-2.36	
Average			0.00	44.32%
Maximum			65.00	
Minimum			-26.78	
Std.Dev			16.14	

ACKNOWLEDGEMENTS

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REFERENCES

- Alkema, Leontine, Gavin W. Jones and Cynthia U. R. Lai (2013) Levels of urbanization in the world's countries: testing consistency of estimates based on national definitions, *Journal of Population Research*, Vol. 30, No. 4 (2013), pp. 291-304.
- Brezzi, M., Piacentini, M., Rosina, K., & Sanchez-Serra, D. (2012). Redefining urban areas in OECD countries. *Redefining" Urban"*, 19-58.
- Brueckner, J. K. (1990). Analyzing third world urbanization: A model with empirical evidence. *Economic Development and Cultural Change*, 38(3), 587-610.
- Cohen, B. (2004). Urban growth in developing countries: a review of current trends and a caution regarding existing forecasts. *World development*, 32(1), 23-51.
- Davis, J. C., & Henderson, J. V. (2003). Evidence on the political economy of the urbanization process. *Journal of urban economics*, 53(1), 98-125.
- Firebaugh, Glenn (1979) Structural Determinants of Urbanization in Asia and Latin America, 1950- 1970, *American Sociological Review*, Vol. 44, No. 2 (Apr., 1979), pp. 199-215.
- Henderson, V. (2003). The urbanization process and economic growth: The so-what question. *Journal of Economic growth*, 8(1), 47-71.
- Hofmann, Anett and Guanghua Wan (2013) Determinants of urbanization. ADB Economics Working Paper Series No. 355 | July 2013.
- Kasarda, John D. and Edward M. Crenshaw (1991) Third World Urbanization: Dimensions, Theories, and Determinants, *Annual Review of Sociology*, Vol. 17 (1991), pp. 467-501.
- Moomaw, R. L., & Shatter, A. M. (1996). Urbanization and economic development: a bias toward large cities? *Journal of Urban Economics*, 40(1), 13-37.
- Pandey, S.M. (1977) Nature and Determinants of Urbanization in a Developing Economy: The Case of India, *Economic Development and Cultural Change*, Vol. 25, No. 2 (Jan., 1977), pp. 265-278.
- Seto, K. C., Fragkias, M., Güneralp, B., & Reilly, M. K. (2011). A meta-analysis of global urban land expansion. *PloS one*, 6(8), e23777.
- Sridhar, Kala Seetharam. What's in a name: Urban or rural, *The Economic Times*, May 20, 2011.
- Un, D. E. S. A. (2015). World urbanization prospects: The 2014 revision. *United Nations Department of Economics and Social Affairs, Population Division: New York, NY, USA*.

1698 URBAN AND RURAL: INTERROGATING THE BINARIES - WATERSCAPE OF UDAIPUR, RAJASTHAN, INDIA

ABSTRACT

In studying urban and rural spaces there is a known and familiar narrative which dominates the development discourse where the dichotomy between them becomes glaring. The binaries are created by juxtaposing one against the other, the core versus the periphery. But the question arises that are these binaries the only way to examine the rural and urban and the flows as well linkages between them? Can we problematize this dichotomous understanding and re-examine the underlying assumptions? This paper attempts to answer these questions by examining the case of Udaipur in western India where water transfer schemes are operating to quench the thirst of expanding urban space. The tentacles to fetch water have stretched beyond the city boundaries to explore and meet the urban demands. This paper illustrates that these diversion schemes present a complex relationship between the rural, urban and peri-urban where these spaces are not discrete but have overlapping boundaries, not merely geographical but also in terms of equity and access. Instead of looking at these two spaces as distinct we focus on the interlinkages, connections, and relationships between them. In doing so, the question arises - what is gained? Yes, it does gain when we adjust the lens to examine such terrains. In doing so we encounter this newly produced socio spatiality through the lens of water transfer - a waterscape - socio natural assemblage. The ever- evolving interactions, and linkages between the urban, peri urban and rural become crucial as they open the possibilities where instead of seeing them as discrete spaces they can be seen as a continuum of flows and transformations. Usually most of the studies explore either of them, overlooking the potential in such implicit and explicit relationships as well as ruptures which evolve due to such configurations connecting the two spaces. Spatial configurations of the urban and rural boundaries collapse as the area witnesses transformed socionatural relationships which evolve due to such dependence, exchange and flows in a newly configured waterscape. This paper argues that conventional spatial categories and units extensively used for planning processes are fragmentary in especially in case of hydraulic flows and infrastructure like water transfer schemes which divert flows of water remaking the entire landscape and thus producing a new spatiality. In fact the rural, urban and peri- urban are reconfigured (in a waterscape) through resources such as water connecting these spaces /zones/ corridors which are continuously transforming - it is not stagnant - making it dynamic. The movement of resources (read here as water) in these spaces are rapid making them porous and fluid as compared to other spatial configurations which are already established and fragmentary. Hence in these new configurations and reconfigurations of a waterscape lies the possibilities of change and regional integration.

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SS14.3. Revisiting rural-urban dichotomy for integrated regional development

1025 DETERMINANTS OF RURAL TO URBAN MIGRATION IN LARGE AGGLOMERATIONS IN INDIA: AN EMPIRICAL ANALYSIS

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ABSTRACT

The paper investigates the relevant determinants of rural to urban migration in large agglomerations in India. The OLS regression results based on data from 51 cities, show that city-wise employment and unemployment situation (measured by male self employed, not in labour force male, male casual labourer) have a negative impact on city level rural to urban migration. The level of poverty (measured by poverty head count ratio) and inequality level of a city also has a negative impact. However, infrastructure condition (availability of total number of electricity connection) of a city has a positive impact on city-wise rural to urban migration. Economic conditions also matters higher level of rural to urban migration. Finally, it suggests that cities need to equip themselves with better infrastructural facilities along with higher job opportunities to encourage urbanization through rural-urban migration for higher and sustainable economic growth in India.

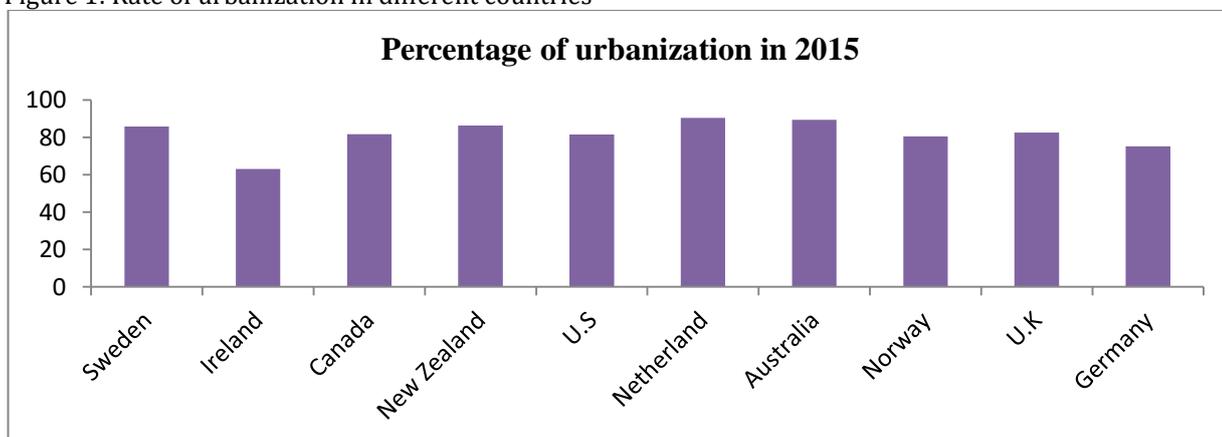
Key Words: Urbanization, rural to urban migration, urban economic growth, India.

JEL Classification: R12, O10, O15

I. INTRODUCTION

In the wake of the rapid urbanization in recent years, Indian economy is witnessing a transformation from an agro-based rural economy to an urbanized modern economy. After independence, urbanization rate has increased continuously; in urban population in India was 28.53 percent in 2001 which increased to 31.16 per cent in 2011. The growth of urbanization has led to higher economic growth (Tripathi, 2013; Tripathi and Mahey, forthcoming) i.e., urbanization is the engine of economic growth in India. Currently 31.16% urban population is contributing about 63% of India’s GDP (GOI, 2011). However, the percentage of population residing in urban areas in developed countries is far greater than in India. As shown in Figure 1, per the data given by World Urbanization Prospects (WUP) (UN, 2014) 85.8 % (or 75.3 % or 63% or 81% or 90.5 % or 89.4 % or 80.5 % or 82.6 %) urban population live in Sweden (or Germany or Ireland or Canada or New Zealand or U.S.A. or Netherlands or Australia or Norway or U.K.) as of 2015. This clearly indicates that India's urbanization rate is lower than in the developed countries.⁵¹³ It is also predicted that India’s future development process ought to be lead by high urbanization rate.

Figure 1: Rate of urbanization in different countries

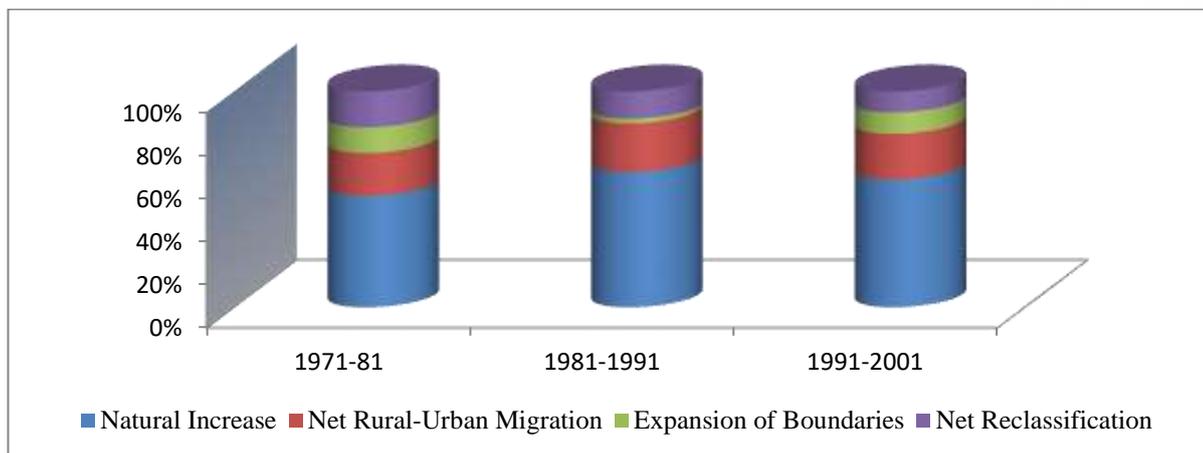


Source: WUP (2014)

The urban growth occurs due to the natural growth of population, expansion of city boundaries, net rural to urban migration, and reclassification of rural areas into urban. Figure 2 shows that net migration from rural to urban areas contributed to about 21 per cent to the increase in urban population in the 1990s, a little smaller than its contribution of 22.6 per cent in the 1980s. Natural increase has been by far the largest source of increase in urban population (62.7 per cent in the 1980s and 59.2 per cent in the 1990s).

Figure 2: Sources of Increase in Urban Population

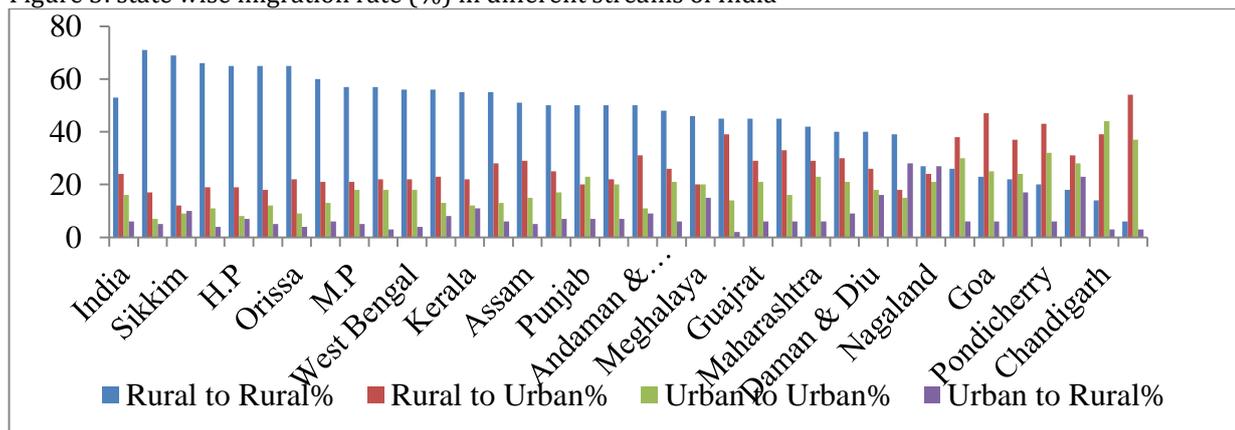
⁵¹³ Though different countries follow different definitions to measure urbanization still we can say India’s urbanization rate is much lower than other developed countries.



Source: GOI (2011)

Migration is the transfer of population from one area to another. Labour migration from agricultural sector to non-agriculture sector in 2007-08 was 66% in which 63% of migrants were men in India. The migration of male population is greater than female. Migration leads to higher growth in urban population, but the migration rate has been very low in India. To increase the growth rate of urbanization, it is essential to promote rural to urban migration. Migration depends upon many factors like job opportunities in urban areas, urban poverty, and higher urban wage rate. Thus, migration positively impacts, the growth of economy, albeit indirectly. Rural to urban migration leads to the growth of economy through the growth of urbanization. Migration could be voluntary or coercive. Voluntary migration occurs due to the promise of job opportunities, education, better medical care, securing family links, industrial job, higher income etc. in the host city. On the other hand, forced migration occurs due to drought, political war, poor medical care, loss of wealth, forced labour, etc.

Figure 3: state wise migration rate (%) in different streams of India

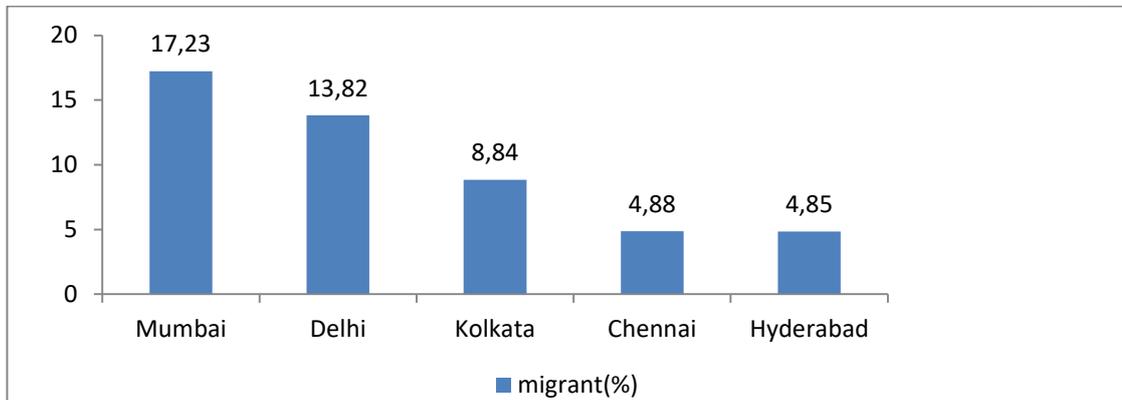


Source of data: NSSO 64th round National Sample Survey of India

The 64th round of Indian National Sample Survey Office (NSSO) on “Employment & Unemployment and Migration Particulars” during July 7 to June 8 2007-08, covered a sample of 1,25,578 households and 5,72,254 persons. The survey, taking into account the entire mobility including within - and between states, estimates the mobility of the Indian population as about 30 percent. However, within this 30% the share of migrants within the state was 85% and across state, 15%. In other words, migration was by and large rural to rural. Figure 3 provides figure of state-wise migration between rural to rural, rural to urban, urban to urban, and urban to rural. As can be seen from the table, in internal migration, the maximum percentage of migration was rural to rural. Rural to urban migration was the highest in Delhi at 54%. In the rural to urban migration stream, Sikkim had the lowest percentage value of 12%. The percentage of urban to urban migration was quite in Chandigarh at 44%. The percentage value of urban to urban migration was quite for Manipur also. The figure shows that the percentage of rural to urban migration is less than that of rural to rural migration in India. On the other hand, developed or economically advanced Indian states have a higher level of rural to urban migration rate than the less developed states. It becomes clear from the above analysis that in order to have higher development, rural-urban migration needs to be promoted.

Given the present focus on smart cities/million plus cities, it is necessary to consider India-specific data on migration, particularly rural-urban migration arrive at any meaningful conclusion. The diagram below (Figure 4) shows the trends of migration in top five million plus cities on the basis of census of India in 2001 on a time-scale of ten years and more than 10 years. Mumbai reported 17.32% its population as migrants, which is quite higher than in other million plus cities. The second-ranking city, Delhi, reported 13.82% as its migration of population.

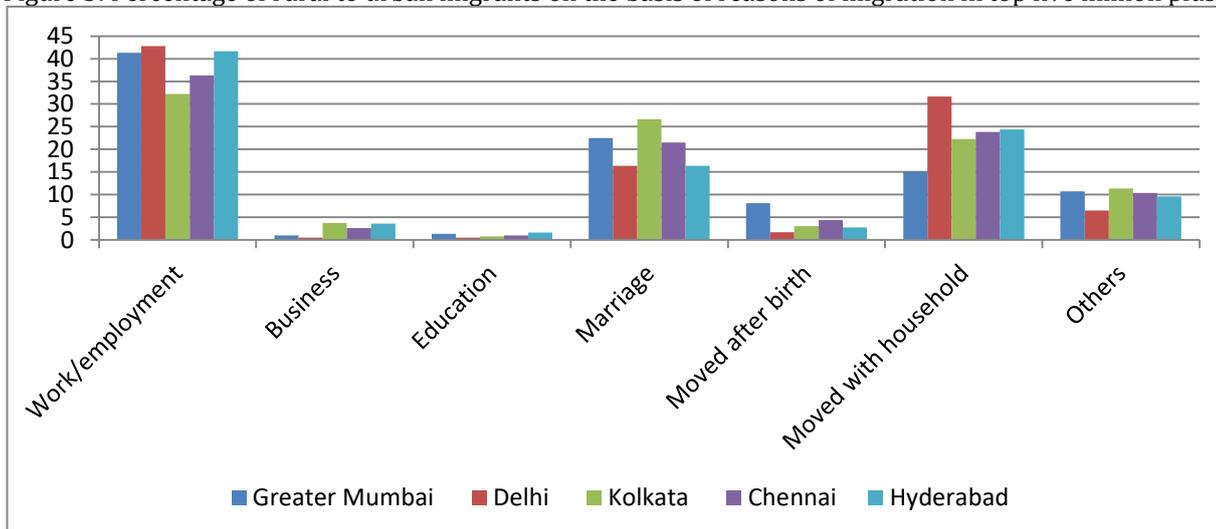
Figure 4: Percentage of rural to urban migration in top five (as per population size) million plus cities



Source: Census of India 2001

The Census data also provides enough clues about the reasons for rural to urban migration in these cities. Figure 5 shows the percentage of rural to urban migrants on the basis of reasons of migration in top five million plus cities with the time duration of ten years and more than ten years. The figure indicates that the main reasons behind the migration of population are work and employment. A large part of migrants move from backward to modern areas due to lure of job opportunities. It is observed that the largest rural-urban migration was to Mumbai (28,47,510 persons), of which 41% people cited work and employment as reasons for migration; 22% people migrated due to marriage in which the percentage of women was higher than that of men. Migration to Delhi, Chennai and Hyderabad also show the same pattern; higher rural to urban migration was dominated by work and employment reasons in these cities. Marriage and consequent relocation of households is also cited as causes for rural to urban migration.

Figure 5: Percentage of rural to urban migrants on the basis of reasons of migration in top five million plus cities



Source: Census of India (2001)

Recently, government of India has launched several policies and programmes to promote urbanisation-led development in India as urban areas have traditionally contributed higher level of GDP than rural areas. Among the various policies, 100 Smart Cities Programme, AMRUT (Atal Mission for Rejuvenation and Urban Transformation), JNNURM (Jawaharlal Nehru National Urban Renewal Mission), UIDSSMT (Urban Infrastructure Development Scheme for Small and Medium Towns), NERUDP (North Eastern Region Urban Development Programme), NUIS (National Urban Information System), Capacity Building for Urban Local Bodies, Lump Sum Provision Scheme for the benefit of North East Region (NER) including Sikkim, Brihan Mumbai Storm Water Drainage (BRIMSTOWAD) project at Mumbai, PPP (Public Private Partnership), Clean India Mission are the major programme and policies introduced by governments in recent years to promote urbanization in India.

The above discussion clearly indicates that India is experiencing a higher level of urbanization and its contribution to national income is also high. This in turn indicates that Indian economy is going through a transformation from an agricultural based rural economy to an industry and service lead urban economy. In fact, recent years government has initiated and implemented various urban related policies and programs to promote urbanization in India. However, the country needs still better policies in the days to come to promote planned urbanization in India and to absorb the maximum economic potential that urban areas can provide for sustainable economic growth in India. Given the importance of knowing the factors which contribute to rural to urban migration in India, it is imperative to systematically study the determinants of rural to urban migration in India. It is only fair to that rural to urban migration will lead to future rapid urbanization in India which in turn will lead to higher and sustainable economic growth. It is hoped that the findings of this paper will help policy makers to formulate effective policies in India to promote urbanization through rural to urban migration. It is also surmised from a review of existing studies on this topic is that this is first study in India which considers city specific factors to identify the reasons behind city level rural to urban migration.

In this study, urban agglomeration is defined as a geographic concentration of urban population and related economic activities. This implies that urban agglomeration includes, but is not equal to, urbanization. Here, cities with 750,000 or more inhabitants as of 2015 are defined as large urban agglomerations. There are several reasons behind the selection of such large agglomerations as the units of analysis. First, World Urbanization Prospects provide updated data for the cities with 750,000 or more inhabitants for the years 1950 to 2025 with five year intervals, whereas Indian census data only provides data up to the 2001 census (as latest 2011 census data is yet to be published) with a 10 year interval. Second, because of the unavailability of city specific data for a large number of variables used in this study (e.g. city income data), city district (where the sample city is located) is used as a proxy of a city. Larger cities are a good proxy for a city district as they cover a larger portion of a district than the smaller cities. Third, as India's urbanization (i.e. share of urban population) is mainly centred around Class I cities, these cities by definition belong to Class I cities. On the other hand, urban economic growth is defined by growth rate of city domestic income (i.e. non - primary district domestic product [DDP])

II. BRIEF REVIEW OF LITERATURES

To understand the movement of people occurring within the country, it is important to study the migration pattern initially. Arzaghi and Rupasingha (2013) argued that the migration of rural to urban occurs due to diversification. The migrants get opportunities to migrate due to correlation of income between origin and destination as measure of diversification, as in the case of United States. Iversen (2006) argues that the rural to urban migration is a dynamic migration model. The reasons of migration are social network, multipliers, spillovers, and caste affinities and the job opportunities in urban areas. According to McCatty (2004) who examined the need of rural to urban migration in developing countries, migration takes place in these countries due to both the push-pull migration forces these forces are of two types -- voluntary forces and involuntary forces. Voluntary forces are job opportunities; education, medical facilities, high per capita income, transport facilities, high living standard etc., and the involuntary forces are political disputes, strike, fighting with neighbors, lack of transport facility, illiteracy, natural disaster, bullying etc.

In the context of India, Mitra and Murayama (2009) found that intra state migration is much higher in magnitude than inter-state migration rate in India. Male and female migration rates are closely inter connected irrespective of whether they migrate from rural areas within the states and outside the states. The social and cultural diversity in India stands as a major hindrance to population mobility. Bhagat (2014) argued that migrants with low education and skills, given with the seasonal and temporary nature of their employment, are more vulnerable and subject to various kinds of exclusions in urban areas. Migration is treated more as an issue of governance rather than one of development in developing countries like India. Akram (2015) analyzed the push factors of rural to urban labour migration in India. His empirical analysis shows that increase in per capita Net State Domestic Product tends to decrease the number of out-migrants from the rural areas of that state whereas increase in the proportion of population living below poverty line, higher proportion of Scheduled Castes in the population and illiteracy rate in the rural area of the state, etc. tend to decrease rural to urban labour migration from that state to other states. Agasty and Patra (2013) who examined the determinants of rural to urban migration in the Indian states of Orissa states that there are two types of variables that influence the migration rural to urban: micro variables and macro variables. These are the two variables that influence people to move from one place to another. Micro variables are individual variables and macro variables refer to the factors that influence the whole population of a particular place or area to move.

However, there only a few studies that have tried to investigate the economic factors that contributes to rural to urban migration in India. Therefore, it is hoped that the present study will be useful not only to measure the effect of migration on urbanization but also its effect on economic growth and development.

III EMPIRICAL FRAMEWORK AND RESULTS OF THE ESTIMATION OF DETERMINANTS

To empirically investigate the determinants of rural to urban migration in large agglomeration in India, the following OLS regression model is used for estimation.

$$\text{Migrant} = \alpha_0 + \sum_{i=1}^9 \alpha_i X_i + \epsilon \dots \dots \dots (1)$$

Here, the dependent variable 'Migrant' in equation 1 has two different forms; first it is measured by percentage of rural to urban migration in large agglomeration in India and secondly, it is measured in terms of the total number of rural to urban migrants. The X_is are independent variables i.e. city wise total self employed male, city-wise self employed female, level of inequality, railway station- distance from the city, total number of electricity connections, not in male labour force, city-wise total number of universities, casual worker male, city output, city-wise poverty headcount ratio, city-wise poverty gap ratio, city-wise total no. of medical facilities, city wise average rain fall, city-wise total receipts and city-wise total number of colleges.

Appendix table AI lists out the all the cities which are considered for the study. Summarized in Appendix table AII are the descriptions, measurements, and data sources of all of the variables used in estimation of OLS regression of Equation 1. Table 1 explains the means, standard deviations, minimum, maximum, and coefficient of variation (CV) values for the variables used for the regression analysis. Most importantly, the CV aims to describe the dispersion of the variables in a way that does not depend on the variable's measurement unit. The higher values of CV for railway station distance from the city in and total number of electricity connections indicate a greater dispersion in these variables. On the other hand, city output, city wise average rain fall and city wise total number of self employed male show a lower dispersion in these variables. On the other hand, Table 2 presents the row correlation coefficients.

Table 1: Description of data used in the regression equation

Variables	Mean	Std. Dev.	Min.	Max.	C.V.
Percentage of rural to urban migration in 2001 (prum)	18.6	12.2	2.7	47.4	65.7
Total number of rural to urban migrants (trum) (in thousands)	383.1	794.9	25.7	4651.5	0.21
City wise total Self employed male in 2004-05 (selfm)	328.4	94.6	188.8	615.8	28.8
City-wise self employed female in 2004-05 (selff)	91.0	71.8	7.4	348.2	79.0
Level of inequality in 2004-05 (Gini)	0.3	0.1	0.1	0.6	28.7
Railway Station distance from the city in 2001 (raildist)	0.4	1.4	0.0	8.0	383.6
Total no. of electricity connection in 2001 (elect) (in thousands)	461.4	1222.2	0.0	8560.3	0.26
Not in male labour force in 2004-05 (nlfm)	215.1	64.2	72.3	439.2	29.8
City-wise total number of universities in 2001 (univ)	1.1	1.2	0.0	5.0	105.0
Casual worker male in 2004-05 (casualm)	104.3	60.4	9.3	300.9	57.9
City output in 2001 (ddp)	16597.8	7614.6	797.2	38412.6	45.9
City-wise poverty headcount ration in 2004-05 (fgt0)	12.2	12.5	0.2	57.8	102.4
City-wise poverty headcount ration in 2004-05 (fgt1)	2.3	3.1	0.0	16.1	132.7
City-wise total no. of medical facilities in 2001 (medi)	187.4	213.8	2.0	781.0	114.1
City wise average rain fall in 2001 (rain)	1075.3	570.2	266.0	3053.0	53.0
City-wise total receipt through taxes and revenue derived from municipal properties (trmp) (in lakh) in 2001	14.9	53.2	0.0	380	0.004
City-wise total no. of colleges (ctc) in 2001	41.5	49.0	1.0	195.0	118.2

Source: Calculated by authors' by using 51 observations

Table 2: Correlation Coefficient of Determinants of rural to urban migration in large cities in India

	prum	trum	selfm	selff	gini	raildist	elect	nlfm	univ	casualm	ddp	fgt0	fgt1	medi	rain	trmp	ctc
prum	1																
trum	0.39	1															
selfm	-0.16	0.09	1														
selff	0.33	0.16	0.54	1													
gini	-0.23	0.08	-0.20	-0.09	1												
raildist	0.03	0.03	-0.04	-0.22	-0.04	1											
elect	0.15	0.05	-0.16	-0.21	-0.16	-0.07	1										
nlfm	-0.03	0.02	-0.46	-0.34	0.16	0.37	0.24	1									
univ	-0.14	0.15	-0.05	-0.04	-0.06	-0.23	0.11	-0.11	1								
casualm	0.09	0.20	-0.26	0.03	-0.14	-0.19	0.22	-0.17	0.24	1							
ddp	0.04	0.03	-0.28	-0.22	0.01	-0.01	-0.07	-0.17	-0.12	-0.03	1						
fgt0	-0.11	0.08	-0.10	-0.08	0.17	-0.06	-0.07	0.12	-0.13	0.28	-0.18	1					
fgt1	-0.05	0.08	-0.18	-0.09	0.15	0.06	-0.05	0.20	-0.15	0.30	-0.12	0.93	1				
medi	0.06	0.03	-0.17	-0.23	-0.11	0.29	0.10	0.04	0.02	0.04	0.22	-0.08	0.01	1			
rain	0.03	0.19	-0.09	-0.19	0.10	0.06	-0.03	0.03	-0.03	-0.21	-0.03	-0.15	0.14	0.03	1		
trmp	0.08	0.03	0.08	-0.08	-0.16	-0.07	0.27	-0.19	0.13	0.06	-0.01	-0.06	0.08	0.32	0.26	1	
ctc	-0.03	0.08	-0.11	-0.19	-0.13	-0.11	0.61	0.06	0.17	0.19	0.11	0.02	0.04	0.48	0.04	0.50	1

Note: See Table 1 for variable definitions. The correlation coefficients are based on 51 observations.

Source: Authors'.

Table 3: Determinants of rural to urban migration in large cities in India

Independent variables	Dependent variable:				
	Percentage of Rural to Urban Migration				Total Migrants from Rural to Urban
	(1)	(2)	(3)	(4)	(5)
City wise total no. of self employed male	-0.081** (0.031)	-0.092*** (0.027)	-0.094*** (0.027)		-0.006*** (0.002)
City-wise self employed female	0.117** (0.048)	0.123*** (0.045)	0.123*** (0.044)		0.006* (0.004)
City-wise level of inequality	-23.74 (19.69)	-31.714* (16.61)	-30.98** (14.39)		-0.447 (1.59)
Road distance to nearest railway station from a city	0.817 (0.847)	1.761* (1.02)	2.091** (0.782)		0.192 (0.109)
City-wise total no. of electricity connection	6.48*** (2.23)	0.276*** (0.081)	0.279*** (0.087)	6.01*** (1.48)	0.005 (0.007)
City-wise total no. of persons not in labour force	-0.005 (0.032)	-0.051* (0.028)	-0.054* (0.029)		-0.003 (0.003)
City-wise total number of universities	-0.855 (1.42)	-1.387 (1.162)		-1.93 (1.621)	

City-wise total no. of casual male worker	-0.033 (0.035)	-0.036 (0.030)	-0.048* (0.028)		
City wise per capita income	-6.284* (3.61)	-0.189 (1.908)			-0.054 (0.283)
City-wise poverty headcount ration	-0.024 (0.265)	0.032 (0.134)	0.051 (0.122)	-0.549** (0.263)	0.026 (0.046)
City-wise squared poverty headcount ration	0.216 (1.35)			2.12 (1.35)	-0.077 (0.194)
City-wise total no. of medical facilities	0.006 (0.008)	0.001 (0.008)			
City wise average rain fall	0.0004 (0.003)	0.002 (0.002)			
City-wise total receipt through taxes and revenue derived from municipal properties	0.056 (0.018)			0.028*** (0.009)	
City-wise total number of colleges	-0.069* (0.039)			-0.122*** (0.037)	
Intercept	56.39 (52.67)	61.405** (27.289)	62.96*** (14.38)	45.83*** (16.45)	14.59** (3.64)
No. of observations	51	51	51	51	51
R square	0.51	0.46	0.44	0.19	0.18
Adjusted R ²	0.28	0.29	0.33	0.08	0.003
F Statistics	4.59***	7.42***	9.65***	7.79***	1.74
Mean VIF	3.62	1.57	1.59	4.07	3.47

Note: Figures in parentheses represent robust standard errors. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. Source: Estimated using equation 1.

Table 3 presents the estimated regression results from Equation (1). Regression 1 reports the full model where all the independent variables for OLS estimation are considered. On the other hand, regression models 2-4 represent the parsimonious model by excluding the explanatory variables that did not show statistically significant results or match with the expected sign conditions. Regression models 1-5 consider the robust standard errors (to control for heteroskedasticity). The significant values of F statistics for Regressions 1-4 indicate that the overall model is statistically significant. The higher values of R² indicate that Regression 1 explains a good percentage of total variation in the dependent variable. The study has also calculated the adjusted R², as it adjusts for the number of explanatory terms in a model, i.e., it incorporates the model's degrees of freedom. The multicollinearity problem does not seem to be troublesome, as the mean VIF values do not exceed 10 for Regression model 1-5.

Regression 1 shows that city-wise total self employed male has a negative impact on the percentage of rural to urban migration. In particular, a 100 percent increase of city-wise total self employed males decreases rural to urban migration by 8 percentage points. However, percentage of city-wise total self employed female has a positive impact on the percentage of rural to urban migration. This indicates that cities having higher percentage self employed female attract higher rural to urban migration whereas cities having higher percentage self employed male discourage to urban migration. This is may be case that if women have the chance to make them self employed in the city; more rural women from rural households will migrate to urban areas to earn more provided that their male partners also find jobs in the same city. The possible increases in income of the households make rural to urban migration easier and also attractive. On the other hand, city-wise availability of higher number of electricity connections has a positive impact on rural to urban migration. The estimated result show that a 10 percent increase of total number of electricity connection in the host city increases rural to urban migration by about 65 percent. It is important to indicate here that availability of electricity connections stand as a proxy of availability of infrastructure facility. The result indicates that infrastructure facility has a positive impact on rural to urban migration. Finally, regression 1 shows that city wise per capita income also has a negative impact on percentage of rural to urban migration. This means that if a city has higher per capita income (i.e., richer city), it discourages rural to urban migration. It therefore indicates that a richer city may be more expensive for a person to migrate from rural to urban areas. City-wise total number of colleges also has a negative impact on percentage of rural to urban migration. This indicates that the educational facilities do not attract higher percentage of rural to urban migration. The other independent variables i.e., city-wise level of inequality, road distance from a city to nearest railway station, poverty ratios, medical facilities, number of universities, average rain fall, and total receipt through taxes and revenue derived from municipal properties do not show any statistically significant effect on the percentage of rural to urban migration.

Regression 2 shows very important results; it shows that level of inequality in a city has a negative impact on the percentage of rural to urban migration. On the other hand, road distance from the nearest railway station to a city exerts a positive impact. In particular, a one percent increase in level of inequality (or road distance from nearest railway station to a city) decreases (or increases) 32 (or 2) percentage of the rural to urban migration. The result indicates that if a city has higher level of inequality, it discourages rural to urban migration. On the other hand, if a city has higher road distance from the nearest railway station, naturally indicates the lower economic potential and therefore it encourages rural to urban migration. This means that cities having lower economic potential attract higher rural to urban migration. Similarly, cities having lower percentage (number) of the higher number of persons those are not in labour force attract

lower percentage of rural to urban migrations. This shows that employment potential in the host city is one of the main factors behind rural to urban migration. People moves from rural areas with the expectation of getting absorbed in the urban areas. City wise total number of self employed male or females, and total number of electricity connections of the host city has a similar impact on percentage of rural to urban migration as explained in regression 1. However, city-wise total number of universities, number of male casual worker, poverty head count ratio, medical facilities, and average rain fall again do not show any statistically significant effect on percentage of rural to urban migration. Most importantly, city wise per capita income lost its significant level in regression 2 compared to regression 1.

Regression 3 shows that city-wise total number of male casual worker has a negative impact on rural to urban migration. A 100 percent increase in total number of casual workers decreases rural to urban migration by about 5 percent. This clearly indicates that cities need to provide formal regular jobs than making the migrants casual workers to attract higher level of rural to urban migration. City-wise total number of self employed males or females, level of inequality, road distance from nearest railway station to a city, availability of electricity connections and number of persons not in labour force show a similar impact on percentage of rural to urban migration. However, city-wise poverty situation does not have any significant impact on rural to urban migration.

Regression 4 shows that city-wise higher poverty ratio (measured by poverty head count) has a negative impact on city-wise rural to urban migration. A 10 percent increase in poverty head count ratio decreases city-wise rural to urban migration by about 5.5 percent. This indicates that poorer cities discourage rural to urban migration. On the other hand, city-wise higher total receipt received through taxes and revenue derived from municipal properties, also have a positive impact on rural to urban migration. This indicates that strong economic conditions encourage higher rural to urban migration. The availability of electricity connection in a city shows a positive impact on rural to urban migration as explained in regression 3. However, city wise total number of universities and squared poverty gap ratio again do not show any statistically significant affect on city-wise rural to urban migration.

Finally regression 5 considers the total numbers of rural to urban migrants as the dependent variables. The estimated results show that city-wise total number of self employed males has a negative impact, and city-wise total number of self employed female has a positive impact on city-wise rural to urban migration. These results are identical to the results obtained in regression models 1-3. However, other independent variables do not show any statistically significant effect on city-wise rural to urban migration. It also indicates that the data considered in this study does not fit properly when the total number of rural to urban migrants is considered as a dependent variable.

IV CONCLUSION AND POLICY IMPLICATION

This paper tries to investigate the determinants of rural to urban migration in large cities of India based on 2001 data. For this analysis, data from various sources such as Census of India and unit/individual level data of National Sample Survey data on employment and unemployment and consumption expenditure data have been used for analysis. Due to lack of city-wise data district level data is used by considering urban sample located in that particular district as a proxy of the city. OLS regression method is used to analysis data in this study. City wise rural to urban migration rate and total number of rural to urban migrants are considered as dependent variables.

The descriptive analysis shows that India's urbanization rate is much lower than other developed countries. Natural increase in population is one of the main sources of increase in urban population in India. The net rural to urban migration from 1991 to 2001 is about 21 percent. Economically developed states have been witnessing higher rural to urban migration than economically underdeveloped states. Among the large cities, Mumbai has recorded the highest (i.e., 17.32%) rural to urban migration rate in the time span of ten years and more, among all other large agglomerations. City-wise analysis shows that reasons for rural to urban migration are predominantly work/employment and marriage.

The OLS regression results show that city-wise total number of male self-employed, level of city level inequality, males not in labour force, male casual labour, city-wise per capita income, city level poverty measured by poverty head count ratio, and city wise total number of colleges have a negative effect on city-wise percentage of rural to urban migration. On the other hand, city wise total number of self employed female, road distance to nearest railway station from a city, total of number of electricity connections and city-wise total receipts through taxes and revenue derived from municipal properties have a positive impact on city-wise rural to urban migration. On the other hand, city-wise total number of self employed male has a negative and city wise total number of self employed female has a positive impact on city-wise total number of rural to urban migrants. This results indicate that city level employment situations, city level inequality level, city level poverty and infrastructure facilities play an important role in rural to urban migration.

It is quite obvious that the country needs more rural to urban migration for economic development in India. In rural areas, more population depend upon agriculture, and the higher dependence on agriculture leads to disguised unemployment in rural area. If the disguised unemployed population is relocated in urban areas, then the supply of labour and demand of consumer goods in urban areas will increase. This will in turn lead to more production, higher level of economic activity and also higher per capita income. The level of job opportunities in the cities will also increase in this process. And this increase will promote investment which will in turn lead to further economic growth. So, the economic growth in India can be catalyzed through the growth of urbanization resulting from rural to urban migration.

In this perspective we suggest the following policies; first, we need to increase the job opportunities in the urban area for higher rural to urban migration. Second, level of urban poverty and urban inequality has to control for this purpose. Third, basic urban infrastructure facilities such as road, electricity, education etc has to increase not only to make

investment friendly but also to promote rural to urban migration. Finally, living cost such as urban housing prices has to control for making Indian cities migrant friendly for higher and sustainable economic growth.

APPENDIX

Table A1. Names of Cities Used in Regression Analysis

Agra (Agra), Aligarh (Aligarh), Allahabad (Allahabad), Amritsar (Amritsar), Asansol (Bardhaman), Aurangabad (Aurangabad), Bangalore (Bangalore Urban), Bareilly (Bareilly), Bhiwandi (Thane), Bhopal (Bhopal), Bhubaneswar (Khordha), Chennai (Chennai), Coimbatore (Coimbatore), Delhi@, Dhanbad (Dhanbad), Durg-Bhilainagar (Durg), Guwahati (Kamrup), Gwalior (Gwalior), Hubli-Dharwad (Dharwad), Hyderabad (Hyderabad), Indore (Indore), Jabalpur (Jabalpur), Jaipur (Jaipur), Jalandhar (Jalandhar), Jamshedpur (Purbi- Singhbhum), Jodhpur (Jodhpur), Kanpur (Kanpur Nagar), Kochi (Eranakulam), Kolkata (Kolkata), Kota (Kota), Kozhikode (Kozhikode), Lucknow (Lucknow), Ludhiana (Ludhiana), Madurai (Madurai), Meerut (Meerut), Moradabad (Moradabad), Mumbai (Mumbai), Mysore (Mysore), Nagpur (Nagpur), Nashik (Nashik), Patna (Patna), Pune (Pune), Raipur (Raipur), Ranchi (Ranchi), Salem (Salem), Solapur (Solapur), Thiruvananthapuram (Thiruvananthapuram), Tiruchirappalli (Tiruchirappalli), Varanasi (Varanasi), Vijayawada (Krishna), Visakhapatnam (Visakhapatnam).
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Note: City district (where the sample city is located) is used as a proxy of a city to measure all the variables (except population data) used in estimation of OLS regression of Equation

1 by considering urban sample persons (if data available for rural and urban separately) of that district. Name in parentheses indicates the name of the district in which the city is located. @ Delhi are considered as a whole proxy of a city district.

Appendix A2: Variable sources and definitions

Work-force participation rate (WPR) (As given in NSSO: The number of persons employed in *usual status* (ps+ss) per 1000 persons is referred to as work force participation rate (WFPR) or worker population ratio (WPR) in *usual status* (ps+ss). **Usual principal activity status:** The usual activity status relates to the activity status of a person during the reference period of 365 days preceding the date of survey. **Usual subsidiary economic activity status:** A person whose usual principal status was determined on the basis of the major time criterion could have pursued some economic activity for a shorter time throughout the reference year of 365 days preceding the date of survey or for a minor period, which is not less than 30 days, during the reference year. **Usual activity status considering principal and subsidiary status taken together:** The usual status, determined on the basis of the usual principal activity and usual subsidiary economic activity of a person taken together, is considered as the usual activity status of the person and is written as usual status (ps+ss). According to the usual status (ps+ss), workers are those who perform some work activity either in the principal status or in the subsidiary status. Thus, a person who is not a worker in the usual principal status is considered as worker according to the usual status (ps+ss), if the person pursues some subsidiary economic activity for 30 days or more during 365 days preceding the date of survey.

City output: Per capita non-primary District Domestic Product (DDP) over the period 2000-01 to 2004-05 at 1999-2000 constant prices is taken as a measure of urban economic growth. Source: Directorate of Economics and Statistics (DES), various State Governments, GoI.

City inequality level: Gini coefficient of the large city districts by considering urban sample persons of that district. Source: Unit level data of NSS 2011-12 on consumer expenditure.

Rain fall: City wise average rainfall.

Medical facilities (Numbers): City- wise Total Number of Hospital + Number of Dispensary + Number of Health Centre + Number of Family Welfare Centre + Number of TB Clinics + Number of Nursing Home + Number of Other Medical Institutions.

Total university (Numbers): City-wise total number of universities.

Electrification (Number of Connections): City- wise Total number of connection by Domestic + Industrial + Commercial + Road Lighting (Points) + Others

Railway Station distance: Railway Station Road Distance (in kms)

REFERENCES

- Agasty, M.P. and Patra, R.N. (2013), "Rural - Urban Migration: Selectivity, Determinants and Destination", *Indian Journal of Research* 2(2), pp. 84-86. Available at: https://www.worldwidejournals.com/paripex/file.php?val=February_2013_1361200095_2ba2d_27.pdf
- Akram, M. (2015), "An Analysis of Rural to Urban Labour Migration in India with Special Reference to Scheduled Castes and Schedules Tribes", *International Journal of Interdisciplinary and Multidisciplinary Studies* 2(10), pp. 53-58.
- Arzaghi, M. and Rupasingha, A. (2013), "Migration as a way to diversify: evidence from rural to urban migration in the U.S.", *Journal of Regional Science* 53(4), pp. 690-711.
- Bhagat, R. B. (2014), "Urban migration trends, challenges and opportunities in India" World Migration Report 2015, Background paper, International organization for migration. Available at <http://www.solutionexchange-un-gen-gym.net/wp-content/uploads/2016/01/WMR-2015-Background-Paper-RBhagat.pdf>
- Iversen, V. (2006), "Segmentation, Network Multipliers and Spillovers: A Theory of Rural Urban Migration for a Traditional Economy", Working Paper T9, Centre for Migration Research, Sussex University. Available at: http://www.migrationdrc.org/publications/working_papers/WP-T9.pdf
- Government of India (2011), "High Powered Expert Committee Report on Urban Infrastructure and Services", Available at www.niua.org/projects/hpec/finalreport-hpec.pdf

- McCatty, M. (2004), *The Process of Rural-Urban Migration in Developing Countries*. Carleton University, Ottawa, Ontario.
- Mitra, A. and Murayama, M. (2009), "Rural to Urban Migration: A district level Analysis for India", *International Journal of Migration, Health and Social Care*, 5 (2), pp. 35-52.
- Tripathi, S. (2013), "Do large agglomerations lead to economic growth? Evidence from urban India", *Review of Urban and Regional Development Studies* 25(3), 176-200.
- Tripathi, S., and Mahey K. (*forthcoming*). "Urbanization and Economic Growth in Punjab (India): An Empirical Analysis." *Urban Research & Practice* 1-24.
- United Nations (UN) (2014), "World Urbanization Prospects: The 2014 Revision, Highlights, New York", United Nations, Population Database, Population Division, Department of Economic and Social Affairs, accessed on 15 June 2014 from <http://esa.un.org/unpd/wup/Highlights/WUP2014-Highlights.pdf>.

1134 DETERMINATES OF GROWTH IN NON-MUNICIPAL PERI-URBAN AREAS OF DELHI

ABSTRACT

The interactions between urban, peri-urban and rural spaces have increased in the last decades with rising commuting, employment interactions, infrastructure provision etc. These new realities encourage to move beyond the simple classification of the urban-rural dichotomy, which is no longer adequate for analyzing the role of settlement and demographic processes. The peri-urban areas will be the dominant urban form and a challenge for spatial planning in the 21st Century in the global North as well in the global South. Most of the projected development will take place in this zone, leading to land fragmentation, loss of habitats and amenity values. In India, most of urban growth takes place outside municipal boundaries, and given the projected unprecedented growth of Indian metropolises, peri-urban areas are crucial for leveraging Indian urbanization. They require policy attention for the following reasons: first, large industries and special economic zones, which are unable to find land within the municipal boundaries due to land scarcity or high prices get land lots from the state government in the urban periphery. Second, rural unskilled migrants are settling in the peripheries of metropolises and large cities without basic services and in unplanned manner. Third, Indian regions will undergo the cycle of urbanization where cities are the engines of economic growth, thus to achieve development this growth needs to be planned and provided with basic infrastructure required to attract economic opportunities. Fourth, the unprecedented increase in census towns in close proximity to large metropolises is unplanned and makes transformation of rural to urban hard to manage. With the above background, this paper attempts to elucidate the factors that trigger growth in the peri-urban areas in order to advocate policy reforms to better plan and manage these areas for unleashing the potential of Indian urbanization. We use recent Census of India enumeration on socio-economic and demographic status as well as GIS data on settlement boundaries, and employ a combination of primary methods (interviews) and secondary methods (multi-variable OLS regressions and geographically weighted regressions). The objective is achieved with the help of following research questions: What are the determinants of peri-urban (area outside the municipal boundary) growth in Delhi? Do the factors of growth change or differ for census towns and villages or are these universal for the whole of peri-urban area? What are the location peculiarities or what differences can be ascertained between the location of census towns and villages? What are the areas that foresee growth and decline in the next decade?

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1136 SPATIAL PLANNING BEYOND BOUNDARIES

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ABSTRACT

Spatial Planning in India is still mostly limited to the urban agglomerations. With a strong urban growth a new type of urbanism arises, that seems to be neither rural nor urban. This so-called “Peri-Urban” growth encompasses a large amount of valuable land, and if not regulated, causes high costs for the construction of public (technical) infrastructure and leads to conflicts with other land uses such as agriculture or with environmentally protected areas. Consistent and systematic spatial planning at the level of the region can be an important contribution to plan the rural-urban linkage and to prevent negative consequences of the aforementioned current spatial developments. In this regard, the Land Use Planning and Management Project, jointly implemented by the Indian Ministry of Rural Development and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, wants to revive Spatial Regional Planning as provisioned in the Constitution of India.

1 INTRODUCTION

The relationship between rural and urban areas is changing and the rural-urban divide is fading, with increasing flows of people, goods and services between the two and the emergence of new migratory and livelihood patterns. This is driven in parts by high urbanization rates in many developing countries, and particularly by urban growth in the continuum of rural areas with villages, towns and cities of fewer than 500,000 inhabitants. Boundaries between rural and urban areas are becoming less distinct, and urban and rural characteristics and activities can lead to diverging territorial needs and divides between governance functionalities.

Realising the full potential of these blurred boundaries is a challenge for policy-makers and planners. Spatial planning and integrated land use management can be used as mechanisms to foster rural-urban interlinkages and promote integrated development. Overcoming the rigid rural-urban dichotomy is also a precondition for the achievement of many of the Sustainable Development Goals (SDGs) and is firmly integrated into the New Urban Agenda.

The Indian Government has recognised the importance of addressing rural-urban interlinkages by launching the National Rurban Mission in 2016. The Rurban Mission is based on the premise that comprehensive development cannot take place unless even the remotest places are developed as growth centres. Nevertheless, spatial planning in India is still mostly limited to the urban agglomerations, despite rapid urbanization and peri-urban growth. Consistent and systematic spatial planning at the regional level is therefore an important contribution to address the increasing spatial complexities of the rural-urban linkage and unlocking the development potentials of urbanization for rural areas.

Under the Indo-German Corporation, the Ministry of Rural Development with its Department of Land Resources and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) are jointly implementing the Land Use Planning and Management Project in India. The project focuses on spatial planning at the regional scale and at the District level. The objective of the project is to improve the system of land use planning in India in order to enable and ensure that Indian state planning institutions apply policies and instruments of integrated spatial and land use planning.

“There is a need for an integrated spatial and territorial planning that keeps the urban and rural areas at the regional level in focus. India's urban-rural regions are shaped by extreme disparities in development and are deprived of adequate basic services and housing. This underlines the need for a strong urban economy that supports the regional balance of the city and the country. Such a paradigm shift requires a systematic and consistent planning approach on all scales”.

2 RURAL AND URBAN LIFE IN INDIA TODAY

Urbanization is linked to economic growth and regional development. However, development in India is concentrated in certain large cities; the rural hinterlands are deprived of growth, resulting in spatial disparities across the country.⁵¹⁴ Despite the known fact that there is substantial migration from rural to urban areas in India, still almost 68% of India lives in rural areas, according to Census of India 2011. Keeping these facts in mind, a reality check of Mahatma Gandhi's “India lives in villages” seems reasonable.

The urbanization in India has reached from 10.8% in 1901 Census to 31.16% in 2011 census. As per the Census 2011, there are 7,935 towns in the country. There are 468 towns with population greater than lakh out of which 53 has a population of one million or above each. These Million Plus cities are the major urban centres in the country.

As per the Census of India 2011, the definition of urban area is as follows:

- Statutory Towns: All places with a municipality, corporation, cantonment board or notified town area committee, etc.
- Census Towns: All other places which satisfy the following criteria:
 - o a minimum population of 5,000

⁵¹⁴ Jain, M. and Pallagst, K. 2015. Land Use Beyond Control. *disP – The Planning Review*, 51:3, 29-43.

- at least 75 per cent of the male main working population engaged in non-agricultural pursuits
- density of population of at least 400 persons per sq. km.

Statutory Towns are notified under law by the concerned State Government and have local bodies like municipal corporations, municipalities, municipal committees, etc., irrespective of their demographic characteristics. Census Towns were identified on the basis of Census 2001 data.

A big percentage of urban growth has the form of patches around the city-centres that are often disconnected from each other. Although these patches have urban characteristics as per the census, they are not statutory urban areas and thus lack institutional structures and capacities to tackle challenges in regard to infrastructure planning and service provision.

As a result, high rise buildings and residential complexes with high densities occur in rural areas - often without including basic infrastructure like roads, electricity, freshwater or sewage in planning. Cities and villages suffer from this development, as it becomes increasingly difficult to determine where cities end and where the landscape and the village start. Census towns growing in the not notified urban areas around cities are only governed by rural local bodies which lack funds and empowerment to cater to urban service delivery standards and planning regulations. Although the quality of life goes urban, development goes haphazard and unregulated, exceeding land resources and demand for infrastructure.

This has implication on the prime resource of rural India, which is agricultural land. The per capita availability of agricultural land has declined from 0.5 hectares in 1951 to 0.15 hectares in 2011. With increase in population and possibility of shrinking land mass due to increased coastal erosion and floods due to climate change, the per capita availability of land is expected to reduce further to 0.2 ha in 2035⁵¹⁵. According to the Land Use Statistics (2012-13), issued by the Ministry of Agriculture & Farmers Welfare (MoA&FW), there has been a gradual increase in the area of land under non-agricultural uses. During the period 2001-02 to 2012-13, the area under non-agricultural uses has increased by 2.6 million hectares (11 per cent).

The agricultural sector has shown less than 2 percent per annum growth during the past decade. The share of agriculture and allied sectors in GDP has come down sharply from 52% in 1951-52 to 13.9% in 2011-12, whereas share in workforce remained high at 54.6%, declining to only 39.6% during the same period. Such disconnection between employment growth and GDP growth is due to lack of non-farm employment opportunities. In such a precarious situation, there is concomitant need for shifting population from agriculture to other sectors.

The McKinsey Global Institute Report on India's Urban Awakening: Building inclusive cities, sustaining economic growth (April 2010) highlights prospects of urbanization that India can look forward to in the year 2030, in terms that India's GDP will multiply five times, there will be "270 million people net increase in working age population... 70 percent of net new employment will be generated in cities". It is estimated that the current contribution of Urban India to the GDP is about 63%, which will further increase with growing urbanization.

The challenge/ solution is therefore not to stop urbanization from happening, but to regulate the phenomenon through effective planning tools like spatial regional planning, that go beyond urban boundaries and serves to reap benefits of urbanization now and in future.

3 THE NEED FOR A REGIONAL PLANNING SCALE

As described in the previous chapter, a big part of the growth is happening in a form that is described in India as "The Urban Sprawl", "The Peri-Urban", or "The Rurban". These spaces are multi-faceted as every area has a different story to say about their growth factors. Yet, the growth of these areas can be understood in three distinctly visible categories:

1. Around/ close to metropolis or large cities
2. Along National or State Highways or Railways and
3. Old cantonments or at strategic trade locations used in historic times.

Most of these areas do not have an applicable spatial plan to strategically control and steer development.

It is estimated that of the 7935 urban settlements of India, only 1233 urban settlements have approved master plans and preparation of 653 master plans is in process a total of 24% urban settlements⁵¹⁶. The application of master plans generally has a good effect on the construction, investment decisions, availability of basic infrastructure for the citizens and finds the right balance between economic aspects (agriculture, mining, industries and commerce etc.), social aspects (urban as well as rural settlements, equity of distribution etc.) as well as the environmental aspects (natural resource management, disaster prevention and mitigation, forest, climate change etc.).

Most of the rural areas in India do not benefit from a consistent spatial planning, which is the responsibility of the state governments, and affects roughly 70 per cent of the Indian population. Planning authorities are limited to urban areas, neglecting the current challenges of unauthorised development at the periphery. A common response to the expanding urban boundaries is the creation of new entities, such as Metropolitan Development Authorities (e.g. the Mumbai Metropolitan Region or Chennai Metropolitan Region). In addition, bigger scale visionary planning of corridors, transit

⁵¹⁵ State of Indian Agriculture 2015-16, Ministry of Agriculture and Farmers Welfare, Government of India

⁵¹⁶ TCPO, MoUD "GIS-base Master Plan Formulation", available from <http://tcpomud.gov.in/Divisions/URIS/Brief Note on GIS based Master Plan.pdf>

axis or big industrial regions across the country are being planned for at national level. The biggest gaps in spatial planning in India therefore exist in those areas that are not covered by either Master Plans or special plans at national level. Sectoral spatial and land use plans are also prepared for eco-sensitive zones, and economic and investment zones. Generally prepared and guided by sectoral / line departments, most of these plans are sporadic and in pockets, lack efficiency, integration and interaction with each other leading to constraints in successful implementation.

The government of India envisions that all States and Union Territories of India should possess and use a fully functional and standardised Integrated Land Use Planning and Management System, which promotes adoption of comprehensive and inclusive land utilisation strategies involving all stakeholders leading to strengthened decision making for sustainable utilisation of land resources.

Under the Constitution, not only provision for Economic and Social Planning (Entry 20 List III, VII schedule); but provision for District level and Metropolitan planning (74th Amendment, Art 243ZD for spatial planning for district and Art 243ZE for co-ordinated spatial planning for Metropolitan area) already exist.

A regional planning approach in India can help to facilitate a system of spatial planning in urban and rural areas and areas which lie somewhere in between, the so called peri-urban. Spatial district plans define the land use and provide a planning base of the whole area on a higher level, regardless of whether it is called urban or rural. In that way, it overcomes the urban-rural dichotomy by choosing a scale of 1:50,000 or above. Although the aforementioned Metropolitan Development Authorities already work at this regional scale, this level and scale of work is still new and uncommon for India, especially when it comes to rural areas.

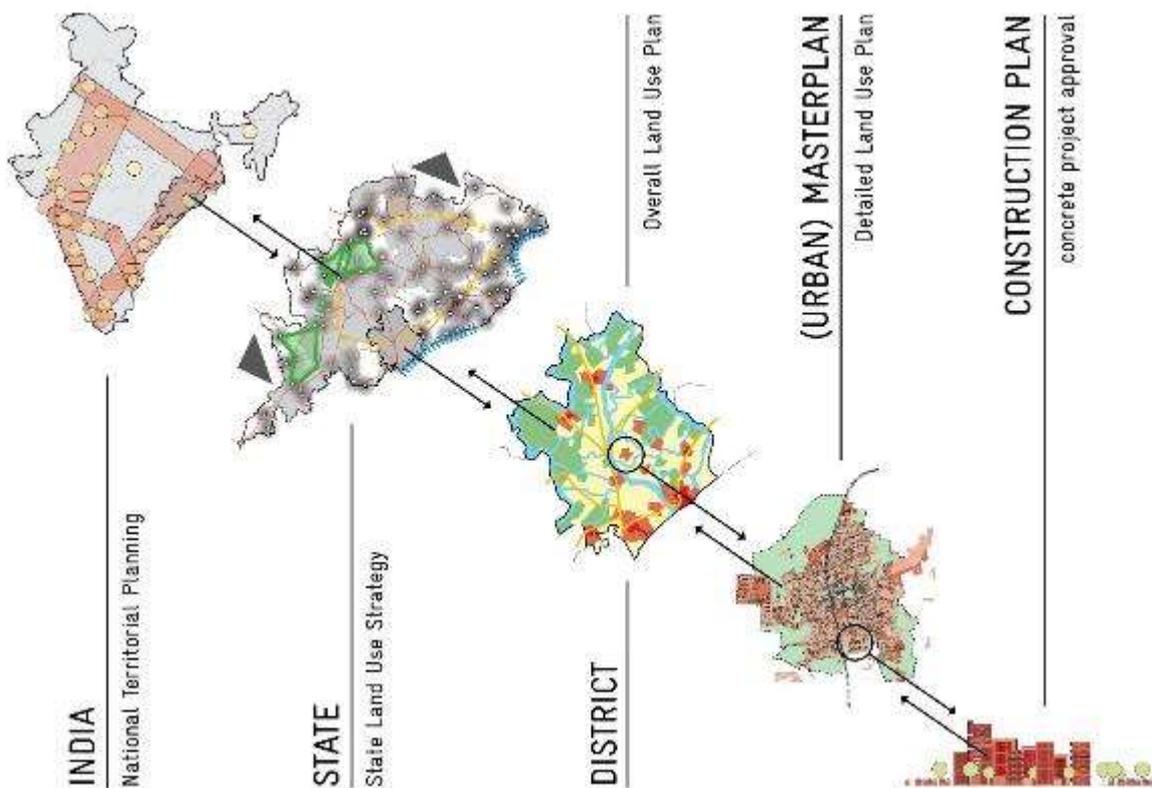


Figure 137: Levels and scales of spatial planning

In the case of Tamil Nadu, the state has only 5% of the area (excluding Chennai Metropolitan Development Area, CMDA) as planned area with master plans of two types: single urban local body or a cluster of ULBs with adjoining rural areas within a “local planning area”. Currently planning in Tamil Nadu is done in 3 levels: the visionary plans (Vision Plan 2023) with economic investments specified for various projects (corridors etc.) with no spatial maps in scale; the master plan in 1:10,000 scale (as well as lower scale like 1:4000 in places required) and Detailed Development Plans in 1:4000 scale (or lower scale 1:1000 as per need). Urban master plans in Tamil Nadu are prepared by the Local Planning Authorities (LPA), which come under the Directorate of Town and Country Planning (DTCP), for areas called as local planning areas.

The major lacks in the planning process are the missing participative approach and demand assessment as a result of which the plans take very long for approval as there are objections from public and requests for reclassification. Similar issues exist in the Planning arena of Odisha where planning is made by consultants selected by the Department of Town Planning (DTP) or the Development Authorities. The process of each consultant largely varies and hence it is difficult to document one single process of planning in the state. Also, scope of public participation is limited to the flag end of the planning process, which does not leave any space for incorporating their demands in the plan. Their participation is limited to only raising objections and giving suggestions.

In both of the states, the town planning authorities have the mandate of spatial planning. However, the execution of this mandate in reality is restricted, as approval processes for building permits consume most of the available resources.

Thus, planning in many cases is left to external consultants. Another observation is that building in the rural periphery outside the jurisdiction of a building authority became more attractive for constructors and developers in terms on financial and time benefits. This highlights the need for an extension of planning beyond urban boundaries and look into the per-urban areas from a planning perspective.

4 THE LAND USE PLANNING AND MANAGEMENT PROJECT OF GIZ

“There is a need for an integrated spatial and territorial planning that keeps the urban and rural areas at the regional level in focus. India’s urban-rural regions are shaped by extreme disparities in development and are deprived of adequate basic services and housing. This underlines the need for a strong urban economy that supports the regional balance of the city and the country. Such a paradigm shift requires a systematic and consistent planning approach on all scales”.⁵¹⁷

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH is providing technical cooperation to the Department of Land Resources, Ministry of Rural Development, Government of India, for promoting Integrated Land Use Planning and Management in India at state level. As part of the agreement GIZ has agreed to support two states (Odisha and Tamil Nadu) with technical assistance towards formulation of state land use policies, development of spatial planning instruments/tools/framework and guiding documents, Human Capacity Development (HCD), organizational and institutional development. GIZ would also demonstrate application of the land use policies and guidelines by providing technical assistance in preparing a district level spatial land use plan in each state and vertically integrating it to a larger regional spatial land use plan for Tamil Nadu and a smaller town / rural area spatial land use plan for Odisha.

The objectives of this collaboration is to strengthening overall culture of a democratic and integrative spatial and land use planning at all levels by enhancing the capacities of State planning institutions in applying standard land use planning and management instruments in selected areas within the two pilot states by utilising the technical assistance as provided by GIZ.

Land Use Planning and Management project is working along with two pilot states, Tamil Nadu and Odisha. Key partners in the states are state government departments which are administrating and developing land and which have the mandate and capacity to introduce a spatial planning instrument at regional scale. In Odisha, the Revenue and Disaster Management Department is mainly concerned with land property rights and has a high stake in land development. While the mandate of the Housing and Urban Development (H&UD) Department is limited to urban areas, it has the vastest experience, competence and capacity for spatial planning. Under the H&UD Department, the Directorate of Town Planning (DTP) is the nodal agency for all urban planning related activities in the state and is majorly entrusted with the preparation of urban master plans.

In Tamil Nadu, a similar structure is followed: Here, the H&UD Department is the Authority for the Directorate of Town and Country Planning (DTCP). As the name says, the mandate is not limited to urban areas only, but covers the full territory of the state. The Planning, Development and Special Initiatives Department in Tamil Nadu is responsible for the preparation of the Five Year and Annuals Plans. State Planning Commission (SPC) is a sub-department and administrates all sectoral strategies for the state. While Department heads (Secretaries) are steering the project at management level, SPC and DTCP are the main partners for technical implementation.

In the focus of this project is a spatial planning approach on regional scale at the level of the District which is the administrative subdivision of a state and headed by a District Collector. While many Districts have planning cells which prepare development plans, district plans in most of the cases are not spatial. The budgetary planning approach does not cater to the need of regulating and steer developments spatially.

4.1 Land Use Policies

In general terms, land use policy primarily uses spatial and land use plans as well as environmental and building code regulations to affect land use. These instruments function by restricting usage of land, but cannot influence how individuals and businesses would like to use land. In most cases, they do not offer efficient, community and market driven land use patterns to emerge. At the same time many other policies and schemes which are not directly related to land use planning systems, create incentives to use land in certain specific ways. However, it is not necessary that such policies correspond to the objectives of land use planning systems. In many cases, the planning systems simply fail to achieve their objectives due to overwhelming pressures from contradicting land developments.

Thus, state land use policies in India must become a spatial governance tool that balances considerations to all sectors at all levels of governance. It is therefore targeted to develop the policies in a cross-departmental working mode, including all sectors of the state government with implications on land. Working groups are steered by external policy and planning experts to moderate the process and streamline the outcomes to a comprehensive policy document. This document aims to

- link tax policy incentives to land use policies,
- link state level fiscal systems, schemes, projects that directly impact efficiency of land use policies,
- integrate demographic and economic trends with due consideration to the fact that all settlements are interdependent,

⁵¹⁷ LUPM. 2017. "Spatial Planning beyond boundaries". Documentation: Dialogue on a Regional Planning approach at the District level. GIZ, New Delhi

- integrate all sectors and levels of government so as to promote convergence and overcome sectoral silo,
- strengthen the concept of regional considerations in planning approaches
- and to create sustainable coordination mechanisms .

4.2 Norms: Pioneers for India

Norms are Spatial Planning instruments for Regional Plan means a collection methods and approaches in the form of standards and guidelines used by the public and private sector to influence the distribution of people and activities in spaces of a region for sustainable development. It also encompasses coordination of practices and policies (SoPs, inter-sectoral coordination mechanism) affecting spatial organization (the sectoral departments, spatial planning departments). These instruments help stimulation and steering of regional development.

While already existing guidelines have a strong focus on planning in urban areas, guidelines for planning on the regional level needs more elaborate and state specific customization. One of the existing guidelines for urban and regional development are the 'Urban and Regional Development Plan Formulation and Implementation' (URDPFI) guidelines. The URDPFI guidelines specifies the scope, purpose and contents of each plan. It also provides a compilation of all types of spatial planning practices across different sectors in the country. It provides formulae for population projection and parameters for delineation of region. Currently both the states of Odisha and Tamil Nadu follow URDPFI guidelines for master planning. Receptivity and willingness for an extended set of norms is prevalent in the states. Together with key stakeholders, the preparation of a manual for district planning is underway to introduce this new set of norms.

4.3 Human Capacity Development: Planners for India

Growing urban India and a constantly growing number of urban, infrastructure and construction projects means a challenge to the public administrative workforce in the field of spatial planning in India. India needs a big amount of well trained (spatial) planners. The Town and Country Planning Organisation of the Government of India / Ministry of Urban Development estimates in its latest URDPFI (Urban and Regional Development Plans Formulation and Implementation) Guidelines from January 2015 a total requirement of "85.000 - 90.000 additional planners in the country at various levels of planning framework, which roughly works out to 1 Planner per 14,000 population."

The academic system for spatial planning produces planners mostly for the private sector. Planners in Government institutions are mostly trained by practice and can apply existing planning instruments and laws. A detailed Capacity Assessment within the two states has shown, that, when it comes to innovation and appropriation of reforms and new planning approaches, government planning institutions lack of properly trained planners. The assessment has also revealed that in both of the states there is currently no regular training offered for spatial planning officials in the state government. Rapid urbanization and industrial growth require increased control of land development and enhanced balancing of sectoral interests. Spatial planning beyond boundaries of urban jurisdictions and beyond boundaries of sectoral departments must respond to the new challenges.

With respond to the increasing demand of planners in the state, the Government of Tamil Nadu is about to introduce a common cadre of Town Planners. But there is a need of increasing the capacities not only in quantitative terms, but also in qualitative terms. Hence, a training on spatial planning will be designed and conducted under the project. A state training institute (Tamil Nadu Institute of Urban Studies) is charged with introducing this training to the annual training curricula. Similar in Odisha, where not only planners of the Directorate of Town Planning, but also district planners and revenue officers are part of the target group for training on spatial planning.

The Training on Spatial Planning is part of a wider Capacity Development Strategy as part of the Indo-German cooperation. As spatial planning is both a cross-sectoral and a multi-level domain, as many levels and sectors within in the government structure must be addressed. The strategy targets three groups:

1. Decision makers: These are secretaries from relevant departments which are crucial for decisions with spatial implications. Topics are awareness for the need regional planning and development and models for necessary cross-sectoral cooperation to balance opposing interests.
2. Planners: The above mentioned training on preparation of spatial plans at city and regional level for technical staff in the State Government.
3. Local representatives: Spatial planning finds its physical manifestation always at the local level in terms of built environment, infrastructure, environmental zones, etc. Local authorities from villages are to be trained on "spatialize" village development plans and map existing resources and future needs of the local community.

4.4 Demonstration Areas

Four demonstration areas were selected to showcase how policies and norms can be applied and to generate a real case example for the application of coordination mechanisms and newly acquired capacities through training. In Odisha, a regional scale at the district level is prepared in Ganjam District. Within this district, a land use plan for Greater Hinjilicut Municipality nearby the main city Berhampur will showcase the interlinkages between the plans on regional and local level. In Tamil Nadu, Coimbatore District has been selected as demonstration area. As part of the regional strategy of the state, a regional plan of four districts will showcase how a land use plan for such an extensive area can look like and what kind of abstraction is required at this level.



Figure 138: Demonstration Areas in Odisha

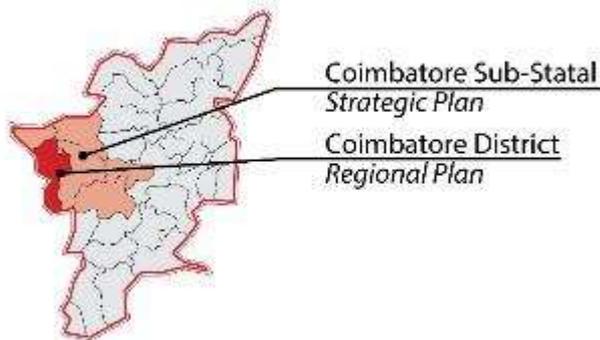


Figure 139: Demonstration Areas in Tamil Nadu

5 WAY FORWARD AND CONCLUSION

The introduction of a regional level of spatial planning requires a solid governance structure with clear responsibilities and capacities to fulfil the tasks. Both of the pilot states are working on the identification of the best suitable working model. Ownership and political will for improving the regional scale of planning are the most important factors for a sustainable impact.

Based on the learnings from the demonstration areas, the Government of Odisha could identify four feasible working models for a governance structure of district spatial planning.

1. District Planning and Monitoring Units (DPMU) are responsible for each of the 30 districts in the state and come under the Planning and Convergence Department (PCD). DPMUs prepare budgetary district plans for each district. Due to lack of capacity, there are no spatial components in these plans. The mandatory inclusion of spatial component (as per provisions of 74th CAA, GoI) in existing district plans can only be achieved when spatial planning capacities within DPMUs are built. DPMUs have the constitutional mandate and institutional statute to prepare and implement district spatial plans/regional plans. This model suggests an overarching spatial planning cell within the PCD for the entire state of Odisha capacitated with planners and experts.
2. The Directorate of Town Planning (DTP) is the main government agency for spatial planning in the state for areas outside the jurisdiction of development authorities. DTP is responsible for masterplans for the majority of cities and towns in the state, for building approvals and preparation of local area plans. It experienced and well versed with spatial planning. Looking at these already existing capacities, district/regional spatial planning may be mandated as an additional statute for DTP by expanding it to Directorate of Town and Country Planning (DTCP).
3. A combination of model 1 and 2, which would encompass budgetary support from PCD and technical support from DTP would meet all requirements. The component of spatial planning under district plans can be mandated under DTP while non-spatial component under district plans stays with DPMUs. The integration of both plan components have to be ensured through regular interactions between DPMU and DTP and would require a specific deliberation on responsibilities and coordination.
4. The last option is a rather visionary idea to create a Directorate of Rural and Country Planning within the Panchayati Raj Department (PRD). This would include the introduction of formal planning mechanisms within the PRD. Under this model, there shall be two separate wings of spatial planning in the state, one under DTP for urban spatial planning, and the other within PRD for rural and country planning. The district and local level representations of the Directorate within PRD shall be through PRI organisations (Zilla Parishad, Panchayat Samiti and Village Panchayats) that shall be capacitated with planners and experts. For such a model, there has to be evolved district level institutions which shall integrate rural and urban spatial plans for preparing integrated district spatial plans. Probable organizations can be DPMU or District Rural Development Authority.

Preconditions in the State of Tamil Nadu are different from those in Odisha. Here, the respective Directorate of Town and Country Planning (DTCP) has already the mandate for spatial planning for the entire state except for the area of Chennai Metropolitan Development Area (CMDA). Also, the Town and Country Planning Act provides the requirement of preparation of regional plans in the state. The Government has recently taken steps to reformulate the regions by clustering districts into six regions. DTCP is about to start a process of regional plan preparation through external consultants. In this context, two other provisions of the Town and Country Planning Act are to be pursued: The creation of the Town and Country Planning Board and the Regional Planning Authority.

The act foresees the Town and Country Planning Board as a steering committee “to guide, direct and assist the planning authorities, advise the Government in matters relating to planning and the development and use of rural and urban land in the State and to perform such other functions as the Government may, from time to time, assign to it”⁵¹⁸. The members comprise representatives of a series of departments, authorities and associations. The constitution of the board requires coordination and political will, as of now, it is still pending. The process of working groups for drafting the land use policy (refer chapter 4.1) is a first attempt to bring these stakeholder together and test coordination mechanisms to overcome contradicting interests of land developments. The process of drafting the policy entails the chance to open a window of opportunity for the constitution of the Town and Country Planning Board.

The same act also provides the introduction of Regional Planning Authorities. The plan preparation of selected demonstration areas (refer chapter 4.4) whether an additional authority is actually needed or other agencies can take up the preparation and implementation of the regional plan.

In general, an integrated spatial planning approach helps to make decisions with spatial implications more effective. A larger scale of spatial planning than the incumbent city scale is needed in order to meet the current challenges of haphazard development at the urban fringes. Urban and rural tends to grow together, thus, a regional level of spatial which covers both would respond to this trend. A regional planning approach at the district level can contribute towards equitable rural transformation by providing policy-makers with information to help them identify and prioritise necessary sectoral interventions. For this purpose, both planning departments as well as sectoral departments must be involved in the process of policy formulation, development of guidelines and capacity development measures. Making use of cross-sectoral synergies is a first step to address the rural-urban continuum in the governance of spatial planning.

⁵¹⁸ Housing and Urban Development Department, Govt. of Tamil Nadu, Chapter II, Section 6, Tamil Nadu Town and Country Planning Act, 1972

SS15.1. Conflict, Migration, and Diaspora

1385 POLITICAL INSTABILITY AND TOURISM. THE CASE OF ARAB SPRING

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ABSTRACT

This paper analyzes the effect that the Arab Spring has had on tourism. For this purpose, a number of countries have been selected from among the affected and potential beneficiaries (Tunisia, Egypt, Thailand and Spain) and the gain or loss of tourists has been quantified through the use of the Synthetic Control Method. Our results suggest that the two affected countries have suffered large losses in the number of tourists while Thailand has increased the number of tourists in Thailand as a result of this conflict. In contrast, in Spain no significant effect is observed.

1 INTRODUCTION

Tourism activity, like the rest of economic sectors, can be affected by political and social instability. The impact degree is greater when the social conflict is transformed into public disorders and, in extreme cases, into terrorist acts or even into armed conflicts. Of course, it becomes maximum when tourism -for which it itself can assume contact with other cultures, economic support of the regimes, or symptom of openness- becomes the ultimate goal of this confrontation or terrorist acts .

In this sense, the social conflict that originates in Tunisia at the end of 2010 and that extends into the Arab world throughout the following year, has its prolongation in armed conflicts or terrorist acts especially intense in 2015. This situation , therefore, it is a good scenario for the study of the impact that both types of events have on tourism activity and its capacity for response and recovery.

In contrast to other papers that only analyze this phenomenon from the perspective of the countries affected by this situation of political instability and conflict, here we will also try to assess the extent to which potential winners of the conflict can be detected, through a process of deviation of tourist flows to other countries.

To do this, the following section provides a brief chronology of the Arab Spring and the events of instability and subsequent conflicts. Next, we review the literature on the impact of political instability on economic activity and, specifically, on tourism. In the following section, the synthetic control method is presented, as an adequate instrument capable of evaluating the impact of instability on tourism activity and which consists in the construction of a counterfactual of the tourist flow, so that the impact is measured as difference between the real data and the constructed counterfactual. Perhaps one of the main weaknesses of this procedure is that the construction of the counterfactual must be carried out through a linear combination of the tourist flows of other economies that have not been affected by this effect, neither positively nor negatively.

To carry out this selection of countries, a process is implemented in three stages: a) identification of the countries affected by the Arab Spring; b) identification of the countries that sent their tourists to those affected and that substantially modify their bilateral flows with them; c) identification of the receiving countries (substitutes) of the affected countries through the analysis of the change of destinations of the countries identified in stage b). Once these countries have been identified, it is possible to carry out the synthetic control method that is applied to the two most affected countries: Tunisia and Egypt; and two of the possible beneficiaries: Spain and Thailand. The paper concludes with the usual conclusions and final considerations.

2 THE ARAB SPRING AND ITS EFFECTS ON POLITICAL STABILITY

For many years, the countries of the Arab world have been governed by authoritarian governments that have combined methods of repression and redistribution in order to maintain their systems of government (Malik and Awadallah, 2011). As Boukhars (2011) points out, Arab societies began to exacerbate their discontent due to economic and political deficiencies despite certain improvements in education and access to new technologies and the Internet. The culmination of this process occurs in a social outbreak by several countries in the MENA region (Middle East and North Africa) between December 2010 and June 2011, and has been called with the generic name of "Arab Spring".

Specifically, this public demonstration of discontent begins in December 2010 in the city of Sidi Bouizid (Tunisia), when Mohamend Bouazizi, a fruit vendor whose stand had been requisitioned by the police, immolated himself, triggering the general discontent of the Tunisian citizenship (Glosh, 2016). On the contrary, Chomsky (2010) dates the beginning of this process in the uprisings produced in Western Sahara in October of that same year. The riots in Tunis led to the resignation of President Ben Ali on January 14, 2011.

After the successes of neighboring Tunisia, the wave of protest spread to Egypt, where youth along with other sectors of the population got the resignation of President Mubarak on February 11, involving that the army dissolved the Parliament, suspended the Constitution and pledged to abolish the emergency laws in force for 30 years (Kirkpatrick, 2012). It is worth noting the role played by the youth sectors first, in the beginning of the riots and later, in the fall of Mubarak. What is more, it was a group of young people who years before the outbreak of the Arab spring joined the labor movement to protest the labor rights of textile workers in the city of Mahalla al Kubra (Souaiaia, 2011). This struggle led to a strike on April 6, 2008, of which this group took the name, called April 6 Movement (Wellman and Rainie 2014).

In Syria, a civil war is still ongoing facing forces loyal to President Assad's regime along with its allies and other forces opposing both the government and each other in varying constellations. This conflict has extended directly to Lebanon where it has strengthened sectarian clashes between factions in support of and opposed to the Assad regime. In Yemen, the protests led to the ouster of President Ali Abdullah Saleh, who had been in power for more than 33 years. In Libya, the protests ended with the assassination of the dictator Muammar Gaddafi and the elections to the General National Congress took place in July 2012. Although, in Morocco and in Jordan, King Mohammed VI and Jordan King Abdullah II have both stayed in power, they have been forced to make such contributions as cabinets and constitutions reforms.

The victory in both Tunisia and Egypt of the revolts can not be explained without the role of the army. He decided to disengage from the presidential orders, refusing to intervene to quell the riots (Abu-Tarbus, 2009). On the contrary, in countries like Libya, Syria or Yemen, an armed struggle was established, which in the case of Syria is still under way.

The root of the problems that led to this situation of discontent were economic, political and demographic. Among the economic causes, as Joffe (2011) points out is the rise in the prices of basic necessities, especially those related to food. According to FAO, food more than doubled its price between 1990 and 2011 (at a cumulative annual growth rate of 4.3%) that was not accompanied either similar wage increases and or low unemployment rates. Besides, there was a the drop in remittances and tourism revenues, as well as the financing difficulties of these economies, as a consequence of the financial crisis of 2007 that significantly affects its main commercial and tourist partners: the European countries (Habibi, 2009). At the political level, the lack of political freedoms linked to the repressive apparatus of the State has exasperated large sections of the population. In addition, widespread corruption and the misuse of public resources increased the degree of delegitimization of these regimes among the popular sectors (Cook, 2011).

Furthermore, the demographic component has played a key role in the outbreak of the revolution. These countries have an important proportion of young population (20% of the population is between 15 and 24 years old) that has led to an increase in education efforts by the Arab states (UNDP, 2002), which clashes head-on with fewer opportunities in access to the labor market, creating disaffection with the different regimes among young people (Bibi and Nabli, 2012). Thus, youth unemployment rates double and even triple the general rates (World Bank, 2009 figures these rates at this time in 43.8% for Libya (43.8%), 30.3% for Yemen and 29, 4% for Tunisia).

Finally, it is remarkable the decisive role that new technologies have played in the propagation of the revolts by granting alternative means of communication to citizens, especially the youngest ones (Lotan et al, 2011), despite the low level of penetration of the same, because its use does not reach more than a third of the population in the best of cases.

3 THE EFFECT OF POLITICAL AND SOCIAL INSTABILITY ON ECONOMIC AND TOURISM ACTIVITY: A QUICK REVIEW

The study of the economic effect of political instability, terrorism and violence has generated a good number of papers, especially since the September 11 attacks. Moreover, the intensity and nature of the conflicts dealt with are very broad; from strikes, protests and demonstrations to armed conflicts and various forms of terrorism (Buesa et al, 2008, Abadie and Gardeazabal, 2003 Blattman and Miguel, 2010). The strong link that sometimes exists between the different forms of instability may explain the difficulty of separating the various effects at the time of being treated (Sonmez, 1998) and hence it is usually expressed political instability in general terms.

In addition, there is a literature that analyzes the channels through which instability affects economic results. Aisen and Veiga (2013) conclude that political instability negatively affects growth. Miguel and Roland (2006) study the economic effect of the American bombings in the subsequent underdevelopment of Vietnam, concluding that the destruction of these attacks had no long-term effects on the levels of poverty, consumption, infrastructure, literacy or population density due to the rapid recovery of affected areas. Braithewaite, Kucik and Maves (2014) evaluate the effect that political instability has on the FDI, proving that markets receive less investment when violent episodes occur and when those revolts fail. Fielding (2013) finds that the episodes of violence of the "Intifada" have caused a lower level of saving of the Israeli economy compared to international standards. Justino (2010) highlights how conflicts affect human capital through shorter school time and that effect is greater for women than for men.

One of the main issues faced by these papers is both to define what is meant by political instability and to identify the beginning of the event to be studied. In fact Jong-A-Pin (2009) points out that these processes are multidimensional and hence the problem of identification. In this sense, Alesina et al. (1996), Siermann (1998) and Miljkovic and Rimal (2008) consider that a change in government can be a sign of political instability, while Alesina and Perotti (1992) identify it with any degree of social instability as political assassinations, coups d'état and deaths related to conflicts.

There is some controversy in the way that instability must be measured, since it is an unobservable. For example, latent variable models have been used to capture the effect of the probability of a change of government (Gurgul and Lach, 2012); Gwenhamo, W. Fedderke, of Kadt (2012) quantified political instability as a composite index that included the number of political detentions or declarations of states of emergency.

A classic problem in the literature is the possible existence of reverse causality caused by the relationship between economic variables and the elements of political instability. This problem has been partially solved, either through the application of the Instrumental Variables technique, through the specification of models of simultaneous equations, or

using procedures such as the synthetic control method, whenever it is eliminated in the construction of the counterfactual all the economies that have not suffered the conflict.⁵¹⁹

The study of the economic effects of instability in tourism is much more scarce (Ryu, 2005). In particular, some research has been done for the analysis of specific countries such as the partition of Cyprus (Mansfeld and Kliot, 1996), The Troubles in Ireland (Wall, 1996), or the terrorism by local groups in Greece, Israel and Turkey (Drakos and Kutan, 2003) and in Spain (Enders and Sandler, 1991). Also, some investigations have been carried out using an aggregate sample of countries (Thompson, 2011, Llorca-Vivero, 2008, Saha and Yap, 2014, Groizard, Ismael and Santana, 2016).

Regarding the political instability that emerged as a result of the Arab Spring, some papers has been written. Groizard, Ismael and Santana (2016) use a gravity equation to find the effect on the flow of tourists finding a direct effect on countries, but also evidencing a contagion effect in Algeria, Jordan, and Lebanon and a substitution effect Iraq, Saudi Arabia, Albania, Bosnia and Herzegovina, Turkey, and Spain. Perles-Ribes et al. (2016) explore the effect on the countries of the Mediterranean through the use of time series, finding a deviation of tourism towards Morocco and Turkey while Greece and Spain do not seem to have benefited. Afonso- Matta, Appleton and Bleaney (2016) estimate the effect of the AS in the GDP Tunisia using the Synthetic Control Method and finding important losses as a consequence of this phenomenon. Finally, Rodríguez and Santana-Gallego (2018) analyze the deviation of the flow of tourists to Spain using cointegration techniques, finding some evidence for the period 2008-2015.

There are multiple explanations why tourism has become the target of different terrorist groups. Ritcher (1980) points out that tourists are seen as "ambassadors of hostile governments" by terrorist factions. Enders et al (1992) consider that attacks on tourist objectives are intended to deter potential tourists and, in this way, to pressure the government to accede to their demands. In addition, these attacks assure them greater coverage in international media (Ritcher and Waugh, 1986).

One of the main consequences observed in all those papers is that political instability leads to a fall in tourist flows, regardless of whether tourism is the direct objective of the agents involved. For example, countries with authoritarian governments or where human rights are violated, at least facing the international community, experience a lower flow of tourism compared to the rest (Neumayer, 2004). Also, most of the works coincide in pointing out the existence of a lag of between three and nine months between the event being analyzed and the fall in tourism, probably as a consequence of the seasonal contracting systems of the sector (Enders and Sandler (1991), Pizam and Fleischer (2002), Bertrand et al, 2004). In terms of recovery time depends on certain factors such as the intensity of the conflict, the frequency of terrorist events and the involvement that the tourism sector has in them (Fletcher and Morakabati, 2008, Pizam, 1999, Drakos and Kutan, 2003, Bruck and Wickstorm, 2004; Frey et al, 2004; Morakabati, 2007).

Moreover, various articles have discovered the existence of two more effects of political instability in tourism: the contagion effect and the substitution effect. The first one known with the term generalization or simply spillover is provoked when a country has a negative image and that image is transmitted to a group of countries that share common characteristics. This spillover effect is the result of biased media coverage and lack of geographical knowledge among Westerns (Taylor, 2006). For example, Beck (2014) finds that Morocco is affected to belong to the same region as countries that are in conflict such as Tunisia and Egypt. On the other hand, this same author finds that UAE has benefited from the conflicts that occurred in the countries of the MENA region, experiencing a substitution effect. This effect is caused when tourists replace tourist destinations that are involved in some conflict by others with similar characteristics. The degree of substitution will depend on the specificity of the country's attractions (Neumayer, 2004). Although it is true, there is some disagreement in the literature on which of the two effects prevails in a given region (Wall, 1996).

4 SYNTHETIC CONTROL METHOD

Often, researchers have tried to evaluate the effect of an event that affects economic activity by comparing the behavior of economic agents affected by this event with others who have not been exposed to it. The main problem lies in finding appropriate controls, that is, agents or individuals that, on the one hand, resemble the treated unit as much as possible but, on the other hand, have not been affected by the event or, as specifies in these methodologies, by the treatment.

In experimental studies, this problem is solved through randomization. For example, in clinical studies, the effect of a treatment is compared between those who have been provided with such and those who have not been provided. Randomization therefore ensures that if the sample is large enough, both the units used as control and those treated will have similar characteristics.

In economics, this type of experiment is more restricted because the units are often not people, but regions or countries, making it more difficult to search for adequate controls. In order to overcome this problem, different methods have been used, as is the case of the differences in differences model. The difference in differences method contrasts the differences in the results of a population enrolled in a program (treatment group) and an unregistered population (control group), controlling for the fixed and unobservable characteristics of both groups and under the assumption that these characteristics remain unchanged. This means that this method allows the existence of unobservable confounders but restricts the effect of these confounder to be constant in time, so that they can be eliminated taking differences. This last assumption could have been relaxed thanks to the adoption of the Synthetic Control Method. This procedure, which is

⁵¹⁹ For a more detailed study of the various estimation methods see Gardeazabal (2010)

essentially similar to the previous one, allows the effect that unobservables have to vary over time (Abadie, Diamond, and Hainmueller, 2010).

Intuitively, the synthetic control method tries to estimate the effect of the treatment by comparing the effect on the observed variable and the counterfactual or synthetic construction as a weighted average of some units used as controls. This procedure is carried out in such a way that said weights are chosen so that the characteristics of the units used as controls are as similar as possible to that of the unit treated.

Formally, it is assumed that there is a sample of $J + 1$ units indexed by j , among which there is a unit that is going to be treated $j = 1$, with the remaining units ($j = 2$ to $j = J + 1$) being potential controls⁵²⁰. In this context, it is called T_0 to the periods prior to the intervention and T_1 to the subsequent periods so that the total period of study is T ,

$$T = T_0 + T_1$$

The synthetic control is represented by a vector $(J \times 1)$ of weights $W = (w_2, w_3, \dots, w_{(j+1)})$ where w_j is between $[0 - 1]$ for $j = 2 \dots J + 1$ and $w_2, w_3, \dots, w_{(j+1)} = 1$. That is, it is a set of weights that will be applied to the variable under study but for untreated units, so that they replicate the variable under study before treatment for the unit treated and serve to construct the counterfactual or synthetic after the treatment. By forcing the weights to add up to one and to be non-negative, the problem of extrapolation is avoided (Abadie and Gardeazabal, 2003). Those weights will be chosen so that the characteristics of the synthetic control are as close as possible to the characteristics of the unit treated

Let $X_1(k \times 1)$ be a vector containing the values of the characteristics belonging to the pre- treatment period for the treated unit and let X_0 be a vector $(K \times J)$ that collects the same values but for the units in the control group. These characteristics, also called predictors, will try to explain the outcome variable, so lags in the outcome variable can also be included as predictors (Abadie, Diamond, and Hainmueller, 2015). The inclusion of this type of predictors solves the problem of the omission of relevant predictors since the effect includes the effect of any variable, whether or not it has been included in the model (Ferman, Pinto, and Possebom, 2016). These variables will be used as predictors of the outcome variable in the preintervention period because they are not precisely affected.

The differences between the characteristics of the unit treated and the synthetic control in the pre-treatment period is given by the vector $X_1 - X_0W$. Those weights W^* will be chosen in such a way as to minimize the difference, that is,

$$\sum_{s=1}^k v_s (X_{1s} - X_{0s}W)^2$$

Where $s = 1 \dots k$, let X_{1s} be the value of the sth-variable for the unit affected by the treatment and let X_{0s} be the vector $(1 \times j)$ containing the values of the sth -variable for the units in the group of control and be v_s indicates the relative weight that is assigned to each predictor. There are several ways to choose the optimal weights of the predictor variables. In this paper the weights will be chosen in a way that minimizes the prediction error, that is to say that v selects the W that minimize the RMSPE during the pre-treatment period (Abadie, Diamond, and Hainmueller, 2010).

Finally, let Y_{jt} be the result variable for unit j at time t . Denote as $Y_1(T_1 \times 1)$ the vector that collects the values for the result variable after the intervention for the unit treated, that is, $Y_1 = (Y_{1T_0+1}, \dots, Y_{1T})$. Similarly, let Y_0 be a matrix $(T_1 \times J)$ where column j contains the values of the outcome variable after the intervention. The synthetic control estimator is calculated as follows:

$$Y_{1t} - \sum_{j=2}^{J+1} w_j Y_{jt}$$

One of the main advantages of the SCM is the possibility of comparing the units used as controls. This is because the synthetic control makes explicit the relative contribution of each control unit to the counterfactual of interest and the similarities or differences between the affected unit and the synthetic control in terms of the predictors. This eliminates the discretion that the researcher can impose in the selection of the control group, replacing it with a data-driven process that looks for those units within the control group that most resemble the unit treated.

On the other hand, one of the main criticisms that has been made about this method is the lack of guidance when selecting predictors (McClelland and Gault, 2017). A possible solution could be to select those predictive variables that minimize MSPE during the pre-treatment period. This is because if the model is correctly specified, the MSPE corresponding to the pre-treatment period should be close to zero because the units in the control group are not affected by it (Ferman, Pinto, and Possebom, 2016).). Furthermore, there is no guide to how many linear combinations of the outcome variable should be used as predictors. While some authors use the variable lagged result for all periods as predictors (Bilgel and Galle, 2015, Kreif et al, 2016, O'Neill et al, 2016), Klößner, Pfeifer, and Schieler (2016) discourage this specification since although it improves the adjustment during the period before the intervention, it eliminates the effect that other

⁵²⁰ It is assumed that a balanced panel is available and the sample contains a number positive of periods before and after the intervention.

covariables may have on the outcome variable. In this way, the weight given to the set of lag variables can cause a bias in the estimator since the eliminated covariables are not taken into account to predict the values of the outcome variable in the period after treatment.

In order for the synthetic control method to be correctly used, a series of conditions must be met: 1) Only the treated unit must be affected by the treatment, since it is a necessary condition for the use of the controls. It is of particular relevance to analyze the existence of spillover since, in the case of any, the affected units should be eliminated; 2) There should be no previous effects to the treatment since if there were the comparison between the synthetic control and the unit treated would be biased. If there is one, this problem can be solved through a readjustment in the year of the beginning of the treatment; 3) The counterfactual created by the synthetic control must be approximated by a fixed combination of the units used as controls; 4) Synthetic control should have a structure similar to that of the treated unit, that is, that the variables used as predictors should be similar to the observed variables of the unit treated. If there is a difference, then the divergence between the outcome variable of the unit treated and the control could be due to structural causes and not to the effect of the treatment itself (Matta, Appleton and Bleaney, 2016)

Since the series of seminal publications that gave rise to the synthetic control (Abadie and Gardeazabal, 2003, Abadie, Diamond and Hainmueller, 2010, Abadie, Diamond and Hainmueller, 2015), there has been a great profusion of papers that have used this method to analyze the effect of natural events (Du Pont and Noy, 2012; Cavallo et al., 2013), political events (Abadie et al., 2014; Gautier et al., 2009) and economic events (Billmeier And Nannicini, 2013; De Angelo and Hansen, 2014).

5. DATA AND IDENTIFICATION OF AFFECTED AND BENEFITED BY THE ARAB SPRING

The basic information used for the evaluation of the effect of political instability originated in the MENA area by the Arab Spring comes from the Compendium of Tourism Statistics prepared by UNWTO. Specifically, as a result variable (on which the analysis is carried out) the total of the visitor (overnight visitors) has been selected. As regressors, the rest of the variables included in this database were initially selected under the rubric of Basic Data and Indicators, eliminating the countries and variables that presented a greater number of omitted data. Finally, basic information has been provided in the form of a balanced data panel for 169 countries or destinations and 42 variables, although from them up to 34 additional ratios have been built. From these 76 variables have been selected those in a joint regression of all of them against the entry of tourists have a p-value less than 0.05, which has reduced the number of variables to 55 (32 of the original and 23 of the calculated ones). The list of countries and variables considered can be found in the Appendix.

As it is indicated in the introduction, one of the key issues is to define precisely both the affected countries and the beneficiaries of this political instability caused by the Arab Spring. For this, three steps are followed: a) identify the countries where the event occurs and, from them, evaluate in which the inbound tourist flows have been damaged; b) identify the origins of these tourists to see their substitutes in those markets; c) identify the countries that could have benefited from the diversion of tourists from the markets indicated in b).

To identify the affected countries, the first thing that has been done is to consult different sources in order to offer a broad list of countries that suffered some type of protest or conflict that may be related to the Arab Spring. The list of selected countries is as follows: Western Sahara, Tunisia, Algeria, Jordan, Oman, Egypt, Yemen, Djibouti, Sudan, Iraq, Bahrain, Libya, Kuwait, Morocco, Mauritania, Lebanon, Saudi Arabia, Syria and Palestine. From this list of countries and the availability of information, the evolution of tourist flows before the event (2007 to 2009) and during its effects (2012 to 2014) and after it, but coinciding with the increase in terrorism, is analyzed. in the area (2015 to 2017).

As it can be seen in Table 1, the three countries that truly seem to have suffered the effect of the Arab Spring are Tunisia, Egypt and Yemen. The rest of the countries have had changes both downward and upward, but of a moderate magnitude. Therefore, these three will be taken into consideration for the concrete analyzes of countries. However, to solve possible problems of contamination of the sample of the rest of the units with which the synthetic is calculated, the other eight economies of those previously mentioned as affected are eliminated from which data are available before and after the event⁵²¹.

Table 1. Tourist Arrivals and market share in the International Tourism Market

521 These countries eliminated from the sample of units with which to build the counterfactual are Lebanon, Saudi Arabia, Morocco, Algeria, Jordan, Oman, Bahrain and Kuwait. For Mauritania, Sudan, Djibouti, Somalia, Iraq, Syria and Libya, full information was not available, so they were previously eliminated.

	Pre-Arab Spring 2007-2009		During Arab Spring 2012-2014		Post-Arab Spring 2015-2017	
	Annual Tourist Arrivals	Market share	Annual Tourist Arrivals	Market share	Annual Tourist Arrivals	Market share
Slight impact						
Lebanon	1398	0,15	1332	0,12	1693	0,13
Sudan	432	0,05	617	0,06	800	0,06
Saudi Arabia	12395	1,35	16788	1,53	17065	1,37
Djibouti	51	0,01	63	0,01	71	0,01
Kuwait	283	0,03	268	0,02	199	0,02
Morocco	7876	0,85	9901	0,90	10608	0,84
Moderate impact						
Algeria	1809	0,20	2556	0,23	2020	0,16
Jordan	3650	0,40	4032	0,37	3967	0,32
Oman	1372	0,15	1415	0,13	2260	0,18
Irak	928	0,10	1002	0,09		
Bahrain	5319	0,58	5812	0,53	9571	0,76
Strong impact						
Tunisia	7203	0,79	7171	0,65	6043	0,48
Egypt	11607	1,27	9999	0,92	7509	0,60
Syria	5227	0,57				
Yemen	1000	0,11	961	0,09	367	0,03
Libya	36	0,00				

Once the three affected economies have been identified, we have proceeded to evaluate which are the countries of origin that have possibly diverted tourists to alternative destinations. To achieve this goal, the information provided by UNWTO on the bilateral flows of tourists received in these three countries has been used and compared information for the period before the Arab Spring (2007 to 2009) with that obtained for the post-Arab Spring period (2015 to 2016). The aggregate results for the three economies are presented in table 2. In total, the three economies lost 7.43 million tourists (in absolute terms and without considering possible growth of tourism between both periods), although this figure is the result of a loss of 8.92 million tourists from the origins that decrease their tourist flow and a gain of 1.49 million from other origins that increase it.

	Average annual tourist arrivals		Change	
	2007-2009	2015-2016	Absolute	% on total loss/gain
France	1.898.269	547.005	-1.351.265	15,15
Italy	1.462.140	310.106	-1.152.034	12,92
United Kingdom	1.492.935	668.121	-824.814	9,25
Libya	2.212.732	1.442.113	-770.619	8,64
Germany	1.674.257	1.011.598	-662.659	7,43
Poland	640.023	155.345	-484.678	5,43
Russian Federation	1.936.193	1.560.006	-376.188	4,22
Belgium	360.029	110.747	-249.283	2,79
Spain	262.435	39.958	-222.478	2,49
Netherlands	343.687	130.921	-212.767	2,39
Switzerland	272.796	90.988	-181.808	2,04
Austria	275.601	115.859	-159.742	1,79
Sweden	187.434	53.024	-134.411	1,51
United States of America	337.554	208.888	-128.667	1,44
Japan	123.157	19.207	-103.951	1,17
Hungary	104.271	29.401	-74.871	0,84
Norway	77.840	12.821	-65.019	0,73
Syrian Arab Republic	124.792	61.030	-63.762	0,71
Finland	74.449	10.850	-63.599	0,71
Loss in tourist arrivals			8.919.315	100,00
China	84.306	153.808	69.502	4,67
Sudan	166.323	239.702	73.378	4,93
Belarus	0	101.807	101.807	6,84
Ukraine	0	394.293	394.293	26,49
Algeria	1.007.042	1.677.997	670.955	45,08
Gain in tourist arrivals			1.488.413	100,0

Taking into account only the 24 origins indicated in this table that represent more than 80% of the losses and 90% of the profits, we proceed to identify the possible alternative destinations that have been able to replace the three affected economies. To do this, we proceed to use information on tourist flows abroad issued by each of these 24 destinations, according to the information offered by UNWTO. To proceed with this identification, the pre-AS quota of the three affected economies (Tunisia, Egypt and Yemen) is compared in each of the indicated origins and compared with the one presented in the post-AS period. If there is a drop in the quota at the origin, the loss of quota that these three destinations haven had among the destinations that have increased their quota in the two analyzed periods is proportionally assigned.

Doing this, it is possible to estimate the possible beneficiary destinations and the amount of this deviation, as a result of the loss of quota of these three countries. The computation is carried out country by country and afterwards, the results on possible winning countries are presented in table 3. From this list, possible winners of tourists have been selected as those who have any of the following four characteristics: a) earning more than 200,000 tourists, b) earning more than 100,000 tourists and representing at least 1% of its total tourist flow; c) a profit of more than 75,000 tourists and that at least represents 2.5% of the total tourist flow; d) tourist gain that exceeds 5% of the total number of tourists. For the selection of these potential winners, not only the jump between the pre and post-AS periods has been taken into account, but also between the pre and the during and between the during and post. This has led to the exclusion of 29 potential winners: Spain, Germany, Netherlands, Portugal, USA, Croatia, Greece, Italy, Thailand, Turkey, Austria, United Kingdom, Hungary, Ireland, Qatar, Indonesia, Sri Lanka, Iceland , Malta, Alabania, Slovenia, Cape Verde, Congo, Senegal, Togo, Niger, Guinea, Central African Republic.

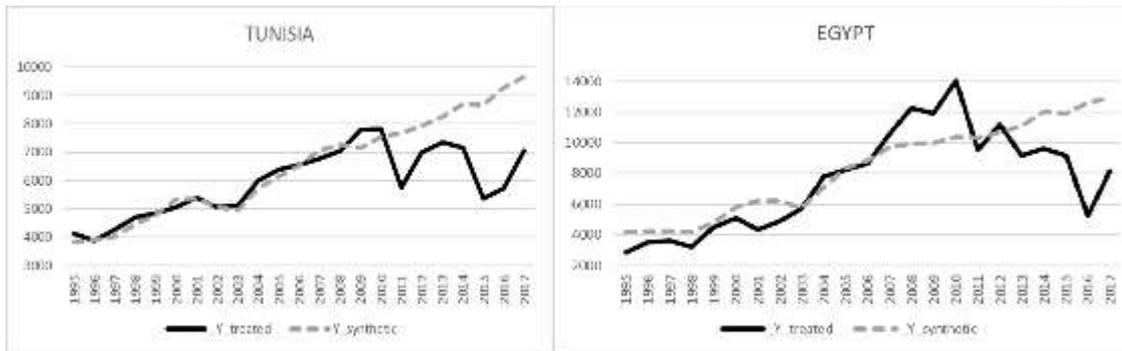
country	Estimated tourist gain	% of own tourist arrivals
Spain	1.055.590	1,47
Germany	649.539	1,84
Netherlands	503.491	3,27
Portugal	453.150	4,22
United States Of America	424.277	0,55
Croatia	337.881	2,55
Greece	317.208	1,31
Italy	299.341	0,58
Thailand	241.070	0,77
Turkey	232.187	0,67
Austria	217.681	0,79
United Kingdom	207.716	0,59
Hungary	193.706	1,31
Ireland	156.992	1,60
Qatar	110.324	3,75
Indonesia	109.735	1,04
Sri Lanka	104.155	5,41
Iceland	103.030	6,69
Malta	102.261	5,46
Albania	96.971	2,47
Slovenia	83.373	2,91
Cabo Verde	44.276	7,92
Congo	22.829	10,59
French Guiana	22.344	10,87

6 RESULTS

A set of countries has been selected with the aim of capturing the effect that the AS has had on the arrival number of tourists. The time period analyzed covers from 1995 to 2016, where the period 1995-2009 represents the pre-treatment period and the years 2012-2016 the post- AS. The selected countries are the following: Egypt, Tunisia, on the side of those affected and Spain and Thailand on the side of the beneficiaries. These countries have been chosen for the following reasons:

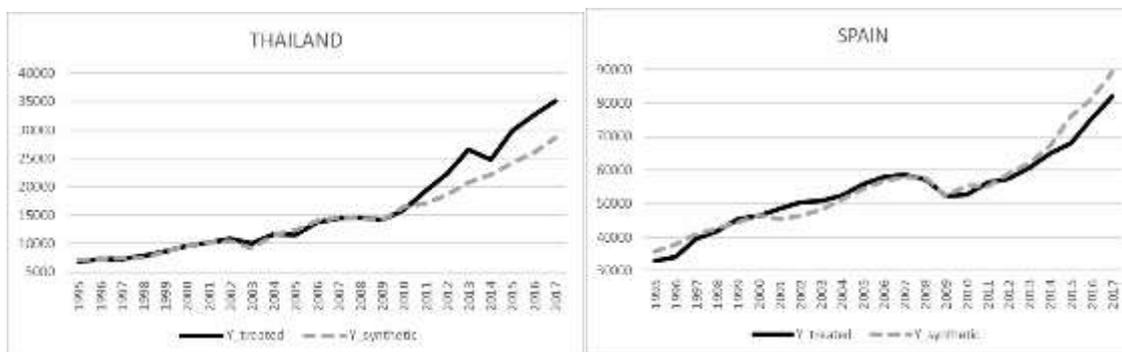
1. Because they represent beneficiary countries as affected countries, we intend to observe the substitution effect caused by political instability.
2. The choice of beneficiary countries is due to the fact that these countries, despite their different geographical situation, represent one of the markets in which the affected countries were specialized: sun and beach tourism.

Regarding the specification of the model, various specifications have been tested for the 4 countries, choosing the one that minimizes the RMSPE corresponding to the pre-treatment period. The goal is that the synthetic country replicates as well as possible the country observed during the previous years to the conflict so that any difference caused after the conflict can be attributed to the latter. To do this, apart from the variables selected in the Basic Data and Indicators from the UNWTO, several lags of the result variable have been added as a predictor variable.



As it can see in the following graphs, there are three periods clearly differentiated. First, there is the period before the AS where both countries experience a constant growth of tourism, more accentuated in the case of Egypt. Second, the period in which the Arab Spring begins coincides with the period in which Tunisia and Egypt suffer the greatest drop in the number of tourists arriving in the analyzed period. Finally, once the political conflict has ended, there is an increase in the number of tourists arriving, which is truncated with a surge in terrorist attacks in both countries.

For example, in the case of Tunisia, a drop in the number of tourists in 2015 can clearly be seen as a consequence of the attacks on the National Museum of the Bardo and the attack on Susa. As a result of these political events, Tunisia has lost about 2.5 million tourists, reaching 7 million arrivals but far from the 9.5 million that it would have reached in the absence of such conflicts. Finally, in recent years there has been a rebound in the number of tourists arriving in the Tunisian country, clearly conditioned by the absence of terrorist attacks and instability in the area.



As a consequence of the drop in the number of tourists arriving in the affected countries, it is expected to observe a displacement of those tourists to other regions or countries with similar attributes. In the case of the Southeast Asian country, the year 2010 represents a change in trend clearly influenced by political events in the MENA region. Thanks to these political events it is estimated that Thailand has gained 7.5 million tourists since the beginning of political instability.

The case of Spain deserves a separate explanation. Although at first it could seem the main beneficiary of the AS, the results obtained using the SCM indicate a negative difference with respect to the synthetic one, that is, the arrivalsof tourist to Spain should have grown more than it has happened. However, the difference between synthetic and observed is probably not significant due to the high level of RMSPE. This result coincides with previous investigations such as Perles-Ribes et al. (2016) where they find a non-significant relationship between the AS and the arrival number of tourists to Spain.

Although this result may seem paradoxical, it may actually be due to an explanation. As De la Peña et al. (2017) points out, Spain experienced a turistic crisis at the beginning of 2008, characterized by a drop in the number of tourist arrivals that does not begin to reverse until two years later. As a consequence of this change in trend, Spain would be recovering all the tourists lost during the last period.

Therefore, the increase in tourism in Spain could be due to a recovery of lost tourism and not to an increase in tourism as a result of the Arab conflict.

7. CONCLUSION

The Arab Spring has been a political event that has affected not only the countries of the area but also the rest of the world due to the importance of this region in terms of tourism. In order to calculate the displacement of tourism that has caused this political event, the main countries affected by the AS and potential beneficiaries have been selected through a procedure. Finally, the Synthetic Control Method (SCM) has been used to quantify the effect that this event has had on tourism. We have focused on analyzing two beneficiary countries (Spain and Thailand) and two countries affected (Tunisia and Egypt). In this way, we have found that the AS has meant a loss of 2.5 million tourists for the Tunisian country. While Thailand has benefited from this political conflict, for Spain no increase is observed.

This paper must be extended to the rest of affected countries and benefited with the objective of calculating the general effect that this conflict has had. Furthermore, to verify that the results we have obtained are true, various sensitivity analyzes must be carried out, such as the case of the falsification or placebo tests commonly used in this literature.

REFERENCES

- Abadie, Alberto, Gardeazabal, Javier, 2003. The economic costs of conflict: A case study of the Basque country. *American Economic Review* 93(1): 112–132.
- Abadie, Alberto, Diamond, Alexis, Hainmueller, Jens, 2010. Synthetic control methods for comparative case studies: Estimating the effect of California's tobacco control program. *Journal of the American Statistical Association* 105(490): 493–505.
- Abadie, Alberto, Diamond, Alexis, Hainmueller, Jens, 2015. Comparative politics and the synthetic control method. *American Journal of Political Science* 59(2): 495—510.
- Alesina, A., and Perotti, R. (1996). Income distribution, political instability, and investment. *European Economic Review* 40(6), 1203-1228.
- Enders, W., and Todd, S. (1991). Causality Between Transnational Terrorism and Tourism: The Case of Spain. *Terrorism* 14, 49–58.
- Groizard, J.L., Ismael, M., Santana, M. (2016), The economic consequences of political upheavals: the case of the Arab Spring and international tourism, pp. 1-8
- Matta, S. (2016). The Impact of Arab Spring on the Tunisian Economy. Policy Research Working Paper
- Neumayer, E. (2004): The Impact of Political Violence on Tourism, *Journal of Conflict Resolution*, 48(2), 259-281.
- Perles, J.F., Ramón, A.B., Moreno, L. y Torregrosa, M.T. (2016). Winners and losers in the Arab uprisings: a Mediterranean tourism perspective. *Current issues in Tourism*
- Wall, G. (1996). Terrorism and tourism: An overview and an Irish example. *Tourism, crime and international security issues*. In A. Pizam & Y. Mansfeld (Eds.), *Tourism, crime and international security issues* (pp. 143–158).

1398 MIGRATION AMONG THE TRIBAL GROUPS OF ARUNACHAL PRADESH

ABSTRACT

Migration and development are closely related. And there are numbers of studies in which this relationship and the causes for migration is widely discussed. New dynamics of migration is coming up with more and more in-depth micro level regional studies. Further Arunachal Pradesh is one of the least studied states located in the northeastern corner of India and it has been observed that the state is in the transitional phase of socio-economic development with some variation across the districts in the level of development and so the mobility pattern. The state is inhabited by more than 25 major tribes and most of them are agrarian societies in nature. Recent government induced employment and other developmental programmes are improving the economic opportunities. Social sector development varies from one tribal group to another due to socio –economic –political–historic-cultural reasons and so the migration. Given the above-mentioned background, it is noteworthy to know the nature and extent of migration among the tribals of Arunachal Pradesh. Hence in this study we have tried to assess the nature, extent causes and consequences of migration among the tribes of Arunachal Pradesh using the appropriate statistical tools.

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1473 LINKING LIVING THROUGH TIME AND SPACE: STUDY ON NEWLY SETTLED RESIDENTIAL UNIT IN SONARPUR-RAJPUR MUNICIPALITY, KOLKATA

ABSTRACT

Changing residence within urban residential areas is a process that changes lives of the people involved and also different composition of neighbourhoods chosen for time being as stepping stones or permanent unit to live in. As a part of spatial mobility, residential relocation or mobility also depends on numerous decisions, i.e. social, political, economic or educational, demand for better household and so on. Decision towards changing of residential area is often associated with homeownership and housing type. Another way, residential mobility even changes demographic characteristics and land use pattern to the place of newly arrived residential area. Frequency to shift residential units before finalizing the last place of residence also might be affected by urban economy, diversity of jobs, job opportunity, daily communication system between urban and suburb, urban policy and other factors. The present initiative is taken to unfold the residential relocation behaviour of the households and special emphasis is given to the reasons for relocation in terms of duration of stay in between residential location before permanent one and their livelihood strategy at the present place of living. In order to understand the whole scenario, urban fringe area within Kolkata Metropolitan District is a perfect choice over which this empirical study has been conducted based on well designed questionnaire survey to collect the main information along with measuring the changing trends of landuse pattern over three decades around final residential units. The study begins with using random sampling method and surveyed 220 households with heterogeneous characters. Study identifies households with respect to source region, period of stay at last place of residence prior to coming at present place and assesses the push and pulls factor behind their mobility. Quality of life, suffering index and Regression analysis used to address the reasons that might act as the main principal factors that affect residential mobility several times even the frequency of residential relocation taken place two to five times. This study also discloses their economic structure and level of dependence for livelihood in different time intervals and level of adjustment to the new place of residence using priority index and housing affordability index. However, an increasing house rent, changing land value, unhealthy living environment, poor sanitation system, increase family size, terms and condition of rent house and aspiration of making a new own residential unit are key factors for further shifting household that would force them to search a residential units that are fitted for them. The whole process may help urban planner to understand the transformation nature of landuse patter over suburb areas in some alike city of Kolkata in developing countries. Key Words: Residential Relocation, Landuse Transformation, Suburb, Affordability, Livelihood

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SS15.2. Conflict, Migration, and Diaspora

1094 UNCERTAINTY OF LIVELIHOOD AND MIGRATION: A STUDY ON JALIAKHALI AND KAIKHALI VILLAGE, KHULNA ZILLA, BANGLADESH

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ABSTRACT

The birth of Bangladesh as an independent country from the regime of Pakistan was in 1971. Since becoming the part of Pakistan in 1947, everything in Bangladesh was under the control of Pakistan. But population movement from Bangladesh to India irrespective of religion was a very common phenomenon. Interestingly after 1971, the propensity of migration of Hindu families started momentum in compare to earlier periods in Bangladesh. Primarily the reason was associated with issue in which the Hindu who became the secondary citizen by default after the declaration of Islam as the state religion in 1988 but with the course of time immigration process pushed by various factors such as environmental problem i.e cyclone, river bank erosion, flood, socio-economic problems i.e unavailability of work, low wage etc. This initiative takes an attempt to find out the factors of response to migration and to identify the crisis of Hindu families as minority in Jaliakhali & Kaikhali villages Dakope & Assasuni Upazilla, Khulna Zilla, Bangladesh. Mainly two methods have been followed- Snow ball sampling and Random sampling along with group discussion, experts view, participant's observation to address the present livelihood status of the Hindu families. The Hindu populations over the study areas have confessed their willingness to be part of migration process and most of them are prepared to leave but rest of them are at the edge where they know that they may be evicted forcefully or voluntarily by various socio-economic and environmental factor. Jaliakhali and Kaikhali both were Hindu Dominated villages, still a significant number of Hindu families are still living in both villages. The distinct nature of response to willingness of migration made the study more meaningful. Jaliakhali is a village where environmental issues more intently affect the lives of people whereas Kaikhali is influenced by socio-economic causes. People who are from the grassroots of society, are mainly vulnerable and prone to migration, which are pushing them towards a life which is completely uncertain and unknown to them.

Key words: Migration, Vulnerable, Uncertainty, Environmental issue, Socio-economic issue, Displacement

INTRODUCTION

The liberation war in 1971 gave a birth of India's another neighboring country Bangladesh. After independence, Bangladesh outlined its own Constitution where secularism was one of the four fundamental principles (the other would be Nationalism, Democracy and Socialism). The Secularism principle was removed in 1977 by the 5th Constitutional Amendment and declared Islam as state religion in 1988. Since the declaration migration of Hindu families started increasing quite remarkably on account of the consequences of biased religion based cultural freedom among the significant number of citizens belongs to Hindu religion. At the beginning of independence of Bangladesh the emigration was related with the insecurity felt by the Hindu population. The communal riots, religious violence, minority harassment forced them to leave the country. Living environment becomes more challenging to Hindu as the proportion of Hindu population is being reduced. According to Population and Housing Census 2011, the percentage of Hindu population decrease 3.59 % from 1981 to 2011. As per census report, of Bangalesh, the Hindu population was 12.13% in 1981 which drops down to 8.54 % in 2011. And the capital of Bangladesh has the lowest number of Hindu population that would be 10.5% to total population of Dhaka followed by Barisal (11.70%) & Chittagong (12.65%) ¹.

Hindu families across the study areas are in the present phase where they are aware of the fact that the motherland will no longer give them the safe shelter. Due to several of socio economic and environmental reasons have continuously been pushing them to move out. The well known many Hindu families are getting vanished from their neighborhood. The present dwellers don't know how long they can stick to their goal to not leaving their native place. People generally to response to migration when the dormant physical and socio-economic factors aggravated their decision for migration.

OBJECTIVES

The principal objectives of this study are

- To identify the factors determine migration and living condition of the Hindu families in the study areas
- To analyze the willingness and phase of preparedness for migration at present and in near future.

STUDY AREA

Jaliakhali is a village Kamarkhola Union of Dakope Upazilla, Khulna Zilla under Khulna Sub-division of Bangladesh. Dakope Upazilla has 9 Unions in which Dakope itself called an Union. On the other hand Kaikhali village is under Assasuni Union, Satkhira zilla, Khulna zilla under the Khulna subdivision. Satkhira upazilla is the easternmost upazilla which share the international border with India.

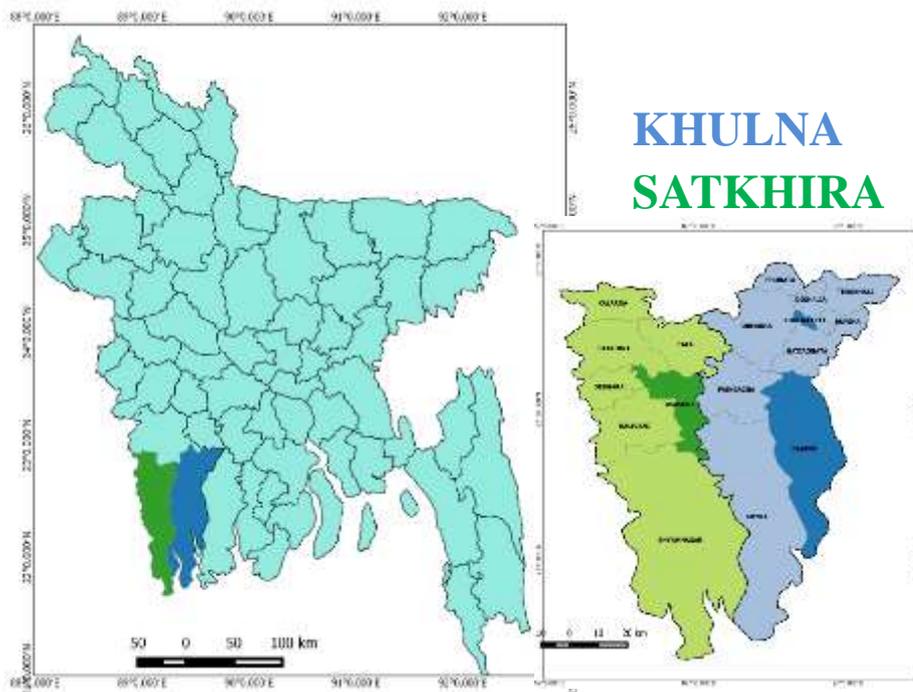


Figure 1: Location map of Study area

DATABASE AND METHODOLOGY

The work has been divided into several phases. Prior to field, in field, post field. Prior to field a detail literature study has been done following by selection of the study area and secondary data such as book, journals, census data also been collected. In field, interview & interaction, discussion with the household members has been done followed by expert's opinion and views also been considered. The post filed work mainly consists with data that have been collected from field which has been generated, compiled and processed for analysis. The primary data further divided into Qualitative and Quantitative. Group discussion, observational data and participant's observation grouped under Qualitative data and individual household survey under quantitative. The entire research work classifies into three group correlation, descriptive, explanatory research work.

RESULT AND DISCUSSION

Phase of preparedness before migration

Migration may be of forced or voluntary. When the migration is induced and caused by external forced is called forced migration and if the migration is caused by the people themselves for fulfill their own desire is called voluntary migration. In Jaliakhali, migration took place due to the embankment breaching so it is better to call as 'Displacement' instead of migration. The people of Jaliakhali were displaced from their previous residence 'Choto Jaliakhali' due to Aila in 2009. After the devastating cyclone they shifted to the backward part of previous Jaliakhali. The area is retreating due to continuous river bank erosion. Now the people of that village demand the permanent solution of every year shifting residence due to natural disaster.

On the other hand, in Kaikhali village, the Socio-economic problems are more dominant than environmental factors. Better employment opportunities, secure living environment, better future for next generation in terms of education, healthcare and other livelihood opportunities pull the people from Kaikhali and as a result voluntary movement is taking place.

As per the present survey, many Hindu families in both villages have good connection with their relatives and neighbours (who have settled themselves earlier in different parts of West Bengal, India). Among the respondents, 95.94 % have visited India and among them 53 % have own land in India mainly in West Bengal. Only 47 % did not buy land any land but still they have been trying to do the same.

Few respondents said that land buying process was not easier for them who don't have any legal document related with Indian citizenship. For them to buy land in India, firstly they need identity proof which helps to prove them as a permanent citizen. As per one of the respondents Smt. Rina Ray, 67 years old woman who had crossed international border (between India and Bangladesh) without passport with his son and husband several times and said "the land brokers are very active in those places (in West Bengal, India) where they bought the lands and for doing the so brokers have been paid a larger amount of money". So the entire process from crossing the boundary to settle down in India is done through some steps i.e. Firstly, entry to India through porous border with the help of brokers (may be called migration smugglers) who take the risk to make illegal migrants cross the international border for getting a lump sum as bribe from illegal immigrants. This kind of unlawful racket is prominent both sides of international border. Although

this illegal activity is more popular in Indian side than Bangladesh. Secondly, after crossing boundary migrants like to take a temporary shelter in those places where their relatives or people coming from Bangladesh earlier and settled up permanently in India. Thirdly, after staying some days at relatives house or or others, they try to take different ways for making different identity cards which also be done through brokers or local political leaders of India by offering bribe.

Willingness and desired place of migration

It is well known fact in the process of migration that both places mean place of origin and place of destination create opposite situations which might attract people and encourage people to leave the place. Some attracting factors at place of destination have already been mentioned earlier. Let us see the factors prominent at place of origin which lead to move out the people. Firstly, some natural factors like land loss due to flood, cyclone, extensive rainfall, river bank erosion are prominent mainly in Jaliakhali village. Secondly, a continuous changing well known traditional society's structure is being affected due to gradually reducing the number of Hindu population. Thirdly, parents of daughter with 15-19 years of age feel insecure in thinking of their daughters' future. Before facing unwanted incidence with their daughters, parents give their daughter marriage before even 18 years of age with groom of same religion. Fourthly, less job opportunity, adverse job environment along with low wage influence them to take decision for the future. Mentioned above factors are interrelated that lead to uncertainty of life. All these dormant factors might aggravate their willingness to move out from the motherland. Although they all have a wish for leading their live in a well manner at present place of living but the hidden desire for willingness to migration is gradually increasing among the Hindu families. Many of the respondents have confessed that they have an alternative shelter in West Bengal but most of them are trying to be part of the citizen of India in near future only for the insure day to day life at place of living. All of these stimulating factors that boost up or aggravated the willingness for migration for those who are at the threshold or near to threshold.

Response to migration can also be applicable for those who desire to lead their lives in coming days better than present life. But in this study the situation is applicable for the vulnerable group mainly the Hindus over the study areas who are not at the edges where they every day are experiencing the numerous challenging related with their life and livelihood. In many countries of developing world, many things in everyday life are directly and indirectly influenced by religion, caste, race, ethnicity etc. In this case, religion does play a foremost leading reason of the study area especially with them who are already minority. The existing 8.54 % Hindu population every day are leading life with different ideas, interests, liking, behaviours, and values from culture of most of the people in Bangladesh.

It can be discussed taking example from two surveyed villages. Jaliakhali is a village where environmental factors are more active in changing the life of dwellers whereas the social-economic factors are playing vital role in shaping the migration decision in Kaikhali. The people of both areas more or less suffered with all the issues discussed earlier. Viability of living condition at Jaliakhali and Kaikhali has been observed in three different manners. Firstly, living conditions that are favorable for the people having no issues with the live and livelihood can be termed as viable. Secondly, those who are gradually affected by the factors which earlier were in favor of them, but in course of time the factors interrupted their lives frequently can be termed as Moderately Viable. Lastly, those who are badly affected with the present factors to leading their lives more efficiently can be termed as less to very less Viable. It can be said that as per the level of viability, people of different categories may respond to migration process. Migrants always follow a path or routes that mainly are used by people moved out earlier or are used by the following immigrants. People try to seek a new accommodation where they can adapt fast than any other place in the world. The process of migration always needs a stimulating factor, that can be negative for the place of origin for the emigration and the same can be a advantage of the place of destination of the immigrants. Here, the environmental problems became negative for the dwellers of Jaliakhali stimulate them to migrate into the area of less frequently occurrence of natural disasters. On the other hand, less job opportunity, low wage, insecurity of young growing daughters' life and newly married wife, children and their education all are the stimulating factors for the inhabitants of Kaikhali village, where people are not able to cope up with the living environs, maximum of the residents of Kaikhali have relatives in West Bengal, India, and a significant number of Hindu families have already sent their young daughters, son or daughters who can get better education, young son who are eligible for pursuing a job to their relative who are living in West Bengal.

Response to migration prominent over Jaliakhali & Kaikhali, Bangladesh

The people who are in the state where the surrounding situation is not in favor of them are called vulnerable. If the condition is adverse to the vulnerable group they may be suffering from numerous negative conditions which are not desirable for them. The response to migration is the concept related to the most vulnerable group of society who are at the edge in which the circumstances in which earlier their living is in the challenge. The response may be induced by various factors related with Environment, political, social or economic.

In the study areas Jaliakhali & Kaikhali, living conditions are becoming difficult. Jaliakhali was affected by cyclonic disaster Aila in 2009, after that the land condition for cultivation becomes unfavorable. Salinity intrusion, destruction of living habitats, huge loss of domestic animals, embankment breaching, extension of river within agricultural field after Aila have altered the balanced condition of living. People of Jaliakhali are now living in few meters apart in the village Jaliakhali, earlier they lived into Choto Jaliakhali. Each of the villagers has lost land due to Aila event, remaining lands are now they using for dwelling purposes. A very less amount of land are left for Agricultural and fishing lands. In this situation they cannot keep faith on their destiny, because every year they cannot bear the devastative natural disasters. Flood and river bank erosion overthrowing them from their dwelling units. So the displaced person now wants a

permanent solution. These is the condition in which people of Jaliakhali do now response to migration, where some of them are prepared to take the risk of uncertain future of a new place, and some of them are waiting till the last.

The main reasons which force people out from their motherland are the **Socio-political** and **Economic** and **Environmental in Kaikhali**. Each of the reason has a push force which induces the people to leave their home land. As the environmental problems associated with the lives of the resident of Jaliakhali and Kaikhali, other two prominent forces are now showing with the help of the diagram

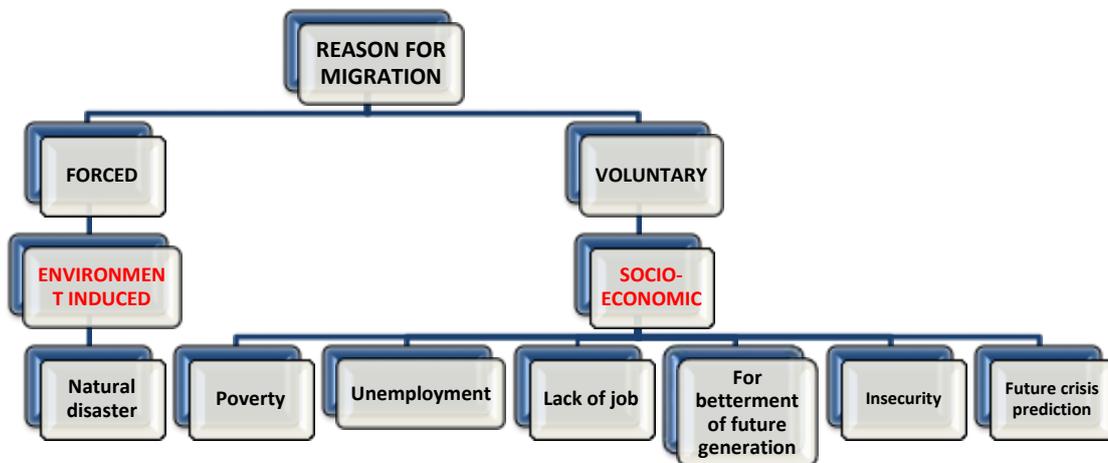


Figure 7: Reason leads to move people out from the study area (Jaliakhali & Kaikhali)

MAJOR FINDINGS:

The trend of immigration from the eight neighboring countries of India, Bangladeshi immigrants are highest in number and the proportion is gradually increasing in proportion. As per recent estimate as of 2017, about 5.2 million outsider are living in India. According to Census 2001 of India, the number was 3,084,826 from Bangladesh highest among the rest. In 1991 the amount was 591,572, so Decadal variation (in %) during 1991 –2001 for Bangladesh is - 52.7 %. According to UN data, more than 7.8 million people of Bangladeshi origin were living in 89 countries of the world in the year 2013. The main host countries are India (3.2 million Bangladeshi migrants) highest among all.³ There are some interesting findings of the present study

1. The people of Bangladesh find themselves near to the neighboring Indian people as they share the same language, culture and identity. It is very obvious for human that they try to seek accommodation where the adaptation strategy become fast. The similar cultural identity gave the comfort to the Bangladeshi’s since before India’s independent. Although better job prospect they can found anywhere the world but the communication as well as the similar identity they will not found, in this regards India has an extra advantages, especially in West Bengal where the adaptation strategy for accommodation, integration and assimilation are faster than anywhere in the world particularly for the Bengali’s
2. Bangladesh is surrounded by India and it share 4095 km of border with the nearest neighboring country. The migration took place since before the country gets there independence, and the recent trend of migration took the path or route of migration which was keep up the practice of immigration into India.
3. The history of seek for better opportunity at neighboring country India, still followed at the bordering zilla of Bangladesh, and not only that searching a better prospect for own as well as for future generation is spreading up rapidly.
4. The Land exchange process that was the exchange of land between dwellers of two difference area took place after the independence of India. the residence of India exchange their land with the residence of east Pakistan, one of them was sri Pallab Bhattacharya who exchange 65 Bighas of land with a Muslim at Khulna City Bangladesh, and get only 35 of Bigha of land at Barasat which account for Rs.... in 1968, now the 83 years old man is a permanent residence of South Kolkata, West Bengal, India.
5. In most of the cases Hindu sold the land to the Muslims in a very lower rate. The reason behind this was, **Firstly**, Hindu’s does not wants to stay in Bangladesh so Hindu Family do not buying a new land and made investment for a land in Bangladesh. **Secondly**, the Hindu families does not have the sufficient money to buy a new land, as per their view “if I bought a land, I will bought it in India” so they are not willing to stay in Bangladesh and buy a new land. So it is very obvious for a Hindu to sell the land to a Muslim and in that case they are paid a minimum amount for that land by them

CONCLUSION:

Migration is an adaptation strategy which shows how people accommodate, integrate and assimilate into a completely unknown environ. Although people try to follow those path or routes and accommodate in which previously his/her neighbor friends or relatives have pursue. It can conclude from the study that the process of immigration from Bangladesh to India has induced by various type of reason. The reasons are mainly varies with distance from main city

and differ from place to place. People who are from the bottom of the society they are mainly vulnerable and prone to migration, due to different environmental social and economic factors which are push them towards a life which is completely uncertain and unknown to them. All the factors are equally affecting the dwellers; it also varies with time and space. It is a phenomena which cannot be stopped, people would move from one place to another due to various of reason and the place of migration also be the choice of the migrants but in case of the study area as the living condition is not in favor of them so it has been predicted migration would be occur either with their own country or into their desire place India, until their uncertain future get a secure shelter.

REFERENCE:

Shakil, H.R., (2013): Systematic Persecution of Religious Minorities: Bangladesh Perspective, Journal of Humanities and Social Science, e-ISSN: 2279-0837, p-ISSN: 2279-0845. Volume 7, Issue 3 (Jan. - Feb. 2013), PP 09-17

Census of India data highlights migration table 2001

<http://www.un.org/en/development/desa/population/migration/data/estimates2/estimatesorigin.shtml>(accessed: 30-8-2017)

Nandy, Chandan., (2005): Illegal Immigration from Bangladesh to India: The Emerging Conflict

Das, Pushpita., (2016): Illegal Migration From Bangladesh, Deportation, border fence and work permits, IDSA Monograph Series Vol. No 56

Goldfinch and Khan., (2010): Cyclone Aila Joint UN Multi Sector Assessment & Response framework, UNDP

1102 ENVIRONMENTAL CHANGE AS A 'THREAT MULTIPLIER': THE CASE OF MIGRATION

ABSTRACT

At a time when migration has become one of the biggest challenges that the European Union confronts, the debate surrounding the role of environmental factors like disasters in fuelling conflicts in the Middle East and North Africa (MENA), causing migration, is gaining momentum. After finding links between the Arab Spring and climatic factors, now climate security analysts have found ostensible links between environmental change and the ongoing civil war in Syria – mainly the mishandling of the worst long-term drought that had plagued the country since 2006. At the same time, attempts to correlate migration with climate change have also been disparaged by a significant number of scholars, according to whom this is a deterministic thesis that has no empirical basis and is an over-hyped contention, especially in a politically and ethnically divided region like MENA. In academic literature concerning climate change, the term 'climate refugee' continues to find place, especially to evoke security implications of climate change. The Paris agreement (COP21) also takes note of migration and seeks to establish a "task force" to "develop recommendations". However, the deeply political nature of the issue forced the parties to avoid any legally-binding obligations as well as the Pacific Island countries' clarion call to create a "coordination facility" for managing climate refugees. First of all, international law does not recognise "environmental refugees", which renders the act of rehabilitation and enforcement of accountability difficult. Secondly, while referring to migration, countries' position has traditionally been pinned on socio-economic and political crises rather than environmental ones. For instance, while referring to 'illegal' migrants from Bangladesh to India, the latter has insisted at the policy level mostly that this has very little to do with climate or environmental change. Thirdly, even while talking about migration caused or exacerbated by environmental change (slow disasters like droughts or sea level rise), a large amount of focus is on inter-state migration and not as much on intra-state migration, which is happening already on a large scale across the world. It has emerged as a cause for livelihood insecurity and erosion of the natural resource base, leading to rural-to-urban, coastal-to-inland and other forms of migration, putting excessive pressure on the available resources. Against this backdrop, the paper will delve into the international debates surrounding environmental migration and 'refugee' using a two-layered approach – law and policy/governance. It will look into international law dealing with 'migration' and 'refugee' and problematise them in the context of environmental security and how theoretically, migration has been recognised as a security implication of climate change. Two cases – Bangladesh (affected by not only annual flooding and cyclones but also effects of climate change like sea-level rise) and the Pacific islands (mainly climate change and increasing frequency of storms) – to provide an overview of the challenges posed by migration to international law, policy and governance mechanisms. The paper will analyse the lacunae in international and regional policies in terms of tackling environmental factors that act as 'threat multipliers' and provide recommendations on filling them through diplomatic initiatives.

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SS15.3. Conflict, Migration, and Diaspora

1541 THE EFFECT OF IMMIGRANTS' SPATIAL CONCENTRATION ON THEIR LABOR MARKET PERFORMANCE - EVIDENCE FROM EU IMMIGRANTS LIVING IN GERMANY

ABSTRACT

Does residing in ethnic communities limit or foster the prospects of immigrants' labor market integration? This question has spurred political discussions and research in both labor and migration economics. Since the direction of the overall effect is theoretically ambiguous, the net effect is most of all an empirical question. We investigate if immigrants' labor market performance depending on whether they live in an ethnically concentrated region or not. During the last years, Germany has established its status as immigration country and as most important receiving country within the European Union. Ongoing EU enlargement, including freedom of movement and constantly declining unemployment attract further migration from Southern Europe affected by the crisis in 2008. As a result, we can observe a concentration of different migrant groups in certain local labor markets. However, also empirical evidence on the direction and magnitude is mixed. On the one hand, Edin et al. (2003) and Damm (2009) find a positive wage premium for immigrants living in ethnically-concentrated areas in Northern Europe. On the other hand, studies conducted for the US indicate that it lowers labor market integration regarding language ability and earnings (e.g. Cutler

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1598 THE ENVIRONMENTAL MIGRATION OF ANDAMAN ISLANDS

ABSTRACT

Due to the direct force of nature or indirect human activities if there is any deterioration in the natural environment or hazardous situation prevails at a particular place at a particular given time which is not suitable for human settlement then the inhabitants of that place is forced to leave their original place of habitation and move to a comparatively safer places, that movement is termed as environmentally induced migration or environmental migration. To justify this statement and find out the actual problem we have chosen the Andaman Islands which is a union territory of India and located in Bay of Bengal. After 2004 so many people migrated from Andaman due to the large-scale destruction caused by tsunami and also due to fear of future natural calamities. Maximum migration took place from Andaman to mainland India. Bengali speaking people moved to West Bengal and adjoining areas and also people migrated to South India as per their ethnicity. The objective of this study was to obtain migrated population, and their pattern of migration, its effect on the socio-economic structure and behavioral changes. The study was based on the statistical analysis, for this purpose two types of investigation were carried out. One is through primary data collection and analysis which is based on field survey and second is by secondary data collection and analysis (data from the census of India and disaster-related data from the administrative office of Port Blair). Excel and SPSS were used as tools for data processing and statistical operation and also it was used for graphical representation purpose. ArcGIS was used for mapping purposes such as demarcating the study area, high and low migrated area etc. The study also included the statistical operation like central tendency, dispersion measurement. Furthermore, mapping tools was used for overlay analysis to compare the different aspect and establish spatial co-relation among migrated people and the area. After the analysis of census of India data (2001 and 2011) and field observations, it is found that the migration took place from north Andaman to south Andaman (particularly port Blair city and its surrounding area) even though tsunami affected the north Andaman less than the southern-most part of Andaman (Nicobar district). The actual causes were that the people of Nicobar were not interested to leave their place because of their ethnic attachment to culture and nature, but north Andaman people migrated due to natural phenomena and better availabilities of services like administrative, educational, employment and entertainment. The people whose economic conditions were not good, migrated on the cost of leaving their own land. That's why a new mixed neo-cultural activities started where the migrated people settled, not only in the Port Blair but also in the other places around it. This observation provides the final result of this study.

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1605 BENGALI MIGRANTS IN MAJULI: NATURE, TRENDS AND CULTURAL ASSIMILATION

ABSTRACT

Human migration is a process of permanent or semi permanent change in usual residential area of an individual or a group of people from one geographical area to another. Majuli, a land with fertile soil and rich natural and cultural resources, but it is being isolated from other districts of Assam for its physical and cultural composition. The flow of Bengali immigrants started during the time of independence and continued till today due to the pull and push factors. The process and volume of Bengali migrants, from Bangladesh contributes a significant change of demographic structure of the district. The nature and dimensions of migration in the district, however, vary both spatially and temporally depending on the processes of development factors and reasons behind of migration. This illegal migration adversely effects on social, political and cultural environment and is one of the major reasons for social and ethnic violence in Assam. The Bengali migrants from Bangladesh are further classified into various residential clusters. This paper tries to identify the trend of the migration route and source area of the immigrants, to find out the role of government and to understand the basic structure of the cultural composition within the society based on both primary and secondary data. This paper entirely deals with both qualitative and quantitative methodology where non-probability sampling has been applied with the help of interviewing method, non- participatory observation method has been used for collecting primary data and the secondary data obtained from various sources. A detailed discussion about that there are physical and cultural barriers in Majuli, but still how the Bengali migrants are settled and also elicited the geographic process (temporal and spatial change) is related to the adaptation of immigrants from Bangladesh to Majuli in terms of cultural practice.

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1634A STUDY ON THE REHABILITATION AND RESETTLEMENT PROCESS OF JRDA IN UNDERGROUND FIRE AND SUBSIDENCE AFFECTED AREAS OF JHARIA, JHARKHAND, INDIA

ABSTRACT

Jharia, “The coal capital of India” is situated in Chhotanagpur plateau of India where Gondwana group of coal fields are located. The mining area is leased to Bharat Coking Coal Limited(BCCL) where they are operating from pre-independence time. The long history of mining in this coalfield has led to increase in the number of sites prone to underground fire and land subsidence which was first reported in 1916. This has jeopardized the life of inhabitants in Jharia and nearby areas. Therefore, they are either compelled to leave their native places and move to comparatively safer places or they must be ready to face the curse of nature which frequency and intensity is increasing day by day. The school, colleges, market places, administrative offices, places of entertainment, means of transport etc. are constantly being put to shut down in this area. The central government has plans to resettle approximately 1 lakh residents away from burning coal mines and for its implementation, Jharia Rehabilitation and Development Authority was established in the year 2004. The objective of this paper was to first identify the sites reported to be under threat from underground fire and subsidence. Secondly, the objective was also to look at the rehabilitation and resettlement process, whether displaced people are getting the compensation as per the norm prescribed by the government. Furthermore, this study also focused on the socio-economic change in the life of displaced people. To fulfill this objective, the area was identified using government database. Most of the work was based on primary data collected through stratified random sampling. Census of India data was used to know the demographics of this area. To overview the government plans and policies reports from various government departments, offices and websites were collected and analyzed. Analyses and representation of data were done using Statistical Packages for Social Sciences(SPSS) and Microsoft Excel. Mapping such as demarcation of the study area, locating the affected area etc. in this study was carried out using ArcGIS 10.4. It is found in this study that till now only 2.04% of people have been rehabilitated. Most of the people seem not satisfied with the compensation they got. Means of livelihood was gone for many people and now they are unemployed. Socio- economic life of people is completely derailed. People do not have easy access to services such school, colleges, market, hospital, entertainment and recreational places etc. it can be said that government is not implementing it purposed plans according to it own norms. : Jharia, coal, underground fire, rehabilitation, Dhanbad, JRDA

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SS17.1. Regional Science and Peace Science

1067 MANAGEMENT OF GLOBAL WARMING GAS AND USES IN DAILY LIFE

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ABSTRACT

Global warming is one of the most influencing factors for climate change of our planet. World Meteorological Organization (WMO) report that 2016 is year is hottest year and the ice at the pole is rapidly melting never seen before and increasing going ahead. The main Sources of the Global Warming gases are different Factories, fuels Vehicles, which help in different aspect of human life by giving the basics and addition needed to them. Therefore, we neither close factories, companies, vehicles nor replace far away from the residency of living life because if we replace the factory from human Shelter. Human being cannot fulfill according to their desire in time and due to transport the cost of prices is high that cannot be effort able to normal people, which indirectly affect the living life. In this paper, we discuss about the management of global warming gases especially coming from brick and other factories. Most of the factories are emitting the gases in open atmosphere, which directly contaminated the atmosphere and directly and indirectly effect near and far Peoples health and crops. So if we pass these gases throw underground tunnel whose length is according to global warming gases emitted from sources. The gases are settled down on the bottom of tunnel and we can use this solid fine powder global warming gas in our daily life. The Tunnels are constructed in two-way normal and specific way according to wealth of the factories or companies. Normal tunnel contain cooling system normal water, which is used on small companies, and factories while specific contain cooling chemical on wall of the tunnel this system is for large companies and factories. Here cooling system make the gases condense and settle down on bottom and we can use this global warming fine powder in our daily life according to the need.

The gases produce from the factories and companies when passes through tunnel contain cooling system condense the gases and the condense mass of the gases is higher than before condense and hence due to gravity of the earth gases settle on the bottom of tube and on continuous system gases fine powder particle is high. When the concentration of the gases is high, we withdraw that fine powder for different uses of human life and chemistry purposed after refined it into pure form because it contain impurities.

Therefore, in this way, we can manage the global warming gases and use in our daily life and save the climate change, which is global issue.

Key Words: Normal and Specific cooling system, Global Warming Gases, Climate Change, Global Issue etc.

REVIEW

Earth's orbit and rotation also play important role for global average temperature is believed to be approximately 5-10°C cooler than at present. John Tyndall measured the infra-red trapped strongly by water vapor, carbon dioxide, and methane. The atmospheric burden of CO₂ is increasing at a rate of 3.3±0.2GtC/yr. Intergovernmental Panel on Climate Change report has forecast that global mean surface temperature will rise by 1.4°C to 5.8°C by the end of 2100, and reported that carbon dioxide emissions from the combustion of fossil fuels are projected to range from about 5 to 35 GtC per year in the year 2100 compared to current emissions of about 6.3 GtC per year [1],[2].

Ireland's annual surface air temperature has increased by approximately 0.8°C over the last 110 years. Average annual national rainfall has increased by approximately 60mm or 5% in the period 1981 to 2010, compared to the 30 year period 1961 to 1990. The global temperature has increased by 0.85°C since records began in the mid-19th century. Atmospheric concentrations of methane have increased by about 150 percent since pre-industrial times, although the rate of increase has been declining. PFCs and SF₆ are predominantly emitted from various industrial processes including aluminum smelting, semiconductor manufacturing, electric power transmission and distribution, and magnesium casting. Since industrial revolution concentrations of CO₂ have been increased by 30 %, of methane doubled and of N₂O increased for about 15 %. It has been predicted that CO₂ will increase for another 30-150% by 2100 [3],[4].

The existence of the greenhouse effect was argued for by Joseph Fourier in 1824. The argument and the evidence was further strengthened by Claude Pouillet in 1827 and 1838, and reasoned from experimental observations by John Tyndall in 1859. The effect was more fully quantified by Svante Arrhenius in 1896. However, the term "greenhouse" was used and described first by Nils Gustaf Ekholm in 1901. Recent headlines such as "1997 Hottest Year on Record" have generated a greater awareness that the global climate may be changing. Global warming is attributed to the steady increase of atmospheric trace gases produced largely by human activities, such as carbon dioxide, methane, nitrous oxides, and chlorofluorocarbons [5],[6].

Sea level rose by an estimated average of 2 mm. per annum between 1880 and 1990, and is currently rising at the rate of about 3.4 mm per annum. About 1.6 billion metric tons of carbon is in addition emitted into the atmosphere by deforestation for agricultural and other land use purposes. The world population has continued to increase and currently stands at about 6.8 billion with an annual growth rate of about 1.39%. Atmosphere is almost completely transparent for

visible or UV part spectra or IR, penetrates directly to the surface, where its energy is being absorbed, heating the Earth cause the heat of air of atmosphere which is surrounding the earth [7],[8].

Pollution whether vehicular, electrical or industrial is the main contributor to the global warming. When sun's light reaches earth in a snow or ice area 80 percent of the light is reflected meanwhile when it reaches earth or water only 20 percent is reflected and the 80 percent is absorbed. Concentrations of two other important greenhouse gases have increased because of human activity, methane has more than doubled, and nitrous oxide has increased by about 20 percent. Tundra, Water vapor in the atmosphere increasing, carbon dioxide and other greenhouse gas variations, solar variations, volcanic eruptions, Ocean circulation, Orbital variations, Permafrost, Climate change, Greenhouse gas [9],[10].

In 2010, estimated worldwide emissions from human activities totaled nearly 46 billion metric tons of greenhouse gases, expressed as carbon dioxide equivalents. Emissions of fluorinated gases more than doubled. Carbon dioxide emissions are increasing faster in Asia, Europe, and the United States, which together accounted for 88 percent of total global emissions in 2012. A given molecule of nitrous oxide has over 300 times the impact on global warming as does a molecule of carbon dioxide [11],[12].

In 2006, Americans consumed 3.8 million GWh of electricity, producing 2.7 billion tons of CO₂. Between now and 2015, demand for diesel is projected to grow about 4 times faster than demand for gasoline; by 2030, the demand for diesel is forecast to grow 14 times as fast. Biodiesel is currently consumed at a rate of 260 million gallons annually, having grown dramatically from 18 million gallons in 2003. The World Health Organization has estimated that more than 140,000 people per year are already dying as a direct result of climate change, primarily in Africa and Southeast Asia. The distribution of CO₂ emissions among the main emitters: China (29%), the United States (15%), the European Union (11%), India (6%), Russia (5%), Japan (4%), and the rest of the world (30%). It also estimates that after 2030, climate change will result in 250,000 additional deaths per year, caused by malnutrition, malaria, diarrhea, and heat stress [13],[14].

Wildfires were once primarily a seasonal threat, taking place mainly in hot, dry summers. In May 2016, the state of Alberta was devastated by wildfires expanding over 350 miles, leading to the evacuation of the 80,000 inhabitants of the city of Fort McMurray, which suffered extensive damage. The people of Tuvalu are finding it difficult to grow their crops because the rising seas are poisoning the soil with salt. The situation is so bad that the leaders of Kiribati are considering a plan to move the entire population of 110,000 to Fiji [15],[16].

Worldwide personal transportation is expected to increase 1.7 percent annually from 2000 to 2050, while worldwide freight transportation is expected to increase by 2.3 percent annually during the same timeframe. More recently, Communauto announced a 13,000-ton reduction in CO₂ emissions because of their 11,000-carsharing users in the province of Quebec, Canada. It is estimated that effort will reduce CO₂ emissions by 15 tons per year by 2050 [17].

A study done by the World Bank in 1993 estimated that the contribution of vehicle exhaust to Total Suspended Particulate was only 3.5 percent compared to contribution of Himal Cement Factory (36%), brick kilns (31%) and domestic fuel combustion (14%). WHO estimates that approximately 3 million people die each year due to air pollution in the world. Bhaktapur is home to over 120 brick kilns registered and operating under Bhaktapur Cottage and Small industries. Kathmandu the third most polluted city in the world after Tetovo and Cairo at Pollution Index 2016 when survey is done about 3,000 locations. The annual population growth rate is in the Valley 4.3 % and the annual motorization rate is 12%. Study on exposure to airborne particulate matter shows in Kathmandu valley in 2009 showed high personal PM_{2.5} exposures with hourly personal PM_{2.5} levels reached >500 µg/m³ and averaged 51.2 µg/m³. Annual consumption of coal in brick kilns in Kathmandu valley is 56100 tons and other fuel around 330 tons. About 350 tons of coal is coming to valley daily, and majority of it is used in brick industries and industries with furnaces. Assuming only 10 tons is used for commercial cooking purposes in the valley, it is used 3650 tons annually [18],[19],[20],[21].

At a global scale, the 20 percent of the world's population living in developed countries account for 46.4 percent of global greenhouse gas emissions, while the 80 percent of the world's population living in developing countries account for the remaining 53.6 percent. Globally, the combined share of CH₄, N₂O and F-gas emissions is about 28% in total GHG emissions, of which F-gases show the highest growth rate of about 3% in 2016, followed by N₂O of about 1.3%, whereas methane has remained at 2015 levels in 2016. It shows there is at least 95% certainty that human activities are the main cause of climate change. The result is less food, which is a big problem because the world's population is set to increase from 7 billion today to 9 billion by 2050, so we will need more food, not less [22],[23],[24].

Compared with a future without climate change by 2030, 38,000 due to heat exposure, 48,000 due to diarrhea, 60,000 due to malaria, and 95,000 due to childhood under nutrition. By 2050, impacts of climate change on mortality are projected to be greatest in south Asia. It is estimated approximately 250 000 additional deaths due to climate change per year between 2030 and 2050. Presidents of the United States and China announced their respective post-2020 actions on climate change, recognizing that these actions are part of the longer range effort to transition to low-carbon economies, mindful of the global temperature goal of 2°C [25],[26].

If the same mass of methane and carbon dioxide were emission into the atmosphere, methane will trap 25 times more heat than carbon dioxide. Natural sources emit about 770 billion metric tons of carbon dioxide each year from the ocean, animal and plant respiration, organic matter decomposition, forest fires, and volcanic eruptions. Anthropogenic or human carbon dioxide emissions originating from fossil fuel burning, cement production and farmland plowing produce an additional 34 billion metric tons of carbon dioxide annually. Electric power, transportation, and industry account for 33 percent, 28 percent, and 20 percent, respectively. The IPCC predictions published in 2000 in the Third Assessment

Report (IPCC, 2000) suggest that in 2100 climate change may cause the temperatures to grow from 1 to 6°C, contributing to a sea level rise of about 90 cm and a significant growth of such climatic events as droughts, floods, periodical spells of cold weather and strong storms [27],[28].

The amount of CO₂ in the air is 280 ppm in 1850 and 367 ppm in 2000. This is a raise of 31 percent within 110 years. The consequence is a higher temperature in the atmosphere. A large proportion of CO₂ production arises from industrial activities. The United Nations Environment Programme by 2010 has noted that “doubling of wealth leads to 80% higher CO₂ emissions” [29],[30].

Cars, factories, and power plants pump billions of tons of carbon dioxide into the atmosphere every year. Worldwide measurements of sea level show a rise of about 0.17 meters during the twentieth century. The problem is serious because as much as 10 percent of the world’s population lives in coastal areas less than 10 meters above sea level. The IPCC estimates that 20-30 percent of plant and animal species will be at risk of extinction if temperatures climb more than 1.5° to 2.5°C. The 90 companies on the list of top emitters produced 63% of the cumulative global emissions of industrial carbon dioxide and methane from 1751 to 2010 amounting to about 914 gigatonne CO₂ emissions according to the research. According to the Environmental Protection Agency, it has been estimated that industrial pollution is responsible for almost 50% of the pollution worldwide [31],[32],[33].

Production of Natural Gas in the Middle East and Asia Pacific increased in the year 2009 due to growth in Iran, Qatar, India and China. China has become the world’s largest energy-related GHG emitter surpassing the United States. Between 1971 and 2007, global emission doubled with developing countries, led by Asia, increased economic activity at a much faster rate. Between 1990 and 2007, CO₂ emissions rose more than double for Asia due to striking rate of economic development particularly within China and India. It also estimates that after 2030, climate change will result in 250,000 additional deaths per year, caused by malnutrition, malaria, diarrhea, and heat stress. The two major terrestrial carbon sinks are plant biomass, currently a repository of 550 Gt of carbon, and soils, containing 2,300 gigatons [34],[35].

About 19% of European CO₂ emissions are attributed to road transportation, giving it a strong social responsibility. In February 2007, the EU confirmed its targets for the reduction of CO₂ emissions in cars and light commercial vehicles: automobiles are to produce no more than 120 g/km of CO₂ by 2012, bearing two separate provisions. According to the Stern Review, 14% of the world is greenhouse emissions stem from transport. The current Kyoto agreement states it will achieve around a 5% cut in greenhouse gas emissions from industrialized countries by 2012 over 1990 levels, European Environment Agency calculations however suggest CO₂ emissions from the industrialised world must be reduced by 35% to 55% by 2010 if ecologically dangerous climate change is to be avoided [36],[37].

Overall, over the last five years, 140 petrochemical projects have been proposed or approved that are expected to produce 179 million tons of greenhouse gases per year. Environmental Protection Agency and state websites that have federal Clean Air Act permits or permit applications for large construction projects that would increase greenhouse gas emissions by at least 100,000 tons annually [38].

Intergovernmental Panel on Climate Change reported, GHG emissions from industry in 2010 is about 13.99 GtCO₂, among which 5.27 GtCO₂ is from direct burn of fuels for energy and another 5.25 GtCO₂ from electricity and heat consumption. Total process CO₂ emissions were 2.59 GtCO₂, out of which 1.35 GtCO₂ came from cement production. Non-CO₂GHGs made up 0.89 GtCO₂. Through this project, 240 tons of HCFC-22 were phased-out, with an impact of more than 960,000 tCO₂ eq per year. The total annual turnover of carbon between global forests and the atmosphere is in the range of 55 to 85 Gt per year by IPCC in 2000. Enormous amounts of carbon are stored by forests and cycled between forests and the atmosphere. Losses of forested area, mostly owing to deforestation in the tropics, are causing transfers of 0.5 to 2.7 Gt carbons to the atmosphere every year [39],[40].

In Finland, the annual mean temperature is predicted to increase by 2-6 degrees by the end 2100, increase in winter months of 3-9 degrees and summer months 1-5 degrees. According to the IPCC, 1 tonne of methane has the warming effect of around 25 and 72 tonnes of CO₂ over 100- and 20-year periods, respectively. China has the largest country-level methane emissions in the world with 3.84 million tonnes; Western Europe produces 4.08 million tonnes, North America 3.39 million tonnes, and Central and South America 1.41 million tonnes. Globally, methane released from animal manure totals nearly 18 million tonnes annually [41],[42].

INTRODUCTION

Global warming gases are those gases that cause to increase the temperature of the planets or earth or atmosphere. The major global warming gases are Carbon dioxide, Methane, Nitrogen oxides, Compound of Carbon and Fluorine. These gases are known as global warming gases because they absorbed the different radiation of sun and other radiation coming from outer atmosphere. When they observed the incoming radiation from the outer atmosphere the wavelength of the incoming radiation is decrease and the radiation have no more energy to escape from our atmosphere. The absorption agent may be soil, building and monument, and global warming gases. When they do not escape from the earth atmosphere, they collision each other and generated heat energy and cause to increase the temperature of the atmosphere. Global warming gases are created by both human activities and nature. Natural emission of green house gases are mainly CO₂, CH₄ and Nitrogen oxides while green house gases emission by human activities are CFC, SF₆, CO₂, CH₄ and nitrous oxides. In the present situation the emission of green houses gases due to human activities is more than that of nature due to industrial revolution. The main agent of global warming are unmanagement of gases emitted from

industries, vehicles using the fuel generate global warming gases, unmanagement global warming gases from house activities like cooking burring the dry biomass and so on, wildfires and so on.

METHODOLOGY

This method needed tunnel at surface below the earth surface 0.5 to 1 meter. Tunnel may be on cylindrical or rectangular the diameter is according the sources i.e. how much amount of gases released during the combustion of the raw materials. If we consider Brick kin or any Factories, we run the tunnel out of the boundary, which at inclined below 45 degrees that help to passes the global warming gases. Tunnel cover with water at different place, according global warming gases emission from the sources and the fasting cooling settle down the gases as powder on tunnel bottom. Tunnel is open at the end that helps to passes the gases from sources point to whole the tunnel up to open ends of tunnel. The open end of tunnel has slight height.

On the other hand we may also passes the emitted global warming gases through the solution which formed there respective compound like CO₂ formed Carbonic acid when passes through water, SO₂ formed sulphuric acid when passes with water, NO₂ formed nitric acid when passes through water and similar other global warming gases. These product are useful in our daily life and we can used as required by saving our planets.

In this way we can control the global warming gases which is more effective than traditional way that is emitting the gases directly in atmosphere.

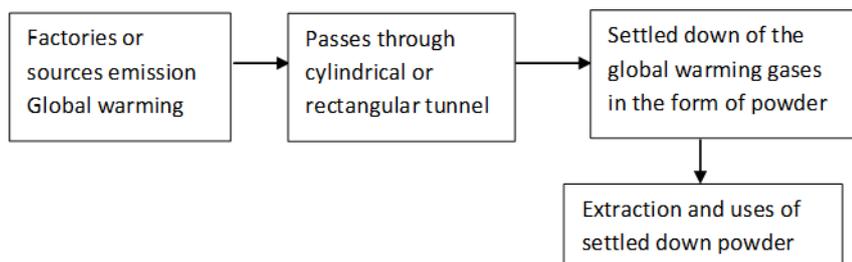


Diagram: Extraction of global warming gases for different purposes in our daily life.

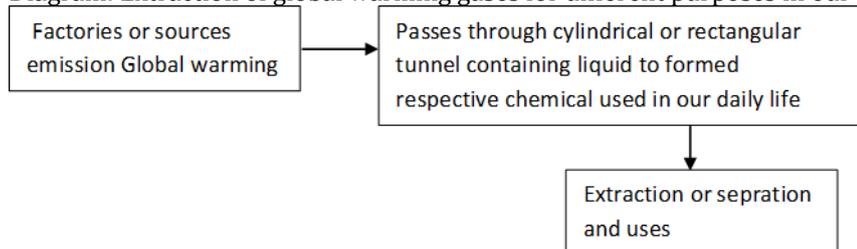


Diagram: Extraction of global warming gases for different purposes in our daily life.

Advantage:

- a. Control Global Warming Gases emitted from factories, which is more dangerous than global warming gases emitted from other sources.
- b. Utilization of global warming gases for different laboratory purpose by extraction.
- c. Safety than traditional ways

Disadvantage:

- a. Expensive slightly than traditional ways manufacturing
- b. Take Little more time to settled down or formation of respective chemical compound

RESULT AND CONCLUSION

From above method, we can control global warming and the impact of the global warming on our planet and can use these global warming gases in our daily life for the different purpose as required.

REFERENCE

[1] T.J. Wallington, J. Srinivasan, O.J. Nielsen, E.J. Highwood, *Environmental And Ecological Chemistry: Greenhouse Gases and Global Warming*, Mauna Loa Observatory, pp1-6, 2013.
 [2] VN157, *Greenhouse Gases and Global Warming*, pp38-39, 2001.
 [3] Environmental Protection Agency, *Ireland's Environment Greenhouse Gases and Climate Change*, pp1-2.
 [4] D.S. Belić, *GLOBAL Warming And Greenhouse Gases*, Facta Universitatis Series: Physics, Chemistry and Technology, Vol. 4, No. 1, pp45-55, 2006.
 [5] P.T. Latake, P. Pawar, A.C. Ranveer, *The Greenhouse Effect and Its Impacts on Environment*, International Journal of Innovative Research and Creative Technology, Vol.1, No.3, pp333-337, 2015.
 [6] Q. Ma, R.H. Tipping, *The distribution of density matrices over potential-energy surfaces: Application to the calculation of the far-wing line shapes for CO₂*, J. Chem. Phys, Vol.108, pp3386-3399, 1998.
 [7] A.P. Aizebeokhai, *Global Warming And Climate Change: Realities, Uncertainties And Measures*, International Journal of Physical Sciences, Vol.4, No.13, pp869-878, 2009.

- [8] P. Zamostny, P. Kukula, J.S. Young, Possible Green House Gases and Global Climate Change, Chem. Listy 93, pp238-242, 1999.
- [9] A.L.E. Zein, N.A. Chehayeb, *The Effect of Greenhouse Gases on Earth's Temperature*, International Journal of Environmental Monitoring and Analysis, Vol.3, No.2, pp74-78, 2015.
- [10] J. Masih, *Causes and Consequences of Global Climate Change*, Scholars Research Library, Vol.2, No.2, pp:100-108, 2010.
- [11] Environmental Protection Agency, *Climate Change Indicators in the United States: Global Greenhouse Gas Emissions*, pp1-2, August 2016.
- [12] J.E. Doll, M. Baranski, *Greenhouse Gas Basic, Climate Change and Agriculture Fact Sheet Series E3148*, Michigan State University, pp1-2, April 2011.
- [13] S. Matthew, B. Kara, M. Kockelman, M. Thompson, *Greenhouse Gas Emission Control Options: Assessing Transportation And Electricity Generation Technologies And policies To Stabilize Climate Change*, "Energy Consumption: Impacts of Human Activity, Current and Future Challenges, Environmental and Ecological Effects," NOVA Science Publishers, pp1-11, 2013.
- [14] J.M. Harris, B. Roach, A.M Codur, *The Economics of Global Climate Change, Global Development And Environment Institute*, Tufts University, pp2-36, 2017.
- [15] M. Richtel, F. Santos, "Wildfires, once confined to a season, burn earlier and longer" New York Times, April12, 2016.
- [16] M. Lves, "A Remote Pacific Nation, Threatened by Rising Seas." New York Times, July 2, 2016.
- [17] S.A. Shaheen, T.E. Lipman, *Reducing Greenhouse Emissions And Fuel Consumption*, International Association of Traffic and Safety Sciences, Vol.31 No.1, pp6-16, 2007.
- [18] S.K. Joshi, *Air Pollution in Nepal*, Kathmandu University Medical Journal, Vol. 1, No. 4, pp231-232, 2003.
- [19] D. Humagain, *Air Pollution Problem in Nepal*, Environmental Development Forum Nepal, pp2-3, 2017.
- [20] Manav-Kendrit Yatayat Abhiyan, *Air Quality Status and Management in Kathmandu Valley*, pp1-6, March 2014.
- [21] Department Of Environment, *Air Quality Management Action Plan for Kathmandu Valley* pp16-36, June 2017.
- [22] D. Dodman, *Urban Density And Climate Change*, United Nations Population Fund Analytical Review Of the Interaction between Urban Growth Trends and Environmental Changes, April 2, pp1-19, 2009.
- [23] J.G.J. Olivier, K.M. Schure, J.A.H.W. Peters, *Trends In Global CO₂ And Total Greenhouse Gas Emissions*, PBL Netherlands Environmental Assessment Agency, pp4-40, December 2017.
- [24] European Commission, *Our Planet, Our Future: Fighting Climate Change Together*, Luxembourg: Publications Office of the European Union, pp9-29, 2015.
- [25] Ed:- S. Hales, S. Kovats, S. Lloyd, D.C. Lendrum, *Quantitative risk assessment of the effects of climate change on selected causes of death, 2030s and 2050s*, World Health Organization, pp1-21, 2014.
- [26] R. Boyd, N. Stern, B. Ward, *What will global annual emissions of greenhouse gases be in 2030, and will they be consistent with avoiding global warming of more than 2°C?*, Grantham Research Institute on Climate Change and the Environment, pp3-12, 2015.
- [27] D.W. Smith, *Contribution of Greenhouse Gas Emissions: Animal Agriculture in Perspective*, Texas A&M Agrilife Extension, pp1-4, January 2014.
- [28] Ministry of the Environment Warsaw, *Poland's Climate Policy: The Strategies for greenhouse gas emission reductions in Poland until 2020*, pp6-7, 4 November 2003.
- [29] U. Dombrowski, S. Ernst, *Effects Of Climate Change On Factory Life Cycle*, ELSEVIER, 21st CIRP Conference on Life Cycle Engineering, pp339-340, 2015.
- [30] Organization for Economic Co-operation and Development, *Industrial Biotechnology and Climate Change: Opportunities and Challenges*, pp 4-36, 2011.
- [31] J. Weier, *Earth Observatory: Global Warming*, NASA, pp1-15, 2002
- [32] S.B. Pandya, *The Impact of Industrial Pollution on Global Warming: Facts, Causes and Effects*, pp1-9.
- [33] National Research Council, *Ecological Impacts of Climate Change Washington Dc: National Academies*, press 2008.
- [34] R. Chandrappa et al., *Coping with Climate Change: Industrial Revolutions*, Climate Change and Asia, Springer-Verlag Berlin Heidelberg, pp27- 35, 2011.
- [35] A.M. Codur, et al., *Hope Below Our Feet Soil as a Climate Solution*, Global Development and Environment Institute: Tufts University, pp1-7, April 4 2017.
- [36] K. Benz, *The automotive industry and climate change: Framework and dynamics of the CO₂ evolution*, pp1-31, 2007.
- [37] K. Hamilton, *The Oil Industry and Climate Change*, Greenpeace International Keizersgracht 176, 1016 Dw Amsterdam, pp5-14, August 1998.
- [38] Environmental Integrity Project, *Greenhouse Gases from a Growing Petrochemical Industry: Fracking and Low Gas Prices Spark Projects In 2015 with Emissions Equivalent to 19 Coal Power Plants*, pp1-9, February 29, 2016.
- [39] United Nations Industrial Development Organization, *Promoting Climate Resilient Industry*, pp5-14, 2015.
- [40] Food and agriculture organization of the United Nations Rome, *Impact of the Global Forest Industry on Atmospheric Greenhouse Gases*, Ppx-10, 2010.
- [41] E.O. Ghali, *The effects of climate change on forest industry and environment: Finland and Morocco*, Thesis, Saimaa University of Applied Sciences Faculty of Technology, pp6-52, 2011.
- [42] An Humane Society International Report, *the Impact of Animal Agriculture on Global Warming and Climate Change*, pp 1-10, November 2011.

1081 AN ANALYSIS ON THE DUOPOLY LOCATIONS AND SOCIAL WELFARE IN A HOTELLING MARKET

ABSTRACT

It is well known that the equilibrium locations in an unbounded Hotelling (1929) model with a quadratic transport cost function are one quarter outside of the unit-length market (i.e., $-1/4$ and $5/4$) a la Tabuchi and Thisse (1995). The total transport cost under these equilibrium locations is $13t/48$, where t is the transport rate. However, the socially optimal locations for the duopoly firms are $1/4$ and $3/4$, so that both firms locate at their market centers, respectively, and the total transport cost is $t/48$. A mild intervention in which the firms enter the market sequentially is only welfare superior to that of the no-intervention case. A strong intervention is that the government runs a welfare-maximization public firm to compete with the private firm. The socially optimal locations can only be obtained either by simultaneous entry, or by sequential entry such that the public firm enters earlier than the private firm.

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1270 IS ISLAMIC TERRORISM A NEW TERRITORIAL AND SOCIO-SPATIAL HAZARD AND A POLITICAL THREAT TO WESTERN DEMOCRACIES?

ABSTRACT

In France, the attacks committed by Mohammed Merah in 2012 and the following ones on the Islamic State of Irak and the Levant (ISIL) behalf have established Islamic terrorist threat as a new territorial hazard. This is a direct result of changes regarding the resources and means of actions, the operational patterns, the proximity between the places involved in the action and the targets (both types of people and types of places). From that time on, how could geographers avoid addressing these new territorial hazards? Their processes and consequences have to be analysed carefully as they have an unquestionable influence on the way democracy and social life will move in the future in West-European countries. It is then of paramount importance to review the current state of research in territorial and regional sciences as regards terrorist hazards. The French and European cases will be the main focus of this review. Even though quite extended research has been done on extreme ideas and behaviours connected to far-right or far-left organisations, little has been conducted by geographers. The North American research sphere is much engaged in academic research about Islamic terrorism. One needs only mention the START Research Consortium (University of Maryland). Nevertheless, the contribution of geographers to this research effort remains almost invisible. On this basis, it has to be demonstrated why Islamic terrorism related to ISIL is a new socio-spatial hazard. This is due to its specific strategic orientation, its more or less specific ideological frame, and its new tactics. Two kinds of data are analysed under their socio-spatial angle: the statistical data provided by the START programme and the textual data provided by the online magazines ISIL has released in many languages since 2014, including in French and English. The latter analysis is obtained with the help of ALCESTE, a software designed for textometrics. Those two approaches have allowed defending the following hypotheses: 1/ Islamic terrorism regarding its lethal intensity index is primarily a very local phenomenon with very specific localizations; 2/ The new tactics promoted by ISIL generated the emergence of new perceptions of socio- spatial hazards, which impose to national, regional and local authorities to manage them despite their low lethal intensity in Western democracies. As a result, countries like France have to manage a paradox: a situation of high exposure with low actual vulnerability. Then the design of more accurate public security policies has to be stimulated, taking into account both the evolutions of the stakes and exposures, and the preservation of effective democratic societies. Indeed, any terrorist attack (no matter whether it has been achieved or prevented) is related to place effects, including the socio-spatial diffusion of fear-related perceptions and behaviours. The understanding of the actual socio-spatial impacts of Islamic terrorism is then a critical need, as any terrorist attack does not reach its goal in the attack itself but through the orientations of collective behaviours resulting from the attack, including policies.

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SS17.2. Regional Science and Peace Science

1466 INDIAN REGIONAL SCIENCE AT FIFTY: TRENDS, RETROSPECT AND PROSPECT

ABSTRACT

Regional Science (RS) is defined as a multi-disciplinary field of inquiry in the study of the theories and methods of spatial development analysis. RS integrates the disciplines of economics, geography and planning in this research enterprise. Jackson et al., (2017, 2011) examines the trends and methodological advancements in RS, and elsewhere makes a case for a critical examination of the ‘core and boundary’ of the multi-disciplinary nature of RS. Fisher and Nijkamp (2013) provide a comprehensive and state-of-art review of the field of RS. Rey’s (2000) exemplary analysis of the publications patterns, citations and impacts of publications in RS journals provides substantial insight about the nature, growth and contributions of the RS discipline to knowledge development.

Haddad (2017) examined the development of RS in Brazil and noted a marked dissemination of insights to peripheral regions. Murray (2017) in the wake of the significance of big data and regional analytics posits RS can contribute immensely to the development, understanding and insights to national and regional systems. Thakur (2006 and 2000) examined the field of Indian RS. This was the first study of the growth and development of RS in the Indian subcontinent. The Indian Regional Science Association (IRSA) was established in 1968 and has conducted annual meetings and published biannual issues of the Indian Journal of Regional Science since then.

Given this overview, this research utilizes the publications from four journals that publishes RS related research. These journals are: Indian Journal of Regional Science, Indian Journal of Spatial Science, Indian Economic Review, and Regional Symbiosis. The time period for inclusion of sample papers for a ‘content analysis’ varies across journals. This research is a follow up of earlier work by Thakur and Dutt (2006) and Thakur (2000) in reviewing and analyzing the development of RS as a multi-disciplinary research endeavor in India. The major areas of research focus are: regional development and planning, agriculture, urban, transport, location and infrastructure, regional disparities, natural resources, rural studies, industry, regional patterns, migration and employment, quantitative regional analysis, geographic information systems and spatial linkages. Several questions are addressed in this research: 1)What are the disciplinary orientations of publications? 2) What data have been used in RS research? 3) What spatial scale of analysis has been used in RS research? 4) What are the philosophical and methodological bases of RS research in India? 5)What are the citations and impacts of RS publications in India and abroad? 6) What are the prominent sub-fields within RS in India? In addition, a critique with prospects for future research are provided.

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1530 REGIONALIZATION OF SEASONAL CROPPING PATTERN USING IRS LISS-III IMAGES IN ANAND DISTRICT OF GUJARAT, INDIA

ABSTRACT

Geospatial techniques and information have become one of the keystone aspect for efficient and timely identification of seasonal characteristics as it is associated with diversified multi spatio-temporal dynamics. Better spectral responses coupled with enhanced spatial resolution lead to extraction of required result in faster and efficient manner. Hence, there is a need to incorporate some semiautomated techniques which can lessen the effort to extract the component of interest in association with manual digitization and ground truthing so that level of accuracy can be increased. In the present study, an attempt has been made to incorporate both the conventional and band rationing techniques for the extraction of seasonal cropping pattern of Anand district of Gujarat, India using Indian Remote Sensing satellite (IRS), Resourcesat 2, LISS III satellite images. Anand district encompasses an area of 3204 km² and located in adjacent to Gulf of Khambhat. The base economy of the district depends upon agriculture. To understand the seasonal pattern of cropping (Karif, Rabi and Zaid), satellite images of three seasons were taken into considerations. For semiautomatic extraction of cropping pattern, three vegetation indices, Normalized Differential Vegetation Index (NDVI), Enhanced Differential Vegetation Index (EVI) and Normalized Differential Short wave -infrared Based Vegetation Index (NDSBVI) were calculated in the GIS platform. For differentiating between crop and non-crop areas and regionalization them, training samples were applied on different seasonal vegetation indices based on threshold reference value. For accuracy assessment of the vegetation indices, digitized reference maps of different seasons were generated. In the study, it was also found that the combination of different vegetation indices gave better result in terms extraction of crop combinations in different seasons. : cropping pattern, NDVI, EVI, NDSBVI.

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1761 REGIONAL SCIENCE: IT'S PAST AND FUTURE FRONTIERS

ABSTRACT

Regional Science has a spectacular history as a new social science discipline during the last fifty years. Walter Isard University of Pennsylvania was its founder. I had the privilege as his student and colleague for forty years. He was my mentor. We established Regional Science Association (International) many years ago. It has now branches in more than fifty countries. Indian section which I co-organized with Professor Pathak is almost fifty years old. I also co-established the Chinese section. So I am in a position to make some comments on Regional Science as a student, teacher and a professional person in that area. I shall discuss its relationship with geography, economics, political science, management, public policies, urban, and environmental studies etc. I shall then indicate the possible future frontiers of Regional Science particularly related to Globalization, Peace Science, Information Technology, Spatial Econometrics, Disaster Management, and Income Inequality.

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SS18.1. Natural and Man-Made Disaster Management

1188 CARBON SEQUESTRATION POTENTIALITY AND ITS ECONOMIC ANALYSIS OF DIFFERENT LAND USE SYSTEMS IN THE NORTHERN PART OF BANGLADESH**M S Bari¹, M.B Abubakar²**¹ Department of Agroforestry and Environment, Hajee Mohammad Danesh Science and technology University, Dinajpur, Bangladesh.²Department of Forestry, Audu Bako College of Agriculture, Kano, Nigeria.Corresponding author (M S Bari) Email: barimdshafiqul@gmail.com**ABSTRACT**

This study was conducted to evaluate the carbon sequestration potentiality in different land use systems in the Northern part of Bangladesh. Common land use system (Cropland, roadside, homestead and orchard) were used. Data were recorded from tree growth parameters (height and diameter at breast height) and under storied vegetation (herbs, shrubs and crops) in order to estimate the total land use biomass accumulation. Complete measure of 20 m line transects in cropland, 20×5m quadrant in roadside, 20 × 20 m quadrant in orchard and homestead were used. At every sampling point, under stories biomass sample were taken from 1 × 1 m quadrant. The results showed that there was significant difference of carbon sequestration potentiality of different land use systems. For the main effect of different land use systems on carbon sequestration, there was significantly difference in respect of tree height (m), DBH (cm), tree carbon sequestration (t/ha) and total land use system carbon sequestration (t/ha). The highest total land use carbon sequestration (325.33 t/ha) was recorded from double roadside and the lowest (36.51 t/ha) was obtained from cropland was determined by DMRT at $p < 0.05$. From the agro-ecological zones (AEZ), the highest carbon sequestration (155.23 t/ha) was obtained from AEZ- 25 and the lowest (109.28 t/ha) was recorded from AEZ-3. However, in case of economic of carbon sequestration, among the six land use systems double roadside gave maximum (4879.95\$ t/ha) monetary returned. So, double roadside tree plantation is a better land use option for reducing atmospheric carbon. Therefore, more emphasis should be given in roadside plantation for mitigating the green house effects.

Keywords: Carbon sequestration; Land use system; Agroforestry; Potentiality**1 INTRODUCTION**

Tropical forests play an important role in the global carbon cycle (Maser *et al.*, 2003). They contain about 40% of global terrestrial carbon, account for more than half of global gross primary productivity, and sequester large amounts of carbon dioxide (CO₂) from the atmosphere (Beer *et al.*, 2010; Grace, 2004; Pan *et al.*, 2011). Carbon is stored in forests predominantly in live biomass and in soils, with smaller amounts in coarse woody debris (Malhi *et al.*, 2009). In tropical forests worldwide, about 50% of the total carbon is stored in aboveground biomass and 50% is stored in the top 1 m of the soil (Dixon *et al.*, 1994). The problem of global climate change is considered to be one of the most important to the environment; it has been at the center of scientific debate in recent years. Carbon dioxide (CO₂) emissions from land use and land use changes, predominantly from forested areas, account for 33% of global CO₂ emissions between 1850 and 1998 (Bolin and Sukumar 2000). Increasing demand for food, fodder, fuel and round wood is increasing the pressure on land-use systems, and conservation and sustainable development of land-use systems are critical for meeting those demands sustainably and stabilizing CO₂ concentration in the atmosphere to mitigate global climate change (Ravindranath and Madelene, 2008). The carbon storage capacity in agroforestry varies across species and geography (Newaj and Dhyani, 2008). Trees and shrubs in agroforestry systems act as carbon sinks. They absorb carbon (as CO₂) through photosynthesis and store it in their aboveground and belowground biomass. This process is called 'carbon sequestration'. IPCC (2000) described carbon sequestration as the process of removal of carbon from the atmosphere and stored it in the biosphere. Moreover, the amount of carbon in any agroforestry system depends on the structure and function of different components within the systems put into practice (Schroeder, 1993; Albrecht and Kandji 2003). The developing countries are bearing the maximum brunt of global warming and climate change, although their contribution to greenhouse gas emissions is much less than that of the developed countries. It is, therefore, important that countries like Bangladesh to take serious steps which contribute in fighting climate change through the role of land use practices to mitigation the climate change. The establishment of agroforestry based land use system will help in substantial and productive agriculture and climate change mitigation. However, in Bangladesh, the amounts of carbon sequestration by different land use system are unknown. The study therefore seeks to assess the potentiality of different agroforestry land use systems for carbon sequestration as a way of mitigating climate change through reduction of carbon dioxide in the atmosphere in the Northern region of Bangladesh. The objectives of the study was to assess the aboveground C stock and accumulation in some commonly practiced land use systems in three agro-ecological zones of Bangladesh and to identify the best land use system that can contribute to C sequestration.

2 MATERIALS AND METHODS**2.1 Study Area**

The study was conducted in the northern part of Bangladesh located in the districts of Dinajpur. A stratified random sampling method was used in a randomized complete block design (RCBD) with three (3) replications as representative areas where different agroforestry like homestead agroforestry, cropland agroforestry and orchard based agroforestry are practiced. Indeed, Dinajpur district includes three Agro-ecological Regions: Old Himalyan Piedmont Plain (AEZ-1), Tista Meander Flood Plain (AEZ-3) and Level Barind Tract (AEZ-25) and land use practices vary among the AEZs. Therefore, one site from each of the AEZs was selected. The experiments consist of six (6) land use system and three (3)

agro-ecological zones. Thus, the simple random sampling design was used to collect data from each sampling units (observations) within the sampling plots. However, eighteen observations were recorded from each AEZ having total of fifty four (54) observations. Each sampling unit consist of six (6) land use systems (treatments) viz; Boundary crop land, single roadside plantations, double roadside plantations, homestead agroforestry, litchi orchard and mango orchard. In each case, three replications were recorded.

The methodological procedure for sampling of this experiment varies due to different land use system. However, seven (7) year Eucalyptus tree was selected as an experimental tree in cropland and Roadside plantations. Similarly, same age was also considered in case of Orchard. In homestead, age was not used due high variability and species diversity. Hence, only matured trees with diameter greater than 5cm (DBH) were considered for this experiment. On the other hand, leaf litter, herb, grass or rice biomass was sampled using 1×1m quadrant method. All biomass was collected and fresh weight was recorded and then taken to laboratory and dried it at 70°C for 48 hours. Dry weight was also recoded. Table 1 below shows the size of sample unit and total area estimated.

Land use system	Sample unit	Total area estimated
Boundary cropland	20 m (transect)	400 m
Roadside plantations	20×5 m (quadrant)	200 m
Homestead agroforestry	20×20 m (quadrant)	400 m ²
Orchard	20×20 m (quadrant)	400 m ²
Understory Biomass	1×1 m (quadrant)	1 m ²

2.2 Tree Biomass Estimation

The biomass of tree is the sum of aboveground and belowground biomass content. For accurate measure of biomass in tree, it has to be felled. To avoid this, the standing woody biomass has been estimated using important growth parameter such as DBH and height. Tree height and DBH are the most common independent variables needed for the estimation of tree volume (Avery and Burkhart, 2001).

2.3 Tree height (m)

Tree height is the height of the seedling from the root-collar to the highest terminal bud (Gazal et al., 2004). The height of tree was measured from ground level to the tip of the tree with the help of Haga Altimeter. The height of all trees per sample unit per replication was recorded and its average was calculated.

2.4 Diameter at Breast Height (cm)

The Diameter at Breast Height (DBH) of stem of the trees was measured in centimeters (cm) at breast height (1.37 cm from ground level) with the help of Tree caliper. The observations of diameter were taken on all the trees per sample unit per replications and its average was also calculated in each land use systems.

2.5 Aboveground biomass estimation (AGB)

AGB include all living biomass above the soil. The aboveground biomass (AGB) has been calculated by multiplying volume of biomass and wood density the volume were calculated based on diameter and height (Pandya et al., 2013). In this system, the following allometric equation for estimating biomass (kg/tree) of tree diameter 5–60 cm of different zones developed by (Chave et al., 2005) were used.

$$(AGB)_{est} = 0.0509 \times \rho D^2 H \quad (\text{Chave et al., 2005})$$

Note: (AGB)_{est} = Estimated aboveground tree biomass (kg/tree)

D = DBH, diameter at breast height (cm)

H = tree height (m)

ρ = Wood specific gravity (Mg m⁻³)

2.6 Belowground Tree biomass (BGB)

Belowground tree biomass (BGTB) of trees was calculated by multiplying the above ground biomass (AGTB) with a default value of 0.26, provided by (Hangarge et al., 2012) as a factor of root: shoot ratio. Average root biomass content of all trees was 26% of aboveground biomass.

$$\text{Below ground biomass} = \text{Aboveground biomass} \times 0.26$$

2.7 Total Biomass

Total tree biomass (TTB) is the sum of the above and below ground biomass. (Sheikhet al., 2011).

$$\text{Total biomass} = \text{AGB} + \text{BGB}$$

2.8 Estimation of carbon stock in trees (tC/ha)

Generally, for any plant species 50% of its biomass is considered as carbon storage (Pearson *et al.*, 2005).
 $Carbon\ Storage = Biomass \times 0.5$

2.9 Estimation of carbon stock in Leaf litter, herb, and grass (LHG) or under stories biomass (t C/ha)

The carbon content in under stories biomass (LHG) was calculated by multiplying with IPCC (2006) default carbon fraction of 0.47. $LHG\ (kg/m^2) = Biomass \times 0.47$

2.10 Estimation of Carbon Sequestered (t/ha)

To estimate carbon sequestration of crops and trees the biomass carbon was multiplied with a factor of 3.67 for all species a formula used by Rajput (2010).

$$Estimated\ Carbon\ sequestration\ (t/ha) = Biomass\ carbon \times 3.67$$

Hence, the factor 3.67 was determined from weight of carbon as calculated below: CO₂ is composed of one molecule of C and two molecules of oxygen.

The atomic weight of C is 12.001115

The atomic weight of O₂ is 15.9994

The weight of CO₂ is C + O × 2 = 43.999915

The ratio of CO₂ to C is 43.999915/12.001115 = 3.6663

Therefore, to estimate the carbon sequestration in tree, multiply the carbon biomass weight by 3.6663.

2.11 Total Land use carbon sequestration (t/ha)

In order to achieve the total carbon sequestration by a particular land use system, total of trees and belowground litter fall, shrubs, herbs or rice were summed (Pearson *et al.*, 2007)

$$Total\ land\ use\ carbon\ sequestration = Tree\ CO_2\ sequestration + LHG\ CO_2\ sequestration$$

2.12 Estimation of Economic Value of Carbon Credits (\$ t/ha)

One ton of net sequestered or mitigated carbon dioxide from plant biomass in a land use is equal to one carbon credit. Therefore, total carbon credit in a land use systems was calculated from CO₂-eq values of retained biomass in respective land use systems. The carbon credits were calculated from the total land use carbon sequestration from tree and crop biomass using the guidelines of IPCC (1996). However, according to Vivian (2010) the monetary value of one ton CO₂ equivalent to US15 Dollars. In this study, the value of Vivian was used.

All data were statistically analyzed using computer package R-studio and MS Excel 2007.

3 RESULT AND DISCUSSION

3.1 Effects of tree Biomass on different Land use system

The study found that the total tree biomass (TTB) was significantly varied with the land use systems (Table 2). The highest TTB (147.1 kg) per tree was found from Single Roadside (T₂) which was followed by Mango orchard (T₆) and Double Roadside. On the other hand, the lowest TTB (67.07 kg) per tree was recorded from Homestead (T₄) which was followed by Cropland (T₁) and Litchi Orchard (T₅). Wide variation of total biomass occurs due to heterogeneity of different land use systems. Khaki and Wani (2011) estimated maximum total ground biomass (181.34 t/ha) in *Shorea robusta* pure forest, which was followed by Agrisilviculture system (46.02 t/ha) and lowest in natural grass land (4.47 t/ha).

3.2 Effects of Carbon stock on different Land use system

The total tree carbon stock (TTCS) per tree was also influenced significantly by different land use systems (Table 3). The highest TTCS (73.55 kg C) was recorded from Single Roadside (T₂) which was followed by Mango orchard (T₆) and Double Roadside (T₃) and the lowest TTCS (33.53 kg C) was found from Homestead (T₄) which was followed by Cropland (T₁) and Litchi orchard (T₅). The above results thus have indicated that biomass components *viz.*, aboveground biomass, belowground biomass and total biomass produced by particular land use system was influenced by variation in biomass allocation pattern and might be attributed due to the divergence in these land use systems or wide range of habitat or bushy nature of growth and age variations. This occurs due to variation in different land use system in the study area. Thus we can say that the rate of carbon stock depend upon the nature of the crop, intensity of the management and soil types. Similar finding were reported by Goswami (2008) and Rajput (2010).

Table 2: Main effect of different land use system on biomass production and estimation

Land Use System	TH (m)	DBH (cm)	AGB (kg/tree)	BGB (kg/tree)	TTB (kg/tree)
Boundary Cropland (T ₁)	11.32b	13.52e	63.48cd	16.51bc	79.99cd
Single Roadside (T ₂)	14.23a	16.31c	116.75a	30.35a	147.10a
Double Roadside (T ₃)	14.53a	15.12d	101.95ab	26.51a	128.46ab
Homestead Plat (T ₄)	10.21b	13.02e	53.23d	13.84c	67.07d

Litchi Orchard (T ₅)	5.86c	21.12b	79.81bc	20.75b	100.56bc
Mango Orchard (T ₆)	6.94c	22.24a	105.49a	27.42a	132.92a
Level of Sig.	***	***	***	***	***
CV%	8.3	7.3	17.4	17.4	17.4

In a column, figures having similar letter(s) do not differ significantly where as figure's bearing different letter(s) differ significantly (as per DMRT).

*** = significant at 0.1% level of probability.

Table 3: Main effect of different land use system on biomass allocation and accumulations

Land Use System	AGCS (kg/tree)	BGCSm (kg/tree)	TTCS (kg/tree)
Boundary Cropland (T ₁)	31.74cd	8.25cd	39.99cd
Single Roadside (T ₂)	58.37a	15.18a	73.55a
Double Roadside (T ₃)	50.98ab	13.25ab	64.23ab
Homestead Plat (T ₄)	26.61d	6.92cd	33.53d
Litchi Orchard (T ₅)	39.91bc	10.38d	50.28bc
Mango Orchard (T ₆)	52.75a	13.71a	66.46a
Level of Sig.	***	***	***
CV%	17.4	17.4	4.5

In a column, figures having similar letter(s) do not differ significantly where as figure's bearing different letter(s) differ significantly (as per DMRT).

*** = significant at 0.1% level of probability.

3.3 Effects of Land use on carbon sequestration

The study found that, the total land use system on carbon sequestrations per hectares (TLUCseq) was highly influenced by the effects of different land use systems (Table 4). The highest TLUCseq (325.33t/ha) was recorded from Double Roadside (T₃) which was followed by Single Roadside (T₂) and Homestead (T₄). However, the lowest TLUCseq (36.51t/ha) was recorded from Cropland (T₁) which was followed by Litchi orchard (T₅) and Mango orchard (T₆). Several studies have been conducted to explore the effects of land use systems on Carbon sequestration and other biophysical factors that affect the systems (Lal *et al.*, 1989; Lal *et al.*, 1999). According to Kursten (2000), stated that by adding trees in a system, it can increase the C storage capacity of the land use systems.

Table 4: Main effect of different land use system on Carbon sequestrations

Land Use System	NT/ha	TTCS (tC/ha)	LHG/RCS (tC/ha)	TTCseq (t/ha)	LGCseq (t/ha)	TLUCseq (t/ha)
Boundary Cropland(T ₁)	158.9e	6.39d	3.56d	23.47d	13.05d	36.51c
Single Roadside (T ₂)	420.0c	30.68b	11.52b	112.58b	42.29b	154.87b
Double Roadside (T ₃)	1166.7a	75.43a	13.22a	276.83a	48.51a	325.33a
Homestead Plant. (T ₄)	988.9b	33.51b	7.69c	122.99b	28.22c	151.27b
Litchi Orchard (T ₅)	216.6d	10.74cd	2.19e	39.62cd	8.03e	47.65c
Mango Orchard (T ₆)	220.0d	14.64c	2.61e	53.72c	9.58e	63.30c
Level of Sig.	***	***	***	***	***	***
CV%	21.7	19.9	4.5	19.9	4.5	16.1

In a column, figures having similar letter(s) do not differ significantly where as figure's bearing different letter(s) differ significantly (as per DMRT).

*** = significant at 0.1% level of probability.

3.4 Effects of tree Biomass on different Agro-ecological zones (AEZ)

Again, the total tree biomass per tree (TTB) was significantly influenced by different Agro-ecological zones (AEZ) (Table 5). The highest TTB (124.83 kg) was recorded from AEZ 25 (S₃) which was followed by AEZ 1 (S₁) and the lowest TTB (96.48 kg) was recorded from AEZ 3 (S₂). Maximum biomass produced by AZE 25 was influenced by variation in biomass allocation pattern, might be attributed due to stand density and wide range of habitat variation and soil condition habit of growth. The similar findings were confronted with Jadhav (2001), Patel (2006), and Patel and Patel (2010).

3.5 Effects of Carbon stock on different Agro-ecological zones (AEZ)

The total tree carbon stock (TTCS) per tree was significantly influenced by different agro-ecological zones (Table 6). The highest (62.41 C kg) was recorded from AEZ 25 (S₃) which is followed by AEZ 1 (S₁). Similarly, the lowest (48.24 C kg) was recorded from AEZ 3 (S₂). The amount of carbon in any agroforestry system depends on the structure and function of different components within the systems put into practice (Schroeder, 1993; Albrecht and Kandji, 2003).

Table 5: Main effect of AEZ on biomass production and estimation

AEZ	TH (m)	DBH (cm)	AGB (kg/tree)	BGB (kg/tree)	TTB (kg/tree)
AEZ 1 (S ₁)	10.41	16.86ab	84.72b	22.03b	106.74b
AEZ 3 (S ₂)	9.98	16.32b	78.58b	19.91b	96.49b
AEZ 25 (S ₃)	11.17	17.48a	99.06a	25.76a	124.83a
Level of Sig.	NS	**	*	*	*
CV%	14.3	2.5	19.5	19.5	19.5

In a column, figures having similar letter(s) do not differ significantly where as figure's bearing different letter(s) differ significantly (as per DMRT).

* = significant at 5% level of probability, ** = significant at 1% level of probability

NS= Not significant

Table 6: Main effect of AEZ on biomass allocation and accumulations

AEZ	AGCS (kgC/tree)	BGCS (kgC/tree)	TTCS (kgC/tree)
AEZ 1 (S ₁)	42.36b	11.01b	53.37b
AEZ 3 (S ₂)	38.29b	9.96b	48.24b
AEZ 25 (S ₃)	49.53a	12.88a	62.41a
Level of Sig.	*	*	*
CV%	19.5	19.5	19.5

In a column, figures having similar letter(s) do not differ significantly where as figure's bearing different letter(s) differ significantly (as per DMRT).

* = significant at 5% level of probability.

3.6 Effects of Land use system on carbon sequestration in different Agro-ecological zones

The total land use system carbon sequestration (TLSCseq) per hectare was significantly influenced by different agro-ecological zones (Table 7). The highest TLSCseq (155.23 t/ha) was recorded from AEZ 25 (S₃) which was followed by AEZ 1 (S₁). Similarly, the lowest TLSCseq (109.28t/ha) was recorded from AEZ 3 (S₂). Tree crop sequestered Carbon at a higher rate than those containing only annual crops or grass lands (Brakas and Aune, 2011). It can be shown that variability in the carbon sequestration potential under various agro-ecological zones depends primarily on climatic factors as rainfall, temperature and soil, which influenced the stand density and finally carbon sequestration ability. Rajput (2010) reported similar result with mean maximum rate of CO₂ sequestration potential (30.86 t/ha/yr) by Orchard + cereal land use system followed by pure orchard. He also revealed that the rate of CO₂ sequestration potential (27.27 t/ha/yr) was higher in Agrisilviculture land use system, which however remained significantly higher than horticulture land use system and forest, respectively.

Table 7: Main effect of AEZ on carbon sequestrations

AEZ	NT/ha	TTCS (tC/ha)	LHGCS (tC/ha)	TTCseq (t/ha)	LHGCseq (t/ha)	TLSCseq (t/ha)
AEZ 1 (S ₁)	527a	27.57b	6.514b	101.02b	23.91b	124.92b
AEZ 3 (S ₂)	498a	23.27c	6.51b	85.4c	23.89b	109.28c
AEZ 25 (S ₃)	561a	34.93a	7.37a	128.19a	27.04a	155.23a
Level of Sig.	*	*	*	**	*	**
CV%	5.4	20	8.8	20	8.8	17.1

In a column, figures having similar letter(s) do not differ significantly where as figure's bearing different letter(s) differ significantly (as per DMRT).

* = significant at 5% level of probability, ** = significant at 1% level of probability

3.7 Economic value of carbon sequestration (US\$ t/ha)

The economic value of carbon sequestration provides market for GHG reduction in monetary value (Fig 1). According to Vivian (2010) 1 ton of carbon was sold at US\$ 15. So, the highest carbon price (4879.95 \$ t/ha) was recorded from Double roadside (T₃) which was followed by single roadside (T₂) and Homestead (T₄). On the other hand, the lowest carbon price (547.65 \$ t/ha) was obtained from Cropland (T₁) which was followed by Litchi orchard (T₅) and Mango orchard (T₆). Vivian (2010) estimated the economic value of carbon trading for Kakamega forest and its environs. He observed that the carbon sequestration potential for Kakamega forest was 334Mg C/ha, then the economic value of carbon trading was US\$ 5010 per hectare. On comparison to that of the farms which was US\$ 3045 per hectare, it implies that the forest has a higher capacity to generate revenue to the country if it participated in carbon trading.

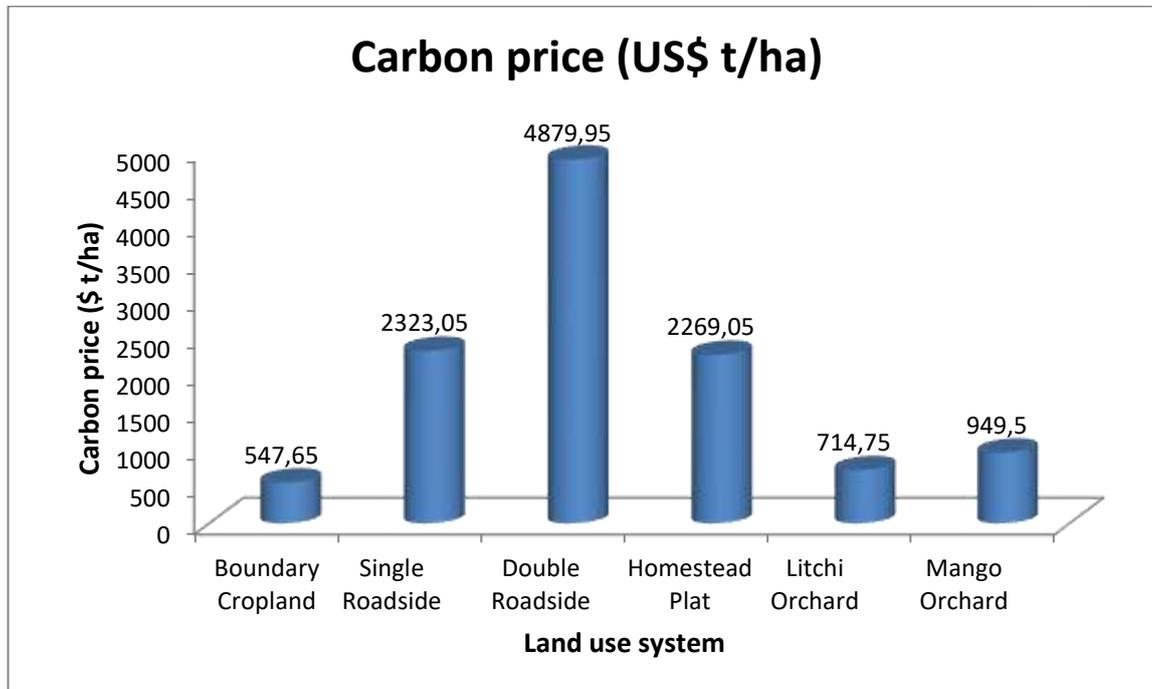


Fig 12: Economic value of carbon sequestration (US\$ t/ha)

4 CONCLUSIONS

The finding of this study showed that agroforestry land use system had significant effects on biomass and carbon accumulation. Planting of multipurpose tree species in non-forest land like cropland, roadside, homestead etc can serve a dual purpose by promoting carbon sequestration and production of non timber forest product for local people. The present investigation finds out that 7 year old Eucalyptus plantation in double roadside strip gave the highest sequestration ability of CO₂ due to its high biomass stand density. The study also found that, among the three AEZ's, AEZ 25 have greater ability for carbon sequestration due to climatic influence and more awareness of farmers in tree management practices. The economic value of carbon sequestration provides market for GHG reduction in monetary value. Finally, it may be concluded that since forest plantations cannot be extended to many large areas of Bangladesh due to high population pressure and demand of agricultural land, roadside agroforestry land use system will be a better option for larger tree plantation coverage and reduction in GHGs effects.

REFERENCE

- Albrecht, A. and Kandji, S.T., (2003) Carbon sequestration in tropical agroforestry systems. Agriculture, Ecosystems and Environment. Institut de Recherche pour le Développement (IRD), c/o International Centre for Research in Agroforestry (ICRAF), Nairobi, Kenya. 99: 15-27.
- Avery, T.E. and Burkhart, H.E. (2001). Forest Measurements (fifth edition). New York: McGraw-Hill, 456 pp.
- Beer, C., Reichstein, M., Tomelleri, E., Clais, P., Jung, M., Carvalhais, N., Rodenbeck, C., Arahm, M.A., Luyssaert, S., Margolic, H., Oleson, K.W., Rouspard, O., Veenendaal, E., Viovy, N., Williams, C., Woodward, F.J., & Papale, D. (2010). Terrestrial Gross Carbondioxide Uptake: Global Distribution and Covariation with Climate. *Science*, 329: 834-838.
- Bolin, B. and R. Sukumar, (2000). Global Perspective. Chapter 1 in Watson, R.T., I.R. Noble, B. Bolin, N.H. Ravindranath, D.J. Verardo and D.J. Dokken (eds.), 2000. Land Use, Land-Use Change, and Forestry. A Special Report of the IPCC.
- Brakas, S.G. and Aune, J. B. (2011). Biomass and Carbon Accumulation in Land Use Systems of Claveria, the Philippines. In: Kumar BM, Nair PKR (eds.) Carbon sequestration potential of agroforestry Systems: opportunities and challenges. Springer, Dordrecht, pp 163-175.
- Chave, J., Andalo, C., Brown, S., Cairns, M. A., Chambers, J. Q., Eamus, D., Folster, H., Fromard, F., Higuchi, N., Kira, T., Lescure, J.-P., Puig, H., Riera, B. & Yamakura, T. (2005). Tree allometry and improved estimation of carbon stocks and balance in tropical forests. *Oecologia* 145:87-99.
- Dixon, R. K., Winjum, J.K., Andrasko, K.J.J., & Schroedes, P.E. (1994). Integrated Systems: Assessment of Promising Agroforestry and Alternative Land Use Practices to Enhance Carbon Conservation and Sequestration. *Climate Change*, 30: 1-23.
- Gazal, R. M., Blanche, C. A., and Carandang, W. M. (2004). Root growth potential and seedling morphological attributes of narra (*Pterocarpus indicus* Willd.) transplants. *Forest ecology and management*, 195(1), 259-266.
- Goswami, S. (2008). Appraisal of agroforestry land use systems for their carbon sequestration potential. Ph.D. Thesis, Dr.Y.S. Parmar University of Horticulture and forestry, Solan, H.P. India.134 p.
- Grace J (2004) Understanding and managing the global carbon cycle. *J Ecol* 92: 189-202
- Hangarge, L. M., Kulkarni, D. K., Gaikwad, V. B., Mahajan D. M. and Chaudhari, N. (2012). Carbon Sequestration potential of tree species in Somjaichi Rai (Sacred grove) at Nandghur village, in Bhor region of Pune District, Maharashtra State, India. *Annals of Biological Research*, Vol. 3 (7):3426-3429.
- IPCC (2000). IPCC Special Report on Land Use, Land-Use Change and Forestry. A special report of the Intergovernmental Panel on Climate Change. Approved at IPCC Plenary XVI (Montreal, 1-8 May, 2000) .IPCC Secretariat, c/o World Meteorological Organization, Geneva, Switzerland. At <http://www.ipcc.ch/>
- IPCC (2006). Agriculture, forestry and other land use. In: Eggleston, H.S., Buendia, L., Miwa, K., Ngara, T., Tanabe, K. (Eds.), IPCC Guidelines for National Greenhouse Gas Inventories, Prepared by the National Greenhouse Gas Inventories Programme. IGES, Japan.

- Jadhav, K. (2001). Proc. DSTA 50 th convention. pp:86-91.
- Khaki, B.A. and Wani, A.A. (2011). Carbon sequestration potential of biomass under different agroforestry land use systems in Poanta area of Himachal Pradesh. Indian Forestry Congress, Conference, New Delhi.
- Kursten, E. (2000). Fuelwood production in agroforestry systems for sustainable land use and CO₂ mitigation. *Ecological Engineering*. **16**: 569-572.
- Lal, R.; Kimble, J. M.; Follet, R. F. and Cole, C. V. (1998). Land conversion and restoration In: The potential of U.S. cropland to sequester carbon and mitigate the greenhouse effect, Lal et al. (eds.). Ann Arbor Press, Chelsea M. I. pp. 35-51.
- Lal, R.; Follett, R. F. and Kimble, J. (1999). Managing U.S. cropland to sequester carbon in soil. *Journal of Soil Water Conservation*. **53**: 374-381.
- Malhi, Y., Aragao, L.E.O.C., Metcalfe, D.B., Paiva, R., Quesada, C.A., Almeida, S., Anderson, L., Brando, P., Chambers, J.Q., Da Costa, A.C.L., Hutyra, L.R., Oliveira, P., Patino, S., Pyle, E.H., Robertson, A.L., & Teixeira, L.M. (2009). Comprehensive Assessment of Carbon Productivity, Allocation and Storage in Three Amazonian Forest. *Global Change Biology*, **15**: 1255-1274.
- Masera, O.R., Caligans, J.F.G., Kanninen, M., Karjalainen, T., Liski, J., Nabuurs, G.J., Pussinen, A., Dejong, B.H.J., & Mohren, G.M.J. (2003). Modelling Carbon Sequestration in Afforestation, Agroforestry and Forest Management Projects: The CO₂ FIX V.2 Approach, *Ecol Modell*, **164**: 177-199.
- Newaj, R., Dhyani, S. K. (2008). Agroforestry for carbon sequestration: Scope and present status. *Indian Journal of Agroforestry* **10**: 1-9.
- Pan, Y., Birdsey, R.A., Fung, J., Houghton, R., Kauppi, P.E., Kurz, W.A., Phillips, O.L., Shvidenko, A., Lewis, S.L., Canadell, J.G., Clais, P., Jackson, R.B., Pacala, S.W., McGuire, A.D., Piao, S., Rautianen, A. Sitch, S., & Hayer, D. (2011). A Large and Persistent Carbon Sink in the World's Forest. *Science*, **333**:88-993.
- Pandya IY, Salvi H, Chahar O and Vaghela N, 2013. Quantitative Analysis on Carbon Storage of 25 Valuable Tree Species of Gujarat, Incredible India. *Indian J.Sci.Res.*, **4**(1):137-141
- Patel, G.C. (2006). Sustence of soil health and productivity of sugarcane through integrated nutrient management in inceptisols of South Gujarat. Ph.D thesis submitted to NAU, Navsari (Gujarat).
- Patel, V.S. and Patel, D.D. (2010). Bio-organic nutrient management in sugarcane production. *Green Farming*. **3**(2):85-87.
- Pearson, T., Walker, S. and Brown, S. (2005). Sourcebook for land-use, land-use change and forestry projects. Arlington, pp19-35.
- Pearson, T.R., Brown, S.L and Birdsey, R.A., (2007). Measurement guidelines for the sequestration of forest carbon, general technical report, USAID forest service.
- Rajput, B.S. (2010). Bio-economic appraisal and carbon sequestration potential of different land use systems in temperate north - western Himalayas. Ph.D Thesis, Dr Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan (H.P.). India.
- Ravindranath, N. H. and Madelene O. (2008). Carbon Inventory Methods: Handbook for Greenhouse Gas Inventory, Carbon Mitigation and Round wood Production Projects.
- Schroeder, P. (1993). Agroforestry systems: integrated land use to store and conserve carbon. *Climate Research* **3**: 53-60.
- Sheikh MA, Kumar M, Bussman RW, Todaria NP (2011) Forest carbon stocks and fluxes in physiographic zones of India. *Carbon Balance Manag* **6**.
- Vivian, J.B. (2010). Potential economic value of carbon sequestration in Kakamega forest and surrounding farms. A Thesis submitted to graduate school. Egerton University.

1255 LIVELIHOOD CHALLENGES IN WATER LOGGING: A VIEW FROM SOUTH-WESTERN REGION OF BANGLADESH

ABSTRACT

The impact of climate change has drawn highest concentration of the present world particularly in Bangladesh. Evidently water logging is a pervasive scenario and ‘slow onset persistent disaster’ prevalent in south-western region of Bangladesh. The situation is not unusual in the country, which is fleeting in nature. Due to increasing threat and challenges of climate variability, the vulnerable people particularly women and children face immense problem in the south-western region is known as the disaster zone. In these areas cyclone, water logging, floods are observed very common among the other natural threats. Coastal region is most intensively disaster prone area where livelihood is extremely vulnerable for the last 30-35 years. The study is an attempt to understand and assess how the vulnerable women and children of coastal belt take challenges for their livelihood in the locked life situation. The study also extensively tried to assess waterlogged victims’ indigenous coping mechanism and comprehensive disaster management process adopted by Bangladesh government. Methods of research mainly based on primary survey thus, it includes field interview, content analysis, focus group discussions and case studies. For this purpose both qualitative and quantitative data have been used. The study depicts that a slow onset disaster increased frequency and unpredictability year by year, making communities more vulnerable and frequent mobility of women and children have been narrowing and restricted. As study showed impact of water logging widespread over short-term, medium-term and long-term. The other common impacts are hardship, coping strategies, educational, health, displacement and migration issues etc. The prolonged water logging has caused humanitarian challenges in safe water supply, sanitation, shelter, food security, employment opportunity and so on. 49% respondents were living in refugee centre with their children at the time of disaster, 34% of the respondents livelihood changed due to water logging. 63% frequently affected diarrhea and cold, 68% does not take purify water. Inadequate transportation system is a major cause of high drop-out rate of the children from school. Hence, the study find out a consecutive resolution with empirical views, in considering the social, technical, and governance aspects aims to enhance resilience of people from the frequent water logging. A comprehensive women and child sensitive action plan can be taken with the help of regional and international cooperation. Need based private and public interventions is necessary to overcome the situation and the possible ramification should be in considering the real field situation.

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1297 ROLE OF ORGANIZATIONS IN PREPAREDNESS AND EMERGENCY RESPONSE TO DISASTERS: VIEWS FROM THE FIELD

ABSTRACT

Bangladesh is one of the natural disaster prone countries in the world and almost every year natural disasters trouble people’s lives and properties without discrimination and differentiation. In such situation, assistance from governmental and non-governmental organizations is very important for the rehabilitation, recovery of damages, alleviation of poverty and reorganization of the disaster affected people. In Bangladesh, sustainable development is closely linked with disaster reduction which needs effective disaster management plan. Within disaster management plan, preparedness and emergency measures are taken by the government and the non-government organizations to minimize the loss and damages caused by the natural disasters and also for its restoration. The general objective of this study is to know the role of organizations and make an assessment on their performances regarding preparedness and emergency response of natural disaster affected people. The study is exploratory in nature and its approach is predominantly qualitative. Data have been collected from both primary and secondary sources. Cyclone affected people were the respondents to evaluate organizational role. In selecting study area, multistage area sampling method and in selecting respondents simple random sampling method have been applied. Department of Disaster Management under the Ministry of Disaster Management and Relief coordinates overall disaster management activities. The NGOs play the key roles immediately after the disasters by providing means of restoring emergency response, rescuing and sending first aid, sanitation and hygiene, helping in damage assessment and extending assistance to external agencies to bring relief materials. To minimize the loss and damages caused by the cyclonic disaster, the government and non-government organizations take different initiatives before any disaster. Regarding arrangement of preparatory meetings and preparing shelter centers, the GOs play very effective role and on the other hand, regarding making arrangements for awareness-building trainings, the NGOs play very effective role. During the emergency period after SIDR, the GOs played comparatively better role in providing CI sheets and cash money as relief for establishing housing facilities and emergency support. The NGOs played comparatively a better role in providing food, water, clothes, medicine etc. The NGOs also provided monetary help in the form of interest-free loan to initiate income generating activities. This paper suggests that problems like limited sanctions, disrupted communications, lack of awareness of the victims, overlapping

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1327 IMPACT OF NATURAL DISASTERS ON INCOME INEQUALITY IN INDONESIA

ABSTRACT

Natural disasters are exogenous shocks that may have socio-economic impacts. As natural disasters affect the poor, it is often assumed that these natural shocks increase income inequality. This is an important issue, especially for developing countries that vulnerable to natural disasters. However, research on the impact of natural disasters on income inequality is still in its infancy. The purpose of this study is to explore the relationship between natural disasters and income inequality in Indonesia, a developing country that has a high risk from natural hazards and high population densities in disaster-prone regions. This paper uses cross-province panel data during the period between 2000 and 2016 provided by CBS Indonesia for socio-economic factors and the Indonesian Disaster Data and Information/’Desinventar’ for natural disasters statistics. The main indicator of income inequality is Gini index, in which we focus on its annual change as the independent variable. Our variable of interest is natural disaster impact measured as density of the number of disaster events and the number of victims; including their lagged variables. Considering various type of natural disasters, we also disaggregated our natural disaster indicators into five groups (biological, climatic, geophysical, hydrological, and meteorological). We also add more control variables in further estimations such as regional income per capita, population density, and an index of regional economic diversity.

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SS18.2. Natural and Man-Made Disaster Management

1118 IMPACTS OF INVASIVE SPECIES ON COMMUNITIES AROUND MULANJE MOUNTAIN FOREST RESERVE, MALAWI**Laura Makhambera¹, Parita Shah^{2*}**¹Malawi Forest Service, Lilongwe²Department of Geography and Environmental Studies, University of Nairobi*Contact person Email – suryasuru@yahoo.co.uk**ABSTRACT**

Invasive species are mostly considered a global, regional and national threat. In most cases these species are known to be having negative impacts on ecosystems, species and livelihoods, although there are exceptions to cases where they are even regarded beneficial. This research was conducted to find out the impacts of invasive species on communities living around the Mulanje Mountain Forest Reserve (MMFR) in Malawi. The invasive species are seen to be amongst the highest threat to the forest species especially the Mulanje cedar. In order to find out the impact of the invasive species on the communities, 30 respondents were selected using systematic sampling from five villages surrounding the forest. The chi-square was used to test the hypothesis that the invasive species had no positive impacts on communities neighbouring the forest reserve. The findings indicated that invasive species hardly had positive impacts on communities neighbouring the MMFR. The results showed that the communities identified reducing agricultural yields as the main threat which was at 47%, followed by competition with medicinal plants, firewood, reducing tourism, damaging infrastructure and reducing water supply. In terms of the recommendations, education and awareness was found to be the key as people must be made to realize that invasive species can also generate positive impacts; there should be the implementation of policies and legal frameworks aimed at reducing the importation of invasive species and the issue of invasive species must be incorporated in management plans.

Key words: Invasive species, threats, communities, education**1 INTRODUCTION**

While the United Nations and other international organizations are trying to improve the livelihoods of the majority of the world's population, more challenges like climate change, terrorism and invasive species are appearing to hinder this progress. Globalization which is aimed at improving the economic well being of individual countries has become a global threat and has resulted in spreading of invasive species (Keller *et al.*, 2011). Invasive species are also spread by climate change and environmental alterations (Levine *et al.*, 2003; Sanu & Newport, 2010). These species being "alien" are a threat to sustainable development and are increasing with global warming. These species are in the form of plants, animals and microbes (Preston & Williams 2003). Moreover these species are introduced accidentally or intentionally (Hurka *et al.*, 2003). Invasive species can survive, reproduce and spread unaided and sometimes at alarming rates across an ecosystem causing detrimental effects on the healthy ecosystems (Van Wilgen & Van Wyk, 1999). Thus these species are termed as predators and competitors within an ecosystem (Sanu & Newport, 2010) and are known to colonize ecosystems within a short time. They are also known to deplete species diversity thus being a threat to indigenous biodiversity (Preisser *et al.*, 2008; Lenda *et al.*, 2013). Invasive alien species are known to threaten local biodiversity on land and in water through direct and indirect competition, predation and habitat degradation and have devastating socio-economic impacts (Pechar & Mooney 2009; Nienhuis *et al.*, 2014). Globally invasive species are considered as the second greatest threat to biodiversity (Bellard *et al.*, 2017).

Invasive species (IS) are species that are non-native (or alien) to the ecosystem under consideration and whose introduction is so unique that it causes or is likely to cause economic or environmental harm (CBD, 2002). Today all continents namely Europe, Africa, Asia, North and South America are affected by these species. Examples of invasive species include Tick bury *Lantana camara L.*, Zebra mussel *Dreissena polymorpha*, Mexican Pine *Pinus patula* and the Himalayan yellow Raspberry *Rubus ellipticus*. They are known to cause damage worth billions of dollars. For example in New Zealand the introduction of a pollinating wasp was accidentally done from Australia and it caused seed setting by the alien Morton Bay Fig tree (IUCN, 2000). In the Americas as the harsh winters of British Columbia begin, pine beetles become the conquerors of the British Columbian forests (Maness *et al.*, 2012). In Africa and Asia *L. Camara* and *P. hysterophorus* are amongst the fastest spreading invasive species from the Americas (Kohli *et al.*, 2004). They have had a devastating impact on some of the natural ecosystems of high value like in Kenya where *L. camara* has been devouring Karura Forest in the city of Nairobi (Shah & Irandu, 2015) and Lake Nakuru National Park in Nakuru town. The *L. camara* is amongst the world's top ten species known for its fast spreading (Sharma *et al.*, 2005; Dobhal *et al.*, 2010; Bhagwat *et al.*, 2012). In India the *L. camara* was introduced as a garden ornamental by the British colonists in 1807. Since then it has spread and covered much of Southern India (Kannan *et al.*, 2013). According to a study conducted by Aravind *et al.* in 2010 amongst the Soliga Community who are hunters and gatherers in the Malai Mahadeshwara Hills Wildlife Sanctuary of Southern Karnataka, the community has reported that they can no longer graze their cattle in the forest nor collect bamboo due to the density and spread on *L. Camara*. Japan being an island nation is severely affected by invasive species especially the cherry trees which have now begun to bloom early due to shorter winters and is an inconvenience to annual festivities and result in incurring economic expenditures (Maness *et al.*, 2012).

Invasions by alien species are considered to be one of the largest threats to both terrestrial and aquatic ecosystems of the earth. In fact the Strategic Plan for Biodiversity 2011-2020 (CBD, 2010) Target 9 states that by 2020, IS and pathways

should be identified and prioritized, priority species controlled or eradicated and measures put in place to manage pathways and prevent their introduction and establishment.

Alien invasive species are known to generate substantial costs to biodiversity as they alter ecosystems (Hulme, 2009). The forest ecosystem is one of the most affected especially in terms of lost revenues, in expenses for their control and in lost conservation values and ecosystem services. Richardson (1998) asserts that the most direct economic impact of alien invasive species on the forest sector is related to the loss or reduced efficiency of production. This in turn affects the surrounding communities as their livelihood depends on the forest ecosystems. For example the introduction of the salt cedar *Tamarix spp.* has led to loss in ecosystem services in the western USA which have been estimated at US\$ 7-16 billion over a total of fifty-five years (GISP, 2001). According to a research carried out by Obiri in 2010 on invasive plant species and their disaster-effects in dry tropical forests and rangelands of Kenya and Tanzania, he found that invasive plants are a hazard in the tropical dry forests and rangelands of East Africa and result in increasing poverty to communities living around these ecosystems. Another study conducted by Pratt *et. al.* (2017) in Eastern Africa indicates that these species are a real threat to food security.

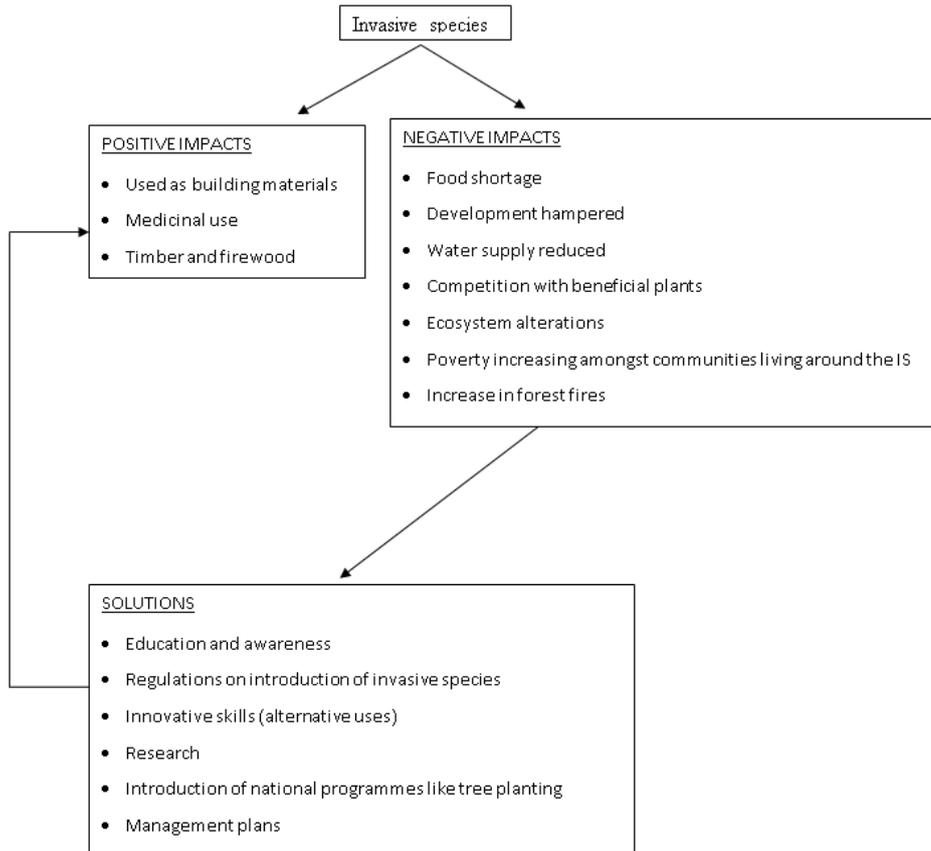
Invasive species are known to have ecological, social and economic impacts and are the key drivers behind the global change. Although most research works show that invasive species have negative impacts, there is evidence to show that the invasive species also have positive impacts (Davis *et. al.*, 2011; Gleditsch & Carlo 2011; Schlaepfer *et. al.*, 2011). They are known to provide habitats or food to species and enhance survival rates on endemic species (Bartomeus *et. al.*, 2016). Research carried out by Gribben *et. al.* (2013) in Southeastern Australia on the impact of invasive green alga *Caulerpa taxifolia* indicated that the alga was very positively associated with the composition and abundance of the epifaunal community. Another example is of fisheries which has resulted in increasing the food stock. Another research conducted by Gleditsch and Carlo (2010) in the USA on the correlation of the invasive fruit tree honeysuckles *Lonicera spp.* and bird communities in Pennsylvania showed positive impacts whereby with the availability of the fruit, the native birds were again sighted in plenty.

The focus of this study was to find out about the socio-economic impacts of invasive species in the Mulanje Mountain Forest Reserve (MMFR) in Malawi. Malawi is facing a major disaster in terms of livelihoods due to the introduction of IS. According to Malawi's National Biodiversity and Strategic Action Plan (NBSAP), the country is highly prone to twenty-nine invasive species due to its geographical position, tropical climate and agriculturally based economy and also the country's heavy reliance on imported products. These species include 17 plants, 3 fish and 9 invertebrates. Some of the key invasive species in Malawi include *Pinus patula*, Himalayan Raspberry *Rubus ellipticus*, Bracken fern *Pteridium aquilinum* and blue gum *Eucalyptus spp.* (Government of Malawi [GoM], 2010) The water hyacinth *Eichhornia crassipes* is the most common and wide spread aquatic invasive species (Phiri *et. al.*, 2001). The *Lantana camara* is the threatening terrestrial alien species and is known to be the largest attacker of native vegetation in areas like the Majete Wildlife Reserve. In some cases the IS are specifically introduced on both land and in water. The best example is the new aquaculture push in Lake Malawi which is also known as the "Galapagos Islands of freshwater" because of its hundreds of cichlid species of endemic fish. These cichlid species have started to disappear fast because of the introduction of the Nile Tilapia which has affected the lake ecologically.

In Malawi, some people have begun to adapt to the use of invasive species for their economic gains and improving livelihoods. This is also seen to be good for the country's economy (Shackleton *et. al.*, 2007; Kull *et. al.*, 2011; van Wilgen *et. al.*, 2011). However, the use of the IS for benefits is very limited. In many parts of the world, these species have been found to have greater benefits and are also used as a mechanism to solve food security issues (Wilson *et. al.*, 2014). While people across most parts of the world see the threats and benefits of the IS differently, in MMFR the IS is amongst four major threats. The IS has been increasing abundantly across the country and as a result its associated costs have been rising. As the IS increases, it affects the access to other natural resources (Wise *et. al.*, 2012). This is similar to India where it has also been noticed that as the IS increases, costs increase and benefits decrease and this leads to the negative perceptions of the IS (Pasiiecznik *et. al.*, 2001). In MMFR the other threats include resource use stemming from high population density, pervasive poverty and lack of awareness and weak incentives for sound conservation practices; agricultural encroachment on the lower slopes due to a combination of population pressure and insecure land tenure and bush fires due to an incomplete system of fire breaks and inadequate response capacity (GoM, 2010).

The authors have shown that IS has a high negative impact on the communities in comparison to positive impacts. This is because of lack of dissemination of knowledge and awareness on the benefits of IS like *prosopis*. This indicates that due to lack of knowledge they drive communities towards food shortages, hamper development and reduce water supply and in turn, make communities poorer than they already are (Food and Agriculture Organization [FAO], 2008). In this research this was done by testing the null hypothesis which stated that the invasive species have no positive impacts on communities neighbouring the MMFR.

In order to understand the impacts of the IS, a conceptual framework has been developed (Figure 1). The conceptual framework shows both positive and negative impacts of invasive species. The framework shows the negative impacts to be the highest. In order to reduce these impacts, solutions are needed which would increase the positive impacts of these species.

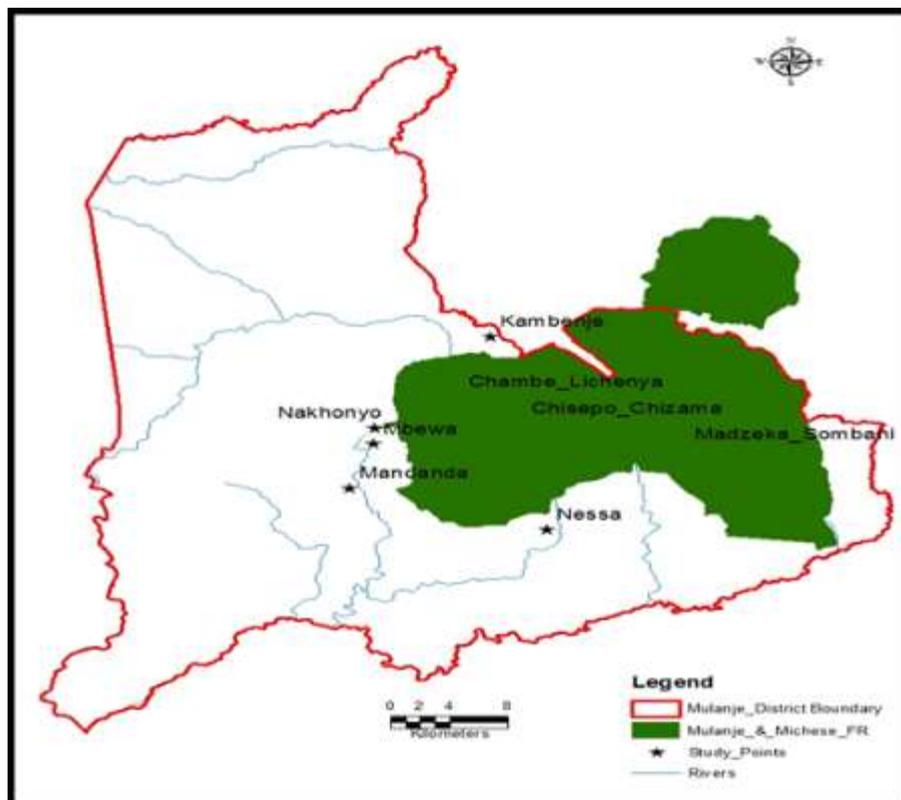


Source: Makhambera and Shah, 2015

Figure 1: Conceptual framework showing impacts driven solutions towards invasive species

2. STUDY AREA

Mulanje Mountain Forest Reserve (MMFR) is situated in the far southeast corner of Malawi. It is the largest mountainous massif in the afro-montane archipelago (15°75'S 35°38E) (Figure 2). The massif itself is a huge syenite intrusion of 640km², rising steeply and abruptly from the south-central African plains to form a broad plateau of basins and deep river gorges at 1800m, and steep rocky peaks that reach 2800m.



Source: Makhambera and Shah, 2015

Figure 2: Map of Mulanje Forest Reserve and the sampling villages

The forest reserve was gazetted in 1927. It is an ecological island of unique biodiversity as well as a critical water catchment area. It has rich and diverse flora and fauna including at least 30 endemic plants including the Mulanje cedar (a distinctive conifer and national icon tree of Malawi) which only grows to a full height of 40m on the mountain.

MMFR experiences mean annual temperature of 20°C with an annual rainfall of 800mm. Mulanje Mountain boasts a variety of ecosystems - the Likhubula dry woodlands areas are unique with cycad species found nowhere else in the world. The Ruo River has tropical rain forest vegetation as it receives up to 100 inches of rain annually.

Mulanje Mountain Forest Reserve spans the two districts of Mulanje and Phalombe. There were an estimated 37,000 people living in 85 villages when this research was undertaken. Mulanje is considered a maize-deficit area that contains approximately 66% of the poorer households of the population. The outskirts of the mountain are mainly surrounded by tea estates and the majority of the local people attain their livelihoods by working in the tea estates.

3 METHODOLOGY

The study used primary data which was collected along settlement patterns targeting villages surrounding MMFR. A sample of five villages namely Nakhonyo, Mbewa, Kambenje, Nnesa, and Mandanda were purposively selected for the study from the Eastern, Western and southern part of the reserve so as to consider various sides of the reserve. This is shown in Figure 2. These villages represent the communities that surround the Reserve.

Systematic random sampling method was used to select the number of households in the selected villages whereby every 11th household was included in the sample. There were a total of 320 households in the five villages. A total of 30 respondents were selected from these five villages namely Nnesa, Kambenje, Mandanda, Nakhonyo and Mbewa. Systematic sampling of respondents was done using a list of households which was obtained from the village headmen.

The distribution of respondents per village is shown in Table 1.

Table 1: Respondent distribution

Village	Total Number of Households	Number of households sampled
Nnesa	72	7
Kambenje	81	7
Mandanda	75	7
Nakhonyo	49	5
Mbewa	43	4
Total	320	30

Source: Makhambura and Shah, 2015

In terms of the characteristics of the respondents, there were 18 (60%) women and 12 (40%) male respondents. A total of 27 (90%) indicated that they were married while 3 (10%) stated that they were single. In terms of occupation, majority of them were in the farming business indicating that they understood the impact of the IS from the farmers point of view (Figure 3).

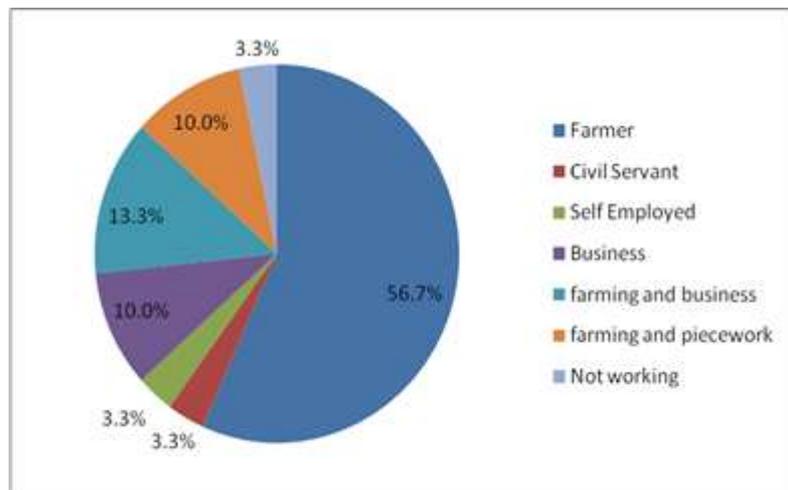
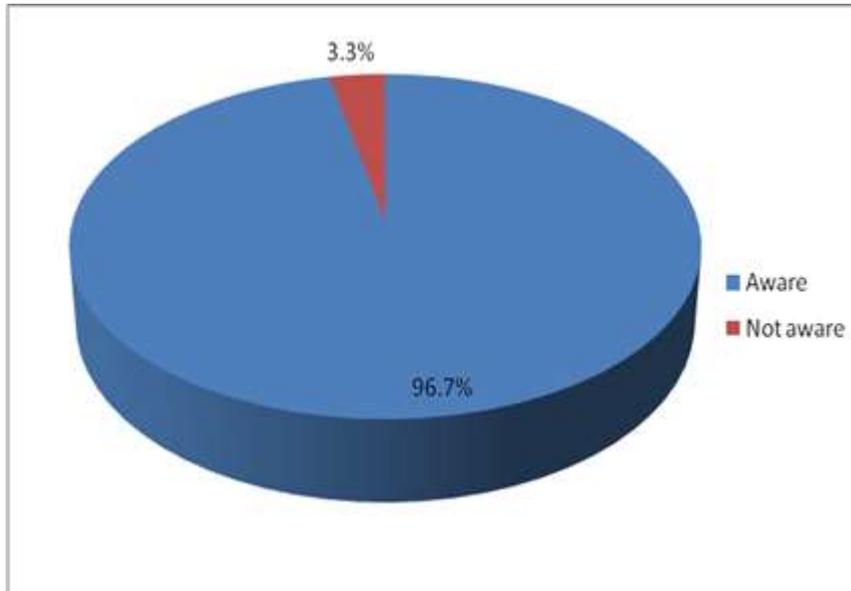


Figure 3: Occupation of respondents

The majority of respondents which were 16 (53.4%) were aged between 31 to 60 years while 14 were in the age group of 21-30 years (46.6%). In the age group of 31-60 years, the majority which was 8 (26.6%) were in the cluster of 31-40 years. In terms of the education levels, majority – 22 (73.3%) had basic education, 3 (10%) had secondary while only 5 (16.7%) had no education. Data from the respondents was also collected based on their knowledge in terms of their awareness of IS and whether the IS had any impacts in terms of benefits or problems.

4 RESULTS AND DISCUSSION

This research indicated that around the MMFR, 96.7% of the respondents were aware that there existed invasive species in comparison to 3.3% who stated that they were not aware (Figure 4). This is in line with the Convention of Biological Diversity’s (CBD) Article 13 on public education and awareness which the Government of Malawi has taken into account and in accordance has educated their citizens on the invasive species.



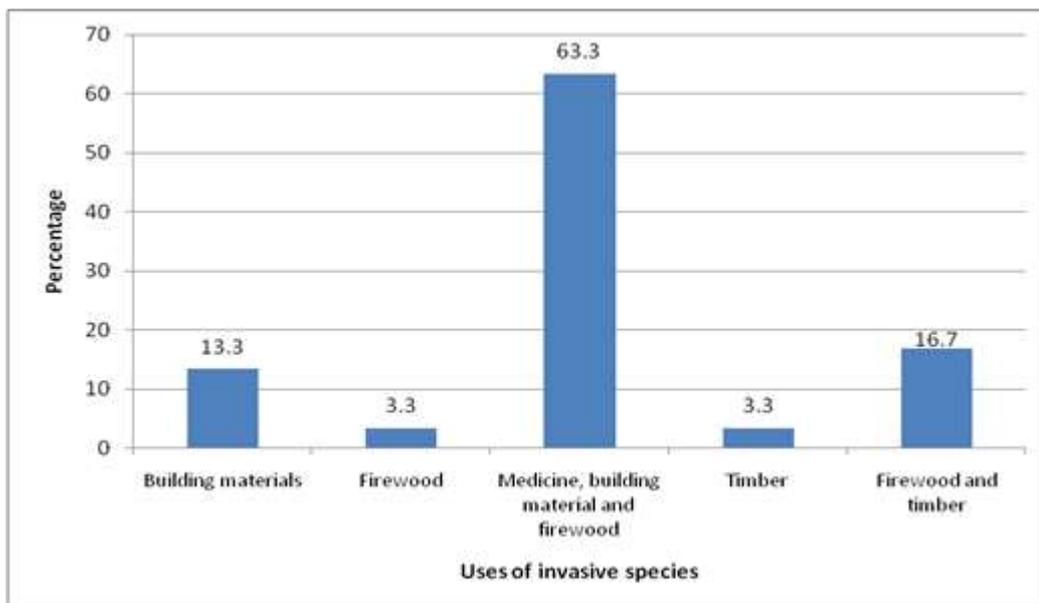
Source: Makhambra and Shah, 2015

Figure 4: Awareness on invasive species

In other developing countries which have paid attention to food security, people are aware of the IS. For India and Pakistan there is documented data on the awareness of the IS by the citizens. The same is the case for Kenya, South Africa as well as parts of Ethiopia and Djibouti (Shackleton *et. al.*, 2004). Furthermore, it is through this awareness that they are benefitting through the use of the IS unlike in places where the knowledge is not there (Choge *et. al.*, 2012).

4.1 Positive impacts of invasive species

As stated by Choge *et. al.* (2012), those aware of IS have been using the IS for benefits in comparison to those who are unaware. This knowledge is making people benefit enormously and improve their livelihoods. When the positive impacts of the respondents were analyzed, the results indicated that the people used the invasive species as building materials, timber, medicine and firewood. Majority of the respondents used these species for medicine, building materials and firewood (Figure 5).



Source: Makhambra and Shah, 2015

Figure 5: Positive impacts of invasive species on local communities

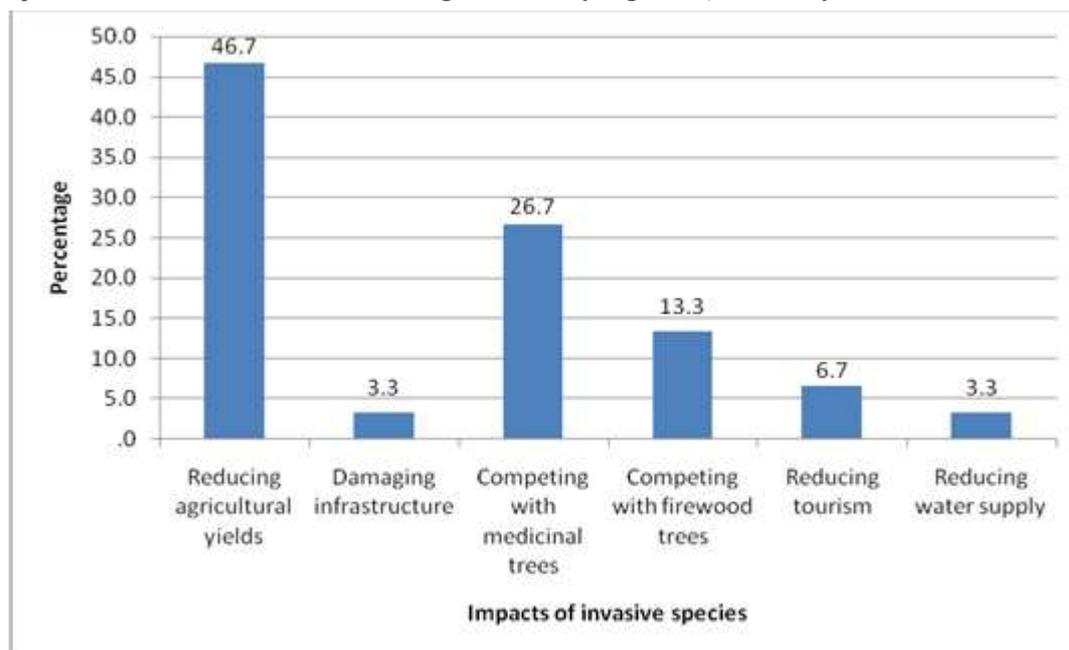
If the respondents are able to use the invasive species positively, it is very good as this helps them to understand the species better. The use of invasive species as firewood is known around the Ranthambore Tiger Reserve in Rajasthan in India. The local community has been using the invasive species *prosopis juliflora* as a source of firewood whereby they make charcoal and sell, thus trying to make income out of the species (Alers *et. al.*, 2007). Kenya has also undertaken research on the use of invasive species especially for firewood and charcoal production. The pilot project was conducted in two places - namely at the Muka Mukuu Cooperative Society in Machakos and the Elangate Wuas Game Ranch in Kajiado. The results indicated very good profits if invasive species were used (Ministry of Environment, Water and Natural Resources of Kenya (MEWNR) & Ministry for Foreign Affairs (MFA) of Finland, 2013). Furthermore, FAO together with Kenya Forest Research Institute (KEFRI) have been working with Non-Governmental Organizations (NGOs) to utilize goods and services from IS. The *prosopis* is one good example where local communities are encouraged to

make *prosopis* flour and they use it for their meals (Choge *et. al.*, 2006). Statistics by Choge *et. al.* (2002) show that in 2002 trade in Kenya for *prosopis* goods was worth US\$ 122 per household in some villages in Baringo District while in 2012 in the same areas it was over US\$ 1.5 million (Choge *et. al.*, 2012). In spite of this benefit, 50-80% of the people in Baringo want the *prosopis* to be eradicated totally. At the same time there are plans to build a power station in Baringo to trap power from *prosopis* biomass (Choge *et. al.*, 2012). This is a technology Kenya wants to borrow from India. At the same time, if invasive species were used instead of acacia species for firewood, environmental deterioration would be reduced. This has been proved by the use of the eucalyptus trees which are grown as plantations and used for fire wood and charcoal. Similarly in Sudan, the National Forest Cooperation has also carried out research on the same and has found that invasive species are a valuable source of firewood and charcoal (Ministry of Environment, Water and Natural Resources of Kenya (MEWNR) & Ministry for Foreign Affairs (MFA) of Finland, 2013).

Besides having positive socio-economic values, they also have to some extent positive ecological values. Examples include of pollinators which use IS as additional food as their habitats are greatly affected by disturbances (Williams *et. al.*, 2011). The same is the case for herbivores which also feed on IS due to habitat disturbances (Bartomeus *et. al.*, 2016). Another example includes the Capricorn Beetle which has adapted to feeding on the pedunculate oak *Quercus robur* (Oleksa and Klejdysz, 2017).

4.2 Negative impacts of invasive species

Although people are aware of the IS having benefits, most people associate IS with negative impacts. In this research the respondents indicated five impacts which were reducing agricultural yields, damaging infrastructure, competing with medicinal trees and firewood trees and reducing tourism and water supply. Reducing agricultural yields had the highest negative impact (Figure 6). This indicates that the communities living around the MMFR are greatly affected in terms of food supply as the invasive species compete for space and do not allow the food crops to grow well. This is in line with what Howard and Matindi (2003) and McGeoch *et. al.* (2010) found out when conducting a research on the threats of invasive species in Africa. These species have been found to grow fast in soils rich in nutrients and they tend to occupy any gaps in disturbed forests. These species destroy soil and during decay release toxic materials and prevent grazing from taking place. These plants are also found in agricultural fields and reduce yields for farmers. At the same time these species tolerate harsh conditions and grow faster (Wagh and Jain, 2015).



Source: Makhambera and Shah, 2015

Figure 6: Negative impacts of invasive species on local communities

The negative effects have also been highlighted in the research conducted by Moroñ *et. al.* (2009); Vila *et. al.* (2011) and Lenda *et. al.* (2013) where they have indicated that these species affect natural ecosystems and take over the indigenous species and in turn affect the food chains. Moreover they also reduce species diversity and density (Ortega and Pearson, 2005). There is dominance of the IS over other species as indicated in the studies by Dogra *et. al.* (2009) on the Shivalak Hills in India. However in this study the negative impacts have been classified by respondents in terms of the socio-economic impacts.

Studies by Osunkoya and Perret (2011) in Queensland, Australia and studies carried out by Simba *et. al.* (2013) in Nairobi National Park, Kenya have shown that the soil pH is very high in areas invaded by *Lantana Camara*. This indicates that the soils are no longer agriculturally productive. At the same time IS are known to increase the nutrient uptake from soil especially nitrogen and phosphorous and in turn reducing their uptake by other plants resulting in lower agricultural yields.

Research by Lui (2011) have shown that IS affect food for livestock as the plants compete with native plants and grow fast thus limiting food for herbivores. These herbivores avoid IS plants like *Lantana* as it is found toxic by some livestock as well as its unpleasant aroma. Moreover the livestock as well as the wild herbivores do not find these species nutritious (Kamau, 1986). Kamau (1986) and Boutton *et. al.* (1988) found that the IS uptake by animals affects their digestive systems negatively and thus poor forage.

Research carried out by Kent and Dorward (2012) in the forests of Kambudikki, India have indicated that the IS has been a real economic challenge to the Soliga and Lingayat communities. These communities have been using the forests for cattle grazing and the bamboo for weaving baskets. However IS have been a threat to the cattle grazing and bamboo stocks have reduced due to competition. This has resulted in cattle becoming underfed and malnourished making them vulnerable to diseases and wildlife predators.

Researchers like Oleksa and Klejdysz (2017) in the United States of America have shown that IS have a huge negative impact on infrastructure. For example *arundo donax* giant reed which has touch fibrous roots penetrates soil. It is known to choke riversides and stream channels, increase forest fires and makes the framework of bridges, dams, roads and culverts very weak. It also competes with all native plants including medicinal (Invasive Species Advisory Committee [ISAC], 2016). Another destructive IS is the red oak *Q rubra* which was introduced in Europe from North America. This species spreads very fast as it begins to occupy rail track and road zones and any empty lands (Riepšas and Straigytė 2008; Woziwoda *et. al.*, 2014a). Furthermore it has negative impacts on the forest biodiversity as it is very in decomposition of its fallen leaves (Chmura, 2013; Woziwoda *et. al.*, 2014b).

As shown in this research, IS have resulted in a fall out in the tourism industry and reduced food security. For example the European Green Crabs are known to eat large quantity of native shell fish resulting in loss of commercial shell fish industries. Another example is in Kenya where the water hyacinth *Eichhornia crassipes* which grows like a carpet and reduces sunlight and in turn affects the water quality, recreational fishing and swimming. As both swimming and recreational fishing are reduced, tourism has been a big blow around Lake Victoria and Naivasha (Waithaka, 2013). Another IS threatening tourism and endangering flora and fauna species is the mikania *mikania micrantha*. It is found in the humid tropical and sub tropical regions of the Pacific and Asia (Waterhouse, 1994). This species is very common in Nepal and is threatening protected areas like the Chitwan National Park, a UNESCO World Heritage Site. Research carried out by Murphy *et. al.* (2013) shows a correlation between mikania and the Indian rhinoceros *Rhinoceros unicornis* (greater one-horned rhinoceros) whereby this mammal has greatly declined in areas of mikania infestation.

The data collected in this research was further analyzed by testing the null hypothesis which stated that the invasive species have no positive impacts on communities neighbouring the MMFR. Table 2 shows the results of the hypothesis which were obtained through the use of the chi square.

Table 2: Results of chi square

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.599 ^a	4	.963
Likelihood Ratio	.933	4	.920
N of Valid Cases	30		

Source: Makhambera and Shah, 2015

The results indicate that the calculated chi of 0.599 is lesser than the critical thus failing to reject the null hypothesis which states that the invasive species have no positive impacts on communities neighbouring the MMFR. This finding concurs with the findings of most researches on invasive species. Research conducted by Sanu and Newport (2010) in the Indian Peninsular, Macharia *et. al.*, (2010) in Central Kenya and Keller *et. al.* (2011) in Europe indicate that the invasive species have negative impacts on local communities. They all indicate a heavy loss in terms of food due to competition from these species resulting in food shortage. This is closely followed by impacts on the ecosystem like deficits in the water supply (Sanu & Newport, 2010).

5 CONCLUSION

This study supports previous work done by FAO (2008), Hulme (2009), Obiri (2010) and the

Ministry of Environment, Water and Natural Resources (MEWNR) and Ministry for Foreign Affairs of Finland (MFA) (2013) on dealing with the negative impacts on invasive species. Education and awareness on invasive species is a key in overcoming threats caused by invasive species. Once people are aware, they would not spread the invasive species, at least knowingly through attractions like souvenirs. It is also very important to put the message of invasive species in schools through the official school curriculum so as to create a country wide education and awareness programme. More stakeholders especially the private and NGOs should be involved so that they help in spreading this message, help in conducting research, help in developing innovative skills on how best the invasive species can be used like in Kisumu, Kenya form the water hyacinth the local people are making furniture and coffins. A unique example is the Nobel Prize winner, Wangari Mathaai who, when she died was cremated in a coffin made of the water hyacinth! The aim is sound environmental practice and positive use of these species which can contribute to poverty alleviation. Malawi should also introduce strict regulations on invasive species especially in relation to transport, trade and tourism. The country should also develop national programmes whereby tree planting using indigenous trees is done and also poverty reduction strategies should indicate link between poverty alleviation and biodiversity conservation. Management plans of national

forest reserves should also take invasive species into consideration under the issue of threats as outlined in the CBD Article 8h on prevention of invasive species.

In order to understand more about the impacts of invasive species, more data as well as the extent of the spread of invasive species at national level should be made available for research. At the same time there should be more funding dedicated to the eradication of the invasive species.

REFERENCES

- Alers, M., Bovarnick, A., Boyle, T., Mackinnon, K. and Sobrevila, C., (2007). *Reducing threats to protected areas lessons from the field*. United Nations Development Programme and the World Bank.
- Aravind, N. A., Rao, D., Ganeshiah, K. N., Uma, S. R. and Poulsen, J. G., (2010). Impact of the invasive plant *Lantana camara* on bird assemblages at Malé Mahadeshwara Reserve Forest, South India. *Tropical Ecology* 51(2S):325-338.
- Bartomeus, I., Fründ, J. and Williams, N. M., (2016). Invasive plants as novel food resources, the pollinators' perspective. In: Sol, D. and Weiss, J., (eds) *Biological invasions and animal behaviour*. Cambridge University Press, Cambridge, pp 119–132.
- Bellard, C., Cassey, P. and Blackburn, T. M. (2016). Alien species as a driver of recent extinctions. *Biology Letters* 12(2).
- Bhagwat, S. A., Breman, E., Thekaekara, T., Thornton, T. F. and Willis, K. J., (2012). A battle lost? Report on two centuries of invasion and management of *Lantana camara* L. in Australia, India and South Africa. *PloS one* 7(3), e32407.
- Boutton, T. W., Tieszen, L. L. and Imbamba, S. K., (1988). Biomass dynamics of grassland vegetation in Kenya. *African Journal of Ecology* 26:89-101.
- CBD (2002). *Sixth Conference of Parties*, The Hague, The Netherlands 7-19 April, Decision V1/23, (available at: www.biodiv.org).
- CBD (2010). *Strategic Plan for Biodiversity 2011–2020*. Secretariat of the Convention on Biological Diversity, Montreal. <http://www.cbd.int/decision/cop/?id=12268> (accessed 14 November 2011).
- Choge, S. K., Clement, N., Gitonga, M. and Okuye, J., (2012). *Status report on commercialization of Prosopis tree resources in Kenya*. Technical report for the KEFRI/KFS Technical Forest Management and Research Liaison Committee. Nairobi, KEFRI.
- Choge, S. K., Harvey, M., Chesang, S. and Pasiecznik, N. M., (2006). *Cooking with Prosopis flour. Recipes tried and tested in Baringo District, Kenya*. Nairobi and Coventry, KEFRI and HDRA.
- Davis, M. A., Chew, M. K. and Hobbs, R. J., (2011). Don't judge species on their origins. *Nature* 474:153–154.
- Dobhal, P. K., Kohli, R. K. and Batish, D. R., (2010). Evaluation of the impact of *Lantana camara* L. Invasion on four major woody shrubs along Nayar river of Pauri Garhwal in Uttarakhand, Himalaya. *International Journal of Biodiversity and Conservation* 2(7):155-161.
- Dogra, K. S., Kohli, R. K. and Sood, R. S., (2009). An assessment and impact of three invasive species in the Shivalik hills of Himachal Pradesh, India. *International Journal of Biodiversity and Conservation* Vol. 1(1):4-10.
- FAO., (2008). *Progress towards sustainable forest management*. FAO Forestry paper, Rome.
- GISP (Global Invasive Species Programme), (2001). *Global strategy on invasive alien species*, GISP, IUCN, Gland, Switzerland.
- Gleditsch, J. M. and Carlo, T. A., (2011). Fruit quantity of invasive shrubs predicts the abundance of common native avian frugivores in central Pennsylvania. *Diversity and Distributions* 17:244–253.
- GoM., (2010). Malawi state of environment and outlook report. Ministry of Natural Resources, Environment and Energy.
- Gribben, P. E., Byers, J. E., Wright, J. T. and Glasby, T. M. (2013). Positive versus negative effects of an invasive ecosystem engineer on different components of a marine ecosystem. *Oikos* 122:816–824.
- Howard, G. W and Matindi, S. W., (2003). *Invasive alien Species in Africa's Wetlands. Some threats and solutions*. The World Conservation Union (IUCN) Eastern Africa Regional Programme, Global Invasive Species Programme and Ramsar Convention. Nairobi.
- Hulme, P. E., (2009). Trade, transport and trouble: Managing invasive species pathways in an era of globalization. *Journal of Applied Ecology* 46:10–18.
- Hurka, H., Bleeker, W. and Neuffer, B., (2003). Evolutionary processes associated with biological invasions in the *Brassicaceae*. *Biological Invasions* 5:281-292.
- ISAC., (2016). *Invasive species impact on infrastructure*. US Department of the Interior, Washington DC.
- Kamau, P. N., (1986). Effects of available forage on goat dietary selection and nutrition. In: Hansen, R. M., Woie, B. M. and Child, R. D. (eds). *Ranch development and research in Kenya*. Proceedings of Njoro Conference, Kenya.
- Kannan R., Shackleton, C. M. and Uma Shaankar R. U., (2013). Reconstructing the history of introduction and spread of the invasive species *Lantana* at three spatial scales in India. *Biological Invasions* 15(6):1287-1302.
- Keller, R. P., Geist, J., Jeschke, J. M. and Kühn, I., (2011). Invasive species in Europe: Ecology, status and Policy. *Environmental Sciences Europe* 23:4-17.
- Kent, R. and Dorward, A., (2012). *Biodiversity change and livelihood responses: Ecosystem asset functions in southern India*. Working Paper Centre for Development, Environment and Policy, SOAS, University of London.
- Kohli, R. K., Dogra, K. S., Batish, D. R. and Singh, H. P., (2004). Impact of invasive plants on the structure and composition of natural vegetation of North Western Indian Himalayas. *Weed Technology* 18:1296-1300.
- Kull, C. A., Shackleton, C. M., Cunningham, P. J., Ducatillon, C., Dufour-Dror, J., Esler, K. J., Friday, J. B., Gouveia, A. C., Griffin, A. R., Marchante, E., Midgley, S. J., Pauchard, A., Rangan, H., Richardson, D. M., Rinaudo, T., Tassin, J., Urgenson, L. S., von Maltitz G. P., Zenni, R. D. and Zylstra, M. J., (2011). Adoption, use and perception of Australian acacias around the world. *Diversity and Distributions* 17:822–836.
- Lenda, M., Witek, M. and Skórka, P., (2013). Invasive alien plants affect grassland ant communities, colony size and foraging behaviour. *Biological Invasions* 15:2403–2414
- Levine, J. M., Vilà, M. and D'Antonio, C. M., (2003) Mechanisms underlying the impacts of exotic plant invasions. *Proceedings of Biological Sciences* 270:775–781.
- Lüi, X., (2011). Quantitative risk analysis and prediction of potential distribution areas of common lantana (*Lantana camara*) in China. *Computational Ecology and Software* 1:60-65.
- Macharia, J. M., Thenya, T. and Ndiritu, G., (2010). Management of highland wetlands in central Kenya: The importance of community education, awareness and eco-tourism in biodiversity conservation. *Biodiversity* 11(1 & 2):85-90.
- Maness, H., Kushner, P. J., and Fung, I., (2012). Summertime climate response to mountain pine beetle disturbance in British Columbia. *Nature-Geoscience* 6(1):65-70.
- McGeoch, M. A., Butchart, S. H. M., Spear, D., Marais, E., Kleynhans, E. J., Symes, A., Chanson, J. and Hoffmann, M., (2010). Global indicators of biological invasion: Species numbers, biodiversity impact and policy responses. *Diversity and Distributions (Diversity Distribution)*

16:95-108.

- MEWNR and MFA, (2013). *Miti Mingi Maisha Bora – Support to forest sector reform in Kenya implementation phase (2009 – 2015)*. MEWNR of Kenya and MFA of Finland.
- Moroń. D., Lenda. M. and Skórka. P., (2009). Wild pollinator communities are negatively affected by invasion of alien goldenrods in grassland landscapes. *Biology Conservation* 142:1322–1332.
- Murphy. S. T., Subedi. N., Jnawali. S. R., Laminchane. B. R., Upadhyay. G. P., Kock. R. and Amin. R., (2013). Invasive mikania in Chitwan National Park, Nepal: The threat to the greater one-horned rhinoceros *Rhinoceros unicornis* and factors driving the invasion. *Oryx* 47(3):361–368.
- Nienhuis. S., Haxon. T. J. and Dunkley. T. C., (2014). An empirical analysis of the consequences of zebra mussel invasions on fisheries in inland, freshwater lakes in Southern Ontario. *Management of Biological Invasions* 5:287–302.
- Obiri F. J., (2010). *Invasive plant species and their disaster-effects in dry tropical forests and rangelands of Kenya and Tanzania*. Masinde Muliro University of Science and Technology, Centre of Disaster Management & Humanitarian Assistance Research, Development and Documentation Dept.
- Oleksa. A. and Klejdysz. T., (2017). Could the vulnerable great Capricorn beetle benefit from the introduction of the non-native red oak? *Journal of Insect Conservation* 21:319–329.
- Ortega. Y. K. and Pearson. D. E., (2005). Weak vs. strong invaders of natural plant communities: Assessing invasibility and impact. *Ecology Applied* 15:651–661.
- Osunko. O. O. and Perret. C., (2011). *Lantana camara* L. (Verbenaceae) invasion effects on soil physicochemical properties. *Biological Fertility of Soils* 47:349–355.
- Pasiecznik. N. M., Felker. P., Harris. P. J. C., Harsh. L. N., Cruz. G., Tewari. J. C., Cadoret. K. and Maldonado. L. J., (2001). The *Prosopis juliflora*-*Prosopis pallida* complex: A monograph. Coventry, UK: HDRA.
- Pechar. L. and Mooney. H. (2009). Invasive species, ecosystem services and human well-being. *Trends in Ecology and Evolution* 24:497–507.
- Phiri. P. M., Day. R. K., Chimatiro. S., Hill. M. P., Cock. M. J. W., Hill. M. G. and Nyando. E., (2001). Progress with biological control of water hyacinth in Malawi, In: Julien. M. H., Hill. M. P. and Jianqing. D. (eds). *Proceedings of the second meeting of global working group for the biological and integrated control of water hyacinth, Beijing, China*, 9–12 October 2000, pp. 47–52.
- Pratt. C. F., Constantine. K. L. and Murhy S. T., (2017). Economic impacts of invasive alien species on African smallholder livelihoods. *Global Food Security* 14:31–37.
- Preston. G. and Williams. L., (2003). Case study: The working for water programme: Threats and successes. *Service Delivery Review* 2(2):66–6.
- Riepišas. E. and Straigytė. L., (2008). Invasiveness and ecological effects of red oak (*Quercus rubra* L.) in Lithuanian forests. *Baltic Forests* 14:122–130.
- Sanu. P. V. and Newport. J. K., (2010). Invasive alien species dispersal: The millennium biodiversity disaster. *Disaster Prevention and Management: An International Journal* Vol. 19 (3):291–297.
- Schlaepfer. M. A., Sax. D. F. and Olden. J. D., (2011). The potential conservation value of non-native species. *Conservation Biology* 25:428–437.
- Shackleton. C. M., McGarry. D., Fourie. S., Gambiza. J., Shackleton. S. E. and Fabricius. C., (2007). Assessing the effects of invasive alien species on rural livelihoods: Case examples and a framework from South Africa. *Human Ecology* 35:113–127.
- Shackleton. R. T., Le Maitre. D. C., Pasiecznik. N. M. and Richardson. D. M., (2014). *Prosopis*: A global assessment of the biogeography, benefits, impacts and management of one of the world's worst woody invasive plant taxa. *AoB Plants* 6 plu027:1–18.
- Shah. P. and Irandu. E., (2015). Ecotourism: The case of Karura Forest, Nairobi. *African Journal of Tourism and Hospitality* Vol 2(2):21–40.
- Sharma. G. P., Raghubanshi. A. S. and Singh. J. S., (2005). *Lantana* invasion: An overview. *Weed Biological Management* 5:157–165.
- Shine C., Williams N. and Gündling L., (2000). *A Guide to Designing Legal and Institutional Frameworks on Alien Invasive Species*. IUCN, Gland, Switzerland; Cambridge and Bonn.
- Simba. Y. R., Kamweya. A. M., Mwangi. P. N. and Ochora. J. M., (2013). Impact of the invasive shrub *Lantana camara* L. on soil properties in Nairobi National Park, Kenya. *International Journal of Biodiversity and Conservation* Vol 5(12):803–809.
- van Wilgen. B. W., Dyer C, Hoffmann. J. H., Ivey. P., Le Maitre. D. C., Moore. J. L., Richardson. D. M., Roget. M., Wannenburg. A. and Wilson. J. R. U., (2011). National-scale strategic approaches for managing introduced plants: Insights from Australian acacias in South Africa. *Diversity and Distributions* 17:1060–1075.
- Van Wilgen. B.W., & Van Wyk. F., (1999). *Invading Alien Plants in South Africa: Impacts and Solutions in Eldridge & Fredenburg, D.*, (eds). *People and Rangelands: Building the future*. Proceedings of the VI International Rangeland Congress, Townville, Australia, pp 566–57.
- Vila. M., Espinar. J. L. and Hejda. M., (2011). Ecological impacts of invasive alien plants: A meta-analysis of their effects on species, communities and ecosystems. *Ecology Letters* 14:702–708.
- Wagh. V. V. and Jain. A. K., (2015). Invasive alien flora of Jhabua district, Madhya Pradesh, India. *International Journal of Biodiversity and Conservation* Vol 7(4): 227–237.
- Waithaka. E., (2013). Impacts of water hyacinth (*Eichhornia crassipes*) on the fishing communities of Lake Naivasha, Kenya. *Journal of Biodiversity of Endangered Species* 1(2):1–4.
- Waterhouse. D. F., (1994). *Biological control of weeds: Southeast Asian prospects*. Australian Centre for International Agricultural Research, Canberra, Australia.
- Williams. N. M., Cariveau. D., Winfree. R. and Kremen. C., (2011). Bees in disturbed habitats use, but do not prefer, alien plants. *Basic Applied Ecology* 12:332–341.
- Wilson. J. R. U., Caplat. P., Dickie. I. A., Hui. C., Maxwell. B. D., Nuñez. M. A., Pauchard. A., Rejmánek. M., Richardson. D. M., Robertson. M. P., Spear. D., Webber. B. L., van Wilgen. B W., Zenni. R. D., (2014). A standardized set of metrics to assess and monitor tree invasions. *Biological Invasions* 16:535–551.
- Wise. R. M., van Wilgen. B. W. and Le Maitre. D. C., (2012). Costs, benefits and management options for an invasive alien tree species: The case of mesquite in the Northern Cape, South Africa. *Journal of Arid Environments* 84:80–90.
- Woziwod. B., Kope. D. and Witkowski. W. J., (2014b). The negative impact of intentionally introduced *Quercus rubra* L. on a forest community. *Acta Societatis Botanicorum Poloniae* 83:39–49.
- Woziwod. B., Potocki. M., Sagan. J. and Zasada. M., (2014). Commercial forestry as a vector of alien tree species—the case of *Quercus*

rubra L. introduction in Poland. *Baltic Forests* 20:131–141

Woziwoda. B., Potocki. M., Sagan. J. and Zasada. M., (2014a). Commercial forestry as a vector of alien tree species—the case of *Quercus*

rubra L. introduction in Poland. *Baltic Forests* 20:131–141.

1120 SPATIAL DIMENSION OF DISASTER MANAGEMENT IN GREATER MUMBAI

ABSTRACT

The concept of “space” in geography can be absolute, relative or cognitive. Unlike, absolute space, which is fixed, is asocial and timeless; relative space describes space in a wider concept as it is socially made and remade over a period of time. Thus relative space is dynamic, fluid and ever changing. It can refer to territories with respect to political boundaries or environmental regions such as forests, water-bodies etc. or Land use-Land cover of an area. However, if the study of relative spaces is carried out with a perspective of a socio-environmental issue taking into consideration its dimensions, impact and distribution; it can lead to a detailed analysis, observation of patterns, future trends and solutions to tackle the issue in future. Thus, in the present study, space is studied with relation to disasters and through the perspective of disaster management. In the study of geography, the spatial dimension describes and compares patterns where environmental factors are located. These patterns are determined by using quantitative and qualitative research to compare areas with one another in relation to a particular variable. The aim of this approach is to amend these factors and create more equity in relation to the variable being studied. In the study an attempt is made to understand the disasters for different wards of Greater Mumbai. The comparison is done to bring forth the patterns and disparities. Further, locations of key facilities, connectivity of roads and accessibility of resources and relief parameters is interpreted and presented with an aim of promoting and providing an equitable approach to disaster management in Greater Mumbai. The methodology used for the study includes perception analysis using questionnaire surveys and mental maps. Geospatial analytical techniques were applied for the purpose. With reference to Kate’s model of hazard perception and response respondents were interviewed adopting stratified random sampling technique for 24 Wards of Greater Mumbai. Perception of people regarding disasters, its impact, and safety measures adopted by them and how management of disasters was presumed was evaluated. Their idea of safe zones, safe routes, direction and resilience was noted and mental maps were prepared. Levels of communications in-terms of disaster management were confirmed and anomalies if any were taken into account. Expectation of local people in terms of disaster management varies with space and time. Detailed geospatial mapping was carried out and an attempt is made to incorporate the same in a GIS tool as a web map, in-order to build a Disaster Information System which would help to disseminate information to local people and build a resilient city in the future.

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1141 BUILDING THE 'DISASTER RISK ASSESSMENT INDEX'

ABSTRACT

The paper provides a comprehensive assessment of hazard, vulnerability, resilience and exposure related to natural disasters for the population of Italian municipalities. We employ state-of-the-art methods to build indicators of the various components of risk assessment and devote a particular attention to the consideration of various different aspects of the economic exposure of municipalities. The combination of these four dimensions is particularly useful to identify hot spot areas that are characterized by high hazard, exposure and vulnerability and by low resilience. A tool like the one proposed in our paper that helps policy makers to identify priority areas of intervention is likely to be very valuable in presence of tight public budgets in order to take effective choices about mitigation and prevention strategies.

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SS18.3. Natural and Man-Made Disaster Management

1222 COMMUNITY RESPONSE AND CYCLONE SIGNALING IN COASTAL BANGLADESH

ABSTRACT

Bangladesh is one of the countries which have been significantly affected by natural disasters. This study was an attempt to investigate people’s response to cyclone preparedness and cyclone shelter of the disaster affected people in south western region of Bangladesh. The study was carried out in costal Bangladesh from the two most cyclone affected areas Shyamnagar upazila, Gabura union under Satkhira District and Moharajpur union in Koyra Upazila under Khulna District of Bangladesh. This paper is descriptive in nature using qualitative and quantitative approaches. In quantitative phase, data were collected through interview schedule technique and in qualitative phase data were collected by using semi structured interview questions along with a checklist was used to gain in- depth information using FGDs and case study method. The result from this study showed that most people of this area were illiterate and have very poor education which leads them lower occupational status as well as lower income level. Most of the people were very little familiar about the term climate change and most of the people get information about climate change from various NGOs. The study revealed that most of the people thought that salinity intrusion were more serious than any other disaster. The Majority of the people did not have any concerns about the loss of the properties and livestock. Almost all the people use mobile Phone and half of them depend on radio as a media source of evacuation order. Almost three-fourth of the people trust CPP volunteers as their personal sources. And more than half of the people trust mosque as their personal sources of evacuation order and the entire respondents had knowledge regarding nearest cyclone shelter and only few respondents did not have any knowledge regarding nearest cyclone shelter. The paper also attempts to identify that people do not follow the evacuation orders due to mistrust of the warning messages which can deter from early evacuation; and insufficient number of shelters and poor transportation facilities which discourage late evacuation. The present paper highlights the community response and cyclone signaling which will help policymakers to create awareness in mitigating cyclone vulnerability among coastal people. Key Words: Vulnerability, Cyclone, Community

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1364 A STUDY OF EFFECT "SOCIAL LOAFING" TOWARD DISASTER PREPAREDNESS

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ABSTRACT

Recently, it is assumed to occur large scale and wide area earthquake, when those kinds of disasters will be occurred. Thus, there is limitations to much work helping residents as public-help. In the great Hanshin-Awaji-earthquake and the great East-Japan-earthquake, it couldn't work much to help them. In the great Hanshin-Awaji-earthquake, administration had to do relief activities and firefighting, therefore administrative could not have enough support for victims. When it was occurred the great East-Japan-earthquake, administration had huge damage by a lot of administrative officer died by tsunami, the office could not work well to help residents. It is necessary to consider comprehensive strategy including not only public-help but also mutual-help and self-help when disaster happen. In this case, it may be occurred "social loafing" in the field of group-psychology in the disaster preparedness. It means that the more citizen trust measurements and support by public-help, it may be decreased intension of disaster preparedness oneself. In this sense, it must not be keeping with action and intention. Katada et al., (2011) discussed about high resident's dependent for public-help is affected to be decreased intention of self-help. But it was not clarified that relationship among resident's dependent for public-help and intention of self- help and social loafing. A questionnaire-based survey was administered to person (N=1000) living in japan. The items ware devise to probe for attitude of person toward disaster preparedness, risk perception about earthquake, trust in public-help and community-help, and others.

Therefore, it is clarified that effect of social loafing preparedness toward disaster preparedness based on disaster preparedness, not action quantity because intentions and actions are disagreement. It will be provided new approach for promoting to the preparedness.

Keywords: disaster preparedness, risk, social loafing, disaster

1, BACKGROUND

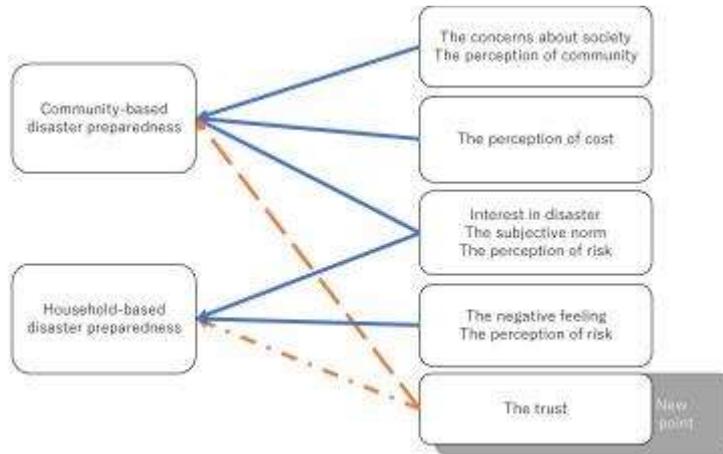
There is great loss of people's lives and prospect is Japan due to natural disaster. Thereafter, with the progress of society's capabilities to respond to disasters and mitigate vulnerabilities to disasters by developing management system and more, disaster damage has shown decline tendency. However, these functions toward disaster are not working normally. For example, In the great Hanshin-Awaji-earthquake (1995), the administration had to do relief activities and firefighting, therefore administration could not have enough support for the victims. In the great East-Japan-earthquake (2011), the administration had huge damage by a lot of administrative officer who supporter of disaster died from the tsunami, the office could not work well to help residents. There is also a high probability of the occurrence of large-scale earthquake in near future, including impending possibilities of Nankai Trough Earthquake and Tokyo inland Earthquake. Various researches and efforts are carried out to promote the disaster preparedness. However, it cannot be promoted due to the problem of administrative dependence awareness such as excessive expectations for disaster support and prevention such as disaster information. Katada et al., pointed out that in areas with flood risk in Gunma Kiryu City, Japan, people with lower administrative awareness take disaster preparedness, and people with high dependency have indicated that the disaster prevention should be taken by the administration. this previous study focus on dependence. However, it is supposed that result is affected by social loafing which is one of group psychology. Because not only the administration but also local resident's organizations, companies, NPOs, etc., carry out disaster prevention and support, it is supposed that it is the same effects on these.

In this study, it is clarified that disaster preparedness is affected by group psychological effect such as social loafing, and what kind of people are strongly affected. it is clarified that new ways from social tear-off which is one of collective psychological phenomena to promote disaster- prevention

2. THE EFFECT OF GROUP PSYCHOLOGY ON DISASTER PREPAREDNESS

2.1. Designs of the hypothesis model of disaster preparedness

There are many studies related to disaster preparedness. Motoyoshi et el (2008) point out based on the theory of reasoned action, factors of disaster preparedness due to disagreement about disaster preparedness and behavior, additionally that disaster preparedness is sort of two type: household -and community-based disaster preparedness, each of which has difference factors such as the interest in earthquake, the subjective norm, the concerns about society, etc. in this study, it is designed that hypothetical model incorporating the trust which is one factor of group psychological effect such as social loafing, these factor of disaster preparedness used in previous study. It is clarified that disaster preparedness affected by group psychological factor because of the verification of the hypothesis model. The object of trust is only the administration which is the body of public-help, and is local resident's organization which is one of body of mutual-help.



Based on Tadahiro Motoyoshi, Kenji Takao, Saburo Ikeda 'Determinates of household-and based disaster preparedness'2008, study of social psychology, vol.23,218

Fig1. hypothesis model of disaster preparedness

2.2. The Validation of the hypothesis model

the contents of the questionnaire are consisted of the hypothesis model's factor based on disaster preparedness model and of items that previous studies used (Motoyoshi et al,2009, Yoshida et al,2009). For hypothetical models, it is conduct questionnaire surveys and verify validity. The abstract for questionnaire survey about disaster preparedness. Table1is display the questionnaire contents. It is conducted an exploratory factor analysis to construct a measure for the composition concept based on the hypothesis model. Additionally, internal consistencies are confirmed.

Table1 abstract of questionnaire

Questionnaire survey	
date	form September 7th to 11 th, 2017
target of the survey	over the age of 18 in Japan
number	1000 sample
contents	the parceptation of risk negative feeling the interest in earthquake theparceptation of benefit and cost the subjective norm the disaster preparedness the commitement to the community the attachment to the community the trust in public-help and mutua-help the personal attribute other

Table2. The structure of answers in this web survey

age	men	(%)	women	(%)
18~19	4	0.8	2	0.4
20~29	96	19.2	99	19.8
30~39	102	20.4	102	20.4
40~49	103	20.6	102	20.4
50~59	101	20.2	94	18.8
60~69	79	15.8	85	17
70~78	15	3	16	3.2
total	500		500	

Table3. the results of Factor analysis on the perception of risk and the negative feeling

	Pattern Matrixa		
	Factor 1	Factor 2	h2
Do you feel worry about when an earthquake occurs?	0.983	-0.082	0.715
Do you feel uneasy about what will happen then if an earthquake occurs?	0.888	-0.007	0.745
Do you have a lot of anxiety about the situation happened an earthquake	0.733	0.17	0.629
Do you think that your residence area is easy to happen an earthquake?	-0.039	0.944	0.652
do you think that there is high possibility that your residence will be greatly damaged by an earthquake?	0.055	0.818	0.624
Factor Correlation Matrix			
Factor	1	2	
the negatibe feeliing		1	0.534
the parceptation of risk for earthquake	0.534		1

It was detected two factors because of factor analysis (maximum likelihood method, promax rotation) 6 items consisting of anxiety feelings and risks for earthquake.

It is interpreted that factor1 is “the negative feeling”, and the factor 2 is “risk”. Factor 2 interpreted with 2 items, because the factor was deleted item that is factor loading value of 0.4 or less (0.353). Reliability coefficient of subscale is $\alpha=.911$ about factor1 and is $\alpha=.876$ about factor 2.

Table 4. the result of factor analysis on perception of benefit and cost items

	Pattern Matrixa				h2
	Factor 1	2	3	4	
do you think that participation in the festival of disaster preparedness is something useful in an earthquake.	0.912	-0.029	0.022	-0.139	0.437
do you think that participation in events of disaster preparedness is something useful in an earthquake?	0.83	-0.07	0.153	-0.025	0.498
do you think that participation in disaster drill is something useful in an earthquake.	0.803	-0.049	0.086	0.021	0.645
do you think that it is possible to respond successfully to an earthquake if community members prepare for?	0.592	0.116	-0.172	0.046	0.601
do you think that it is possible to reduce earthquake-damage if community members prepare for?	0.535	-0.026	0.031	0.175	0.679
do you think that you can deal with an earthquake if disaster response is taken at home	0.404	0.24	-0.277	0.231	0.469
do you think it is difficult to make opportunities for families to talk about earthquake disaster sufficiently	0.069	0.763	-0.046	-0.111	0.527
do you think it is difficult to prepare disaster prevention supplies from the usual time	-0.012	0.726	0.045	0.018	0.402
do you think that it will take time to earthquake disaster response at home?	0.069	0.647	0.131	0.014	0.592
it takes time for community member to engage in disaster-prevention activities.	-0.071	0.029	0.846	0.06	0.621
it is difficult for community member to engage in disaster-prevention activities to prepare for an earthquake	0.135	0.114	0.599	0.006	0.321
it is difficult to take time for you to engage in disaster-prevention activities	-0.166	0.375	0.446	0.022	0.467
do you think that it will be useful when an earthquake if you talk about earthquake disaster prevention plans in your family?	0.115	-0.033	0.047	0.78	0.403
do you think that it will be useful when an earthquake occurs if you prepare disaster prevention goods at home?	0.069	-0.059	0.073	0.77	0.441
Factor Correlation Matrix					
Factor	1	2	3	4	
benefit(community-based)	1	0.203	0.402	0.635	
cost(household-based)	0.203	1	0.508	0.241	
cost(community-based)	0.402	0.508	1	0.515	
benefit(household-based)	0.635	0.241	0.515	1	

It is detected 4 factor by factor analysis (maximum likelihood method, promax rotation) for 14 items consisting of perception of benefit and cost of household and community-based disaster preparedness. It was possible to interpret 3 factors; however, it was adopted 4 factors due to simply analyze. It is interpreted that factor1 is the perception of benefit of community-based disaster preparedness, the factor 2 is the perception of cost of household-based disaster preparedness, factor 3 is perception of cost of community-based disaster preparedness, factor 4 is the perception of benefit of household-based disaster preparedness. Reliability coefficient of subscale is $\alpha=.856$ about factor1 and is $\alpha=.782$ about factor 2, is $\alpha=.763$ about factor 3, is $\alpha=.848$ about factor 4. table 5. the result of factor analysis on the subjective norm items

	Pattern Matrixa		
	Factor 1	2	h2
people who is your around you think you want to engage in local disaster-prevention activities.	0.825	-0.029	0.512
do you think that local people have worked eagerly on disaster prevention	0.79	-0.051	0.461
do you think that local people will be delight if you engage in the local disaster activities.	0.74	0.103	0.536
Do you think your family will be delighted if you take the earthquake disaster prevention at home?	-0.15	0.867	0.446
Do you think that your family want you to do earthquake disaster response at your home?	0.111	0.67	0.474
Do you think that your family wants you to think about disaster prevention?	0.157	0.656	0.414
Factor Correlation Matrix			
Factor	1	2	
the subjective norm about community-based disaster preparedness	1	0.606	
the subjective norm about household-based disaster preparedness	0.606	1	

It is detected 2 factors by factor analysis (maximum likelihood method, promax rotation) for 6 items consisting of the subjective norms. It is interpreted that factor1 is the subjective norm of community-based disaster preparedness, the factor 2 is the subjective norm of household-based disaster preparedness. Reliability coefficient of subscale is $\alpha=.83$ about factor1 and is $\alpha=.795$ about factor 2.

It is detected only one factor by factor analysis (maximum likelihood method, promax rotation) for 6 items the trust in public-help and mutual-help because the factor was deleted 2 item that is factor loading value of 0.4 or less (0.254, 277). In additionally, it is judged that it was useful to verify the hypothesis model by dividing it into the trust is public-help and the trust in mutual-help, thus, it is interpreted two factors. Factor1 is the trust is public-help that is consist of 2 items. Factor2 is the trust is mutual-help that is consist of 2 items Reliability coefficient of subscale is $\alpha=.816$ about factor1 and is $\alpha=.827$ about factor 2.

Table6. the results of Factor analysis on disaster preparedness items

Pattern Matrixa

	Factor		
	1	2	h2
do you want to participate If disaster prevention events are held in the residential area?	0.913	0.039	0.818
do you want to participate If disaster prevention the festivals are held in the residential	0.908	-0.098	0.668
do you want to participate If disaster prevention drills are held in the residential area?	0.904	0.041	0.826
do you want to participate if disaster prevention drills and seminar by the administratic	0.744	0.206	0.478
do you want to prepare regularly disaster prevention items due to reduce disasters whei	-0.122	0.989	0.737
do you want to confirm information on disasters in the area due to prepare for the earth	0.015	0.884	0.722
do you want to talk about earthquakes and disaster prevention to my family in preparati	0.171	0.753	0.732
do you want to subscribe to insurance for houses and household goods in preparation f	0.172	0.569	0.778

Factor Correlation Matrix

Factor	1	2
the community-based disaster preparedness	1	0.7
the household-based disaster preparedness	0.7	1

It is detected 2 factors by factor analysis (maximum likelihood method, promax rotation) for 8 items consisting of the disaster preparedness. It is interpreted that factor1 is the community- based disaster preparedness, the factor 2 is the household disaster preparedness. Reliability coefficient of subscale is $\alpha=.944$ about factor1 and is $\alpha=.903$ about factor 2.

It is conducted only reliability analysis for Other factors such as the interest in disaster, concerns of society etc., because of it is detected only one factor each item.

Reliability coefficient of subscale is $\alpha=.916$ about the attachment to the community and is $\alpha=.911$ about the concerns of society , is $\alpha=.893$ about the interest in earthquake. About the attachment to the community, it is inappropriate as factor, because that is consists of only one item; however, it is included as the factor due to that factor does not have the effects in this study, Based on these results of factor analysis, it is examined the factors that have affected disaster preparedness using multiple regression analysis.

Table7 the result of hypothesis model of disaster preparedness

	household-baseddisaster preparedness	community-based disaster preparedness	community-based disaster preparedness(caseA)	community-based disaster preparedness (caseB)
	N=1000	N=1000	N=146	N=471
	β	β	β	β
interest in earthquake	0.22 **	0.255 **	ns	0.33 **
negative feelings	0.174 **	0.143 **	0.265 **	0.146 **
risk	ns	ns	ns	ns
benefit(household-based)	0.303 **	ns	ns	ns
benefit(community-based)	-	0.171 **	0.373 **	0.143 **
cost(household-based)	-0.183 **	-	-	-
cost(community-based)	-	-0.128 **	-0.346 **	-0.118 **
the subjective norm(household-based)	0.156 **	-	-	-
the subjective norm(community-based)	ns	0.149 **	ns	0.223 **
the commitment to the community		0.248 **	ns	0.23 **
the attachment to the community	0.081 **	0.085 **	ns	ns
the concerns about society	ns	ns	0.191 *	ns
the trust in public-help	ns	ns	ns	ns
the trust in mutual-help	ns	-0.085 *	ns	-0.127 *
Adjusted R ²	0.429	0.434	0.471	0.383

**p<.01,*p<.05

ns: not significant , -: not variable inputed

The table 8 is indicated result by multiple regression analysis (stepwise method). Regarding household-disaster preparedness, this case is not affected by the trust which is one factor of group psychological effects. By contrast, community-based disaster preparedness is affected by the trust in mutual-help. In addition, it is conducted cases analysis to clarify the attributes of those who strongly affected. In this analysis, it was defined that case A was citizens who answered “the efforts by mutual-help is important”, and that case B was citizens who answered “the efforts by self-help, mutual-help, public-help in disaster prevention is important” was case B

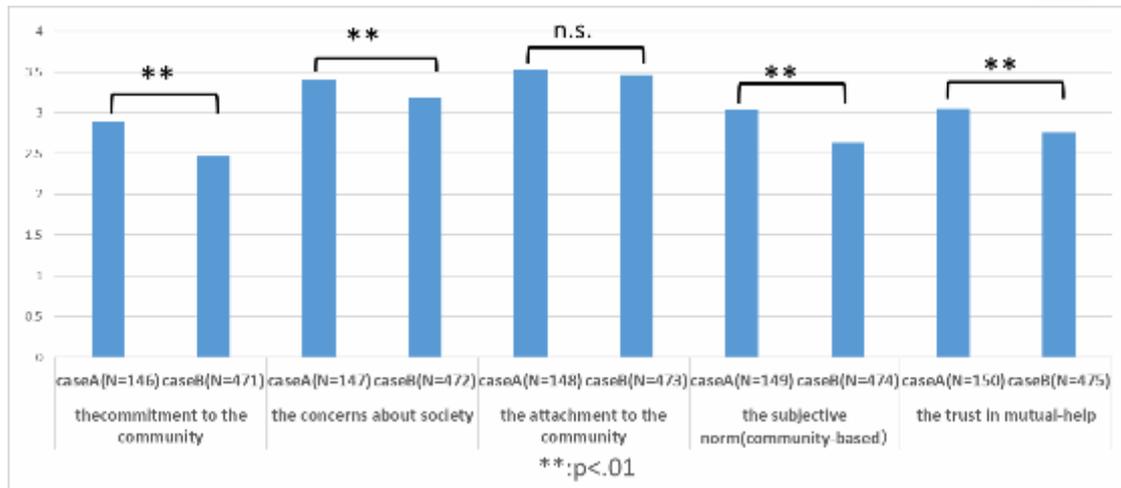


Fig2.the result of the different between the average value of the factor in case A and case B

Figure 2 indicates that there is a significant difference in factors related to social consciousness and community consciousness in the case of community-based disaster preparedness between case A and case B by t-test. It was clarified that compared to case B, case A has significantly higher the commitment to the community ($t=4.648$, $df=615$), the concerns about society ($t=2.924$, $df=615$), the subjective norm of community-based disaster preparedness ($t=5.248$, $df=615$), the trust in mutual-help ($t=3.695$, $df=615$). by contrast, there was no significant difference between case A and case B about the attachment to the community ($t=0.83$, $df=615$). As the result, it clarified that case A is totally more social and community consciousness that is group consciousness than case B.

3. CONCLUSIONS

It was clarified that community-based earthquake disaster preparedness is affected group psychologically affects by the trust in mutual-help. Particularly, case B that answered "public-help, mutual-help and self-help is important" has a stronger effect than case of other case including case A. In addition, Case B has a lower consciousness of society and the community, such as the concerns about society and the commitment to the community than case A. Although it is not clear why case B tends to have low group consciousness and is affected strongly by group psychology, it is supposed that the need for disaster preparedness of case B decline by reason that group size related disaster prevention become big due to the case B understand that the participation by diverse bodies is important. In this study, it could not be clear that characteristics of people who is affected social loafing. Therefore, it is needed additional investigation with another factor.

In this result at the present, it is could not make any concrete suggestion. However, it is necessary to raise various factors concerns about social and community the same as previous study related social loafing and to point out the importance of community-based disaster preparedness. However, that is pointed out in various scenes such as school disaster prevention education and administrative disaster prevention information. Therefore, another method is required for case B that is affected by the group psychological effect such as trust. It is needed to develop methods and tools to strengthen various factors of society and the community, in addition to the previous methods showing the importance of community-based disaster preparedness behavior and disaster risk.

REFERENCE

Japan Cabinet office" Disaster prevention white paper"2014
 Japan Cabinet office" Disaster prevention white paper"2016
 Toshikazu Yoshida, Tadahiro Motoyoshi, Shuichi Hirooka, Kumiko Morioka, Mitsutaka Kitaori, Naoki Ando, Tatsuo Fjita, Kazushi Saito, Ysuhiko Ishida "A Study of Social Annoyance (1)"1999, bulletin of Nagoya university of Education
 Tadahiro Motoyoshi, Kenji Takao, Saburo Ikeda 'Determinates of household-and based disaster preparedness'2008, study of social psychology, vol.23,209-220
 Toshitaka Katada, Takeru Kinoshita, Masanobu Kanai 'The Influence of the Dependent on Government Response about Natural Disaster Upon Preparedness' academic journal "Disaster information" No.9,2011
 Naoki Kugihara "why people get lazy in the group(Japanese)"2013
 Kipling D. Williams & Steven J. Karau "Social Loafing and Social Compensation: The Effects of Expectations of Co-Worker Performance" in Journal of Personality Social Psychology, Vol61. No4,570-581

1560 THE ANALYSIS OF FLOOD HAZARD IN THE GHATAL CD BLOCK OF PASCHIM MEDINIPUR DISTRICT, WEST BENGAL, INDIA

ABSTRACT

Located in the Indian state of West Bengal, the Ghatal Community Development (CD) Block of Paschim Medinipur District is highly susceptible to the flood hazard. This area is a low-lying inter-sedimentary lobe pocket between the floodplains of Kangsabati and Damodar Rivers. The rivers like Kangsabati, Shilabati, Darakeswar etc., which are originated in the Chhotanagpur Plateau and flowing through the Ghatal region, struggle to carry surplus runoff during the high discharge events and eventually cause flooding. These rivers receive runoff from the upstream reservoirs built under the Damodar Valley Corporation (DVC) and Kangsabati Reservoir Projects. The Ghatal region usually gets flooded every year and the floodwater may remain stagnated for months at a number of places. In recent times, major floods occurred here in October 2013 and July-August 2017. The 2013 event occurred due to the landfall of the ‘Phailin’ cyclone that resulted into torrential rainfall in the Chhotanagpur Plateau region of Jharkhand State and the western part of West Bengal. Whereas, the 2017 event was triggered by a monsoonal low pressure system that brought incessant rains in the same catchment area. This study attempts to figure out the characteristics of flood hazard in the Ghatal CD Block from the analysis of different satellite images (IRS LISS-III, Landsat-5TM, Landsat-8 OLI, Sentinel-2), field surveys and secondary information. The areas located on the left bank of Shilabati River were mostly affected during the flood events prior to the monsoons of 2017. Whereas, the areas located on the right bank of Shilabati River, including the towns like Ghatal and Daspur, were safeguarded by the circuit embankments constructed during the British Raj. The longest circuit embankment—Chetua—was breached at Pratappur during the high stages in the monsoon of 2017. The circuit embankments in the adjacent areas prevented the floodwater to get back to the channels. As a consequence, the inundation scenario was severe at Ghatal town and its surroundings. About 60% area in the Ghatal CD Block remained inundated for three weeks during July-August 2017. Very low regional slope and tidal activity in the Rupnarayan River, which is the principal drainage outlet of the region, ensure long periods of inundation.

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1606 CLIMATE CHANGE AND DECLINING NATURAL AND SOCIAL CAPITAL IN THE PORTUGUESE MOUNTAINOUS PROTECTED AREAS: A RECIPE FOR NATURAL DISASTERS AND AN OPPORTUNITY FOR INNOVATIVE TERRITORIAL POLICES

ABSTRACT

Portuguese mountainous areas experienced a long term decline in both their natural and social capital. Within the later 30 years the mountainous agroforestry and pastoral agro-ecosystems which shaped the landscape of these areas have been progressively abandoned in association with major sociodemographic and economical changes, which have led to depopulation, population ageing, farmland abandonment and grazing decline. The interrelated decline in both natural and social capital enhanced the expansion of recurrent wild fires that accentuated the impoverished of natural capital stocks and flows of regulating ecosystem services. Climate change are aggravating the problem with uncontrollable large wild fires with devastating consequences for the local populations, the ecosystems as the country as whole. Along with the declining stock and flows of ecosystems services such as landscape fire resilience, soil, water services and the rural landscape aesthetics, tourism and the demand for cultural services in these areas have exhibited an opposite trend, what has led to the expansion of the tourism supply, including accommodation and the offer of recreation services. Agri-environmental EU schemes have had a limited success, varying between practically unsuccessful in same protected areas to a successful policy measure on another, mainly depending on the role of common land (collectively ownership) to pasture. The traditional natural protected areas policies had contradictory impacts and show somehow exhausted. Local products promotion policies, such as the protected denomination origin show as well a limited success. This paper bases on empirical evidence collected to the Natural Park (NP) of Serra da Estrela (NPSE) to illustrate the decline on both the social and natural capital, and on the respective flow of services (social and natural capital based), along with the increase on the demand of cultural services. Ecosystem mapping and economic valuation methods have been employed, along with the regional data available to estimate some indicators for green accountability. Empirical data have been collected through an interdisciplinary and participatory approach involving local stakeholders in focus groups and group discussions. The main goal of the paper is to use the evidence abovementioned to anchor a discussion on innovative territorial policies able to underpin collective-based solutions for the value capture of the services of natural capital at the local level. These build largely on the acknowledgement of the scarcity and the cost (and value) of the provisioning, regulating and cultural services supplied by the mountainous areas by both: 1) the various direct and indirect beneficiary populations, including the local population, tourists and visitors, urban water consumers, among others; 2) the economic and political actors at local, regional and supra-regional scale.

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SS18.4. Natural and Man-Made Disaster Management

1621 IMPACT OF COAL FIRED THERMAL POWER PLANT ON THE DRINKING WATER QUALITY OF ANPARA, SONBHADRA, UTTAR PRADESH, INDIA

ABSTRACT

Anpara is a town in Sonbhadra district of Uttar Pradesh state in India which is well surrounded by small hills. It hosts the Anpara Thermal Power Station(ATPS) which is built aside the Govind Ballabh Pant Sagar dam on Rihand river, a tributary of river Son which also serves as a water source for the boilers of this power plant. This power plant has four stages and total 9 units of which stage A, B, and D are under UPRVUNL and C is under LANCO with a total installed capacity of 3830MW (2630MW under UPRVUNL and 1200MW under LANCO). The waste generated, from a coal-fired thermal power plant contains harmful elements such as Arsenic, Cadmium, Chromium, Mercury, Nickel, Lead etc. The fly ash generated from these units are either converted into a slurry and deposited in the ash ponds or kept in the dry state from where it is carried away by different industries like cement and brick industry. This fly ash, when deposited in ponds or kept for further transportation, contaminate the soil and surface water bodies through leaching process and then infiltrates to the aquifer where it contaminates groundwater. The quality of water bodies also deteriorates by the release of water from cooling towers which use chlorine as a coolant, responsible for algal bloom in water bodies. This study tries to find out the impact of this fly ash on the drinking water sources (surface water and groundwater) of nearby areas which are located near fly ash dumping sites. To fulfill this objective, samples were collected from handpumps and surface water bodies making concentric circles with an interval of 2 km in all four directions centering the fly ash dumping sites. The coordinates of sample collecting point were recorded and henceforth plotted on a map with the help of ArcGIS 10.5. The samples collected were taken to environmental science laboratory of Indian Institute of Technology (Indian School of Mines) Dhanbad to measure the concentration of elements such as Arsenic, Cadmium, Lead and Nickel with the help of Atomic Absorption Spectrophotometer. pH, conductivity, TDS, and turbidity was measured in Central Research Facility at the same institute as well. It was found that all the samples collected and tested have the concentration greater than the prescribed limit of World Health Organization for Drinking water. It is also found that there is a trend of decrement in concentration of elements in samples each time the collection point shifts away from the fly ash dumping ground. Key Words: Anpara, groundwater, fly ash, ash pond, thermal power plants, UPRVUNL

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1652 MONITORING OF AGRICULTURAL DROUGHT USING PRECIPITATION AND VEGETATION INDICES- A STUDY IN THE SOUTH-WESTERN PART OF WEST BENGAL

ABSTRACT

Indian agriculture is very much dependent on precipitation, especially of the Summer Monsoon Rainfall (SMR). Hence, delay of SMR may result in damaging effect on agriculture and thereby rural economy of India. The south- western part of West Bengal, the present study area, experiences drought in the state of West Bengal, mainly due to erratic SMR along with its typical soil and drainage characteristics. Drought has multi-dimensional effects, of which the most prominent is obviously reduction of agricultural productivity and, to a great extent, food security of the region. So, drought monitoring is an essential task for climatic hazard management. Application of geospatial techniques can be essentially useful for spatial analysis and planning to mitigate the hazard. In this study, agricultural drought has been assessed using both precipitation based and vegetation response indices. Gridded precipitation dataset of CRU T 3.21.4 and Moderate Resolution Imaging Spectro-radiometer (MODIS) Normalized Deference Vegetation Index (NDVI) and Land Surface Temperature (LST) have been used to assign the drought conditions across the study area. Crop production data of Kharif season (July-October) have been used to produce Yield Anomaly Index (YAI). On comparative analysis of both the precipitation based indices and vegetation response indices, a positive relationship has been found between vegetation based drought indices with the crop productivity in the study area. Keywords: MODIS, NDVI, LST, Yield Anomaly Index (YAI)

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1661 RISK SENSITIVE LAND USE MODELS FOR DISASTER RESILIENT URBAN DEVELOPMENT

ABSTRACT

Urban areas, due to their inherent nature of population and activity concentration pertaining to development are faced with severe challenges. Rapid and uncontrolled urbanisation has given rise to metropolitan and megacities in India that have complex urban problems like population explosion, high density, lack in physical infrastructure, informal housing, non-compatible land uses and magnified disaster risks. The development patterns of the cities, unplanned development turn both natural as well as manmade hazards into disasters which in turn adversely impact development; the sprawl of cities in ecologically sensitive areas/ unsuitable areas also result in increased vulnerability of built environment. Land use and urban development often do not take into account the vulnerability of environmental resources and thus in turn contributes towards increasing the risk of disasters. Land use planning and the city development processes also do not take into account the vulnerability, hazard and imminent disaster risks; risks reduction is not mainstreamed in the spatial planning processes. The significant impacts of urbanisation pertain to the high amount of land consumption, high density and low share of open areas among others. Also, the inadequate coping capacities of the cities limit the cities from overcoming and withstanding the adverse impacts. The disaster risk is for the city populace in general and the low income communities in particular as they don't have the resources to avert the ill-effects of a disaster. The vulnerability of the city is also associated with activity areas and work places, business districts, high density areas, public property and infrastructure, heritage structures, intense movement corridors, environmental resources/ eco sensitive and vulnerable areas. The consequences of disasters in metropolitan cities and megacities are closely linked to spatial distribution of activities. The development pathway of the present and future cities is thus dominated by increased vulnerability, growing hazards and amplified disaster risks. The future of the development of cities is thus unsustainable and untenable considering the impending unaddressed risks and the consequent severity of impacts. Hence the cities need to be resilient i.e. increase the ability to survive, withstand, adapt and grow in the face of stress and shocks, even transform when conditions require and recover quickly from any plausible hazards. Disaster resilient development is thus the sustainable trajectory for the cities in future. Hence disaster risk reduction needs to be mainstreamed into urban planning and development processes and land use planning has a significant role in resilient city development. Risk sensitive land use models is imperative for disaster resilient development so as to achieve sustainable urban growth without creating new risks; risk mitigation related to land development practices; reduction of vulnerability of people and places; address and reduce anticipated damages and losses and increase people's coping strategy and ability to recover through rehabilitation.

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1041 EVALUATING THE ECONOMIC DAMAGES BY TSUNAMI AND REGILIENCE: A MUNICIPALITY INPUT-OUTPUT APPROACH

ABSTRACT

This study aims to investigate how the production activities in 54 municipalities of Aichi Prefecture recover these activities stop due to a tsunami caused by Nankai Megathrust Earthquakes. We propose sequential dynamic bottleneck model using non-competitive import-type inter-regional input-output tables among 54 municipalities. By applying sequential hypothetical extraction method, we clarify the recovery process of municipal economy caused by production activities stop and restoration in coastal area of Aichi Prefecture by simulation analysis. As a disaster area, we focus on the surrounding areas of Mikawa Port and the flooded areas in the hazard map published by Aichi Prefecture.

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SS18.5. Natural and Man-Made Disaster Management

1697 AN EXTREME EVENT ON THE UPPER GANGA DELTA: A CASE STUDY OF 2000 FLOOD IN WEST BENGAL, INDIA

ABSTRACT

The Indian part of the Upper Ganga Delta is traversed by the Ganga River and its distributary system. As most of these distributaries—in their present condition—are unable to contain the monsoon discharge within their banks, the region has become susceptible to flood hazard in almost every year. The topography of the region is mainly characterized by natural levee systems and earthen embankments alongside the rivers. Also, quite a few palaeochannels are found near the rivers in the form of oxbow lakes, meander scars etc., pointing towards shifting of the channels through meander formation and avulsion. In some parts, due to channel siltation, elevation of the river bed is higher than the surroundings, causing stagnation of floodwater till it is percolated down or drained out using some abandoned river course. Moreover, the levees often act as barriers and prevent the water from getting back into the main channel. The largest flood in living memory occurred here in 2000. In September 2000, the remnant of a cyclonic depression triggered heavy downpour in the northwestern part of the Upper Ganga Delta and created an unprecedented flood that simultaneously breached a dyke and a railway embankment at Kalukhali in Murshidabad District (24.289°N, 88.292°E) on 21 September 2000. The flood inundated 46% of the Upper Ganga Delta region and many areas remained waterlogged for over a month. The floodwater surged southward following a non-descript palaeodistributary of the Ganga called Gobra Nala and caused most of the inundations (IRS-1D LISS-3 image: Path-108/Row-55/Subscene-A of 24-09-2000; Landsat-7 ETM image: Path-138/Rows-43, 44 of 30-09-2000). Following the regional slope, the floodwater then moved along the Jalangi, Mathabhanga– Churni and Ichhamati courses to flow southeastward into the Jessore District in Bangladesh (Landsat-5 TM image: Path-138/Rows-43, 44 of 08-10-2000). The palaeocourses present in the Bhagirathi–Jalangi and Jalangi–Churni Interfluves carried the floodwater along the regional slope, as found from different satellite images and digital elevation models. The flood took a week to reach the North 24 Parganas District from the central part of the Murshidabad District, covering a distance of about 150 km. The pre- and post-event satellite images of the 2000 disaster show very minimal alterations in channel orientations and floodplain morphology. The existing channel configuration and floodplain morphology of the Upper Ganga Delta are the outcomes of slower and less devastating fluvial processes. Floods are traditionally thought of as a devastating natural disaster, which led to the policies to prevent the flood completely. However, the inhabitants, residing in the mid-channel bars and near the river channels, have become quite accustomed to live with the floods. In view of the fact that the flow in the rivers is quite erratic during the monsoons, the flood prevention strategies may create more problems than solving them. Instead of being considered as a problem, the floodwater should be treated as a useful resource.

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1703 REGIONAL DEVELOPMENT AND ADAPTATION TO FLOODS: AN EMPIRICAL ASSESSMENT OF GENERIC AND STATE'S EMPLOYED DISASTER SPECIFIC MEASURES IN THE FLOOD AFFECTED DISTRICTS OF BIHAR, INDIA

ABSTRACT

Scientific evidences from the extent empirical literature are still tenuous in establishing relationship between rising income and reduction in disaster casualties. Further, at the varying institutional, environmental, and spatial settings, studies pertaining to the effectiveness of disaster specific and generic adaptation measures, and the state's intervention are sparse as well as inconclusive. In this paper, in the background of regional development and adaptation connections, we attempt to address these challenges and try answering the following: (i) do disaster specific and generic adaptation measures reduce damages from disasters?; and (ii) is the state intervention in facilitating adaptation measures effective in reducing the disaster outcome? Using data from the secondary sources we construct an unbalanced panel for the period 1973-2016 to empirically examine the conceptual risk-hazard model in the flood affected districts of Bihar. We consider flood fatalities as a function of (i) exposure elements represented by river water level, rainfall, and affected population; (ii) demographic attributes; (iii) generic adaptive capacity reflected by per capita district domestic product, female literacy, infrastructure, medical facilities; and (iv) the disaster specific adaptation measures such as learning from the number of past flood events, annually employed number of relief and health care centers, and boats in operation for the evacuation. As the flood fatalities are the non-negative count variable, we employ count data model; more specifically to account for the over-dispersion, we incorporate the fixed effect Poisson and negative binomial models. Additionally, to mitigate the potential endogeneity problem one period lag has been introduced among the explanatory variables. Controlling for the climate exposure and demography variables, our empirical exercise culminates into three major statistically significant findings. First, experiencing past flood events does not equip people to adapt reflecting that the flood prevention measures are not adequate. Second, generic adaptive capacity such as rising income and female's awareness help in reducing the flood fatalities. Finally, the disaster-specific measures are proved essential and immediate adaptation intervention from the state to enable a region experiencing less number of death. Overall, the findings also lay importance to the adaptive disaster prevention measures in the flood affected districts of Bihar. From the policy perspective, this study suggests that the state should adopt a comprehensive strategy in ensuring that generic and disaster specific adaptation measures are required to be complemented with the disaster specific prevention measures. With measures such as flood warning systems, regular and efficient monitoring and maintenance of embankments, and flood awareness programs among the others, government with the help of local institution should adopt a wider adaptation plans. Additionally, the transboundary dimension of flooding should be addressed involving the government of Bihar, Nepal, and India.

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1721 ASSESSING SOCIAL VULNERABILITY TO FLOODS IN BIHAR, INDIA

ABSTRACT

Assessing social vulnerability to natural disaster using composite indices enables and provides critical information to the policy makers to comprehend why disaster events have varying outcomes within and between the locales. In the various spatial and environmental settings, although adequate research contributions in the field of social vulnerability have emerged, we do not find much contribution based on Bihar even though the region’s experience to flooding has been frequent. This study, while assuming vulnerability is a state rather outcome, incorporates a host of indicators and further categorizes them in the conceptual cast of exposure, sensitivity, and adaptive capacity in its assessment. Subsequently, principal component analysis is used to identify the dominant factors at the subcomponent levels which influence the vulnerability of the flood affected districts. With standardization and aggregation across the sub-indices, followed by the use of the Geographic Information Systems (GIS), the social vulnerability index is demonstrated as spatially varying. Concomitant to the varying degree of exposure, sensitivity, and the adaptive capacity, the composite social vulnerability index indicates that (i) among the disaster management department declared flood prone districts, the concentration of highest level of social vulnerability is in north Bihar; (ii) most of the districts which are ranked next to the highest level are in the neighborhood showing a spatial pattern; (iii) districts coming in the bottom two categories although do not show any such spatial pattern, however, they lie mostly in the south of river Ganges; (iv) most vulnerable districts have many flood causing rivers passing through them; and (v) district Patna although is one of the significantly high exposed districts to floods, because of the highest adaptive capacity with least sensitivity, it emerges as the least socially vulnerable district. Besides, the overall vulnerability in Bihar is significantly high. This suggests that the policy at the ‘start point’ level needs to address both the disaster prevention, risk reduction, and the mitigation measures as well as enhancing the efforts to makes inhabitants capable to reduce the risk to floods.

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SS19.1. Globalization and Regional Science

1054 CRIME ANALYSIS AND PREDICTIVE MODELLING USING GEOINFORMATICS

ABSTRACT

Crime is not only related to human mind, but is deeply associated with geographical space. It is also evident that specific crime takes place in the specific geographical locations and areas. Crime studies from decades are based on tabular or textual representation in the records. However, with the advent of geospatial technology especially, Geographic Information System, there is a turning point in the crime study and analysis. With rapid advancement in the sophisticated technology in combination of GIS, Remote Sensing, GPS and very advanced information and communications system, the analysis and modelling has been very simpler and rela time or near real time. It gives an opportunity to spatially enabled eGovernance in the area of crime analysis and management and expected to help immensely if used properly combining various factors of crime in the modelling. This paper is an endeavour to develop spatially enabled analysis and modelling for crime management through the case study of Shimla City. The database used is the crime records obtained by the police department in terms of FIRs for the years 2001, 2006 and 2012. It analyses the crime types, spatial pattern, hotspots, seasonality and diurnality integrating associated probable factors related to geographical and socio-economic aspects to develop an intelligence system through modelling for prediction and management. It is expected to provide a base for highlighting the importance of geographical factors in crime analysis, prediction and management.

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1077 REGIONAL SCIENCE IN THE PAST: WHAT CAN ARCHIVES TELL US?

ABSTRACT

This presentation focuses upon the use of archives to explore regional science in the past. It examines three main aspects: institutional histories; the history of the contributions of key individuals; and the history of particular ideas, techniques and theories. The RSAI Archives are held at Cornell University in Ithaca, New York State and contain a large amount of material about the founding of the RSA in the mid-1950s and the setting up of RSA sections throughout the world, including the establishment of the Indian Section in the late 1960s. It also includes Walter Isard's papers and correspondence' as well as those of a number of important American regional scientists. The presentation provides examples of how the Archives have been used to construct an institutional history of particular sections and supra-regional groupings within the RSAI. It also demonstrates the use of the so-called Wayback Machine to record websites and their changes over time. Finally, the presentation shows how archives may be used to build up a detailed account of the work of particular regional scientists, using the examples of Philip Sargant Florence, one of the earliest regional scientists. and the work that has been done to record RSAI activities through the so-called Wayback Machine, an online system for storing past web-pages. In addition, I would include two presentations in this session, drawing on my own archival research: one focusing on the institutional history of RSAI and the other exploring the role of an early regional scientist, Philip Sargant Florence.

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1113A STUDY ON 'GALAPAGOS SYNDROME' ON MOBILE HANDSET MANUFACTURERS IN SMARTPHONES ERA IN JAPAN

ABSTRACT

The purpose of this paper is to study the “Galapagos Syndrome,” in which many Japanese mobile handset manufacturers left the market in smartphones era, by comparing with trilateral such as Europe, U.S. and Japan. Previous studies: Kushida (2011) describes “Galapagos effect,” in which winning in an isolated domestic market led to losing in global markets.” This paper adds the viewpoints of analysis for the relationship in competition among mobile carriers located inside and outside one country. Analysis: This paper mainly focuses on the feature phones era and second generation (=2G) of mobile service launched in 1993 in Japan, whereas the smartphones launched in 2007, such as iPhone and Android, use 3G and 4G mobile services. (i) EU In 2G, EU launched new policy, as directive with legal basis, which enable the mobile user be convenient by defining only one standard and realize one mobile handset available in all EU member states. Unifying into only one standard of mobile system in 2G, if one incumbent mobile carrier outstandingly dominates the standard, all other mobile carriers would be dominated from the viewpoint of technology. In result, it is said not mobile carriers but the equipment manufacturer led standardization of mobile system (=GSM) in 2G, and mobile carriers accepted it without the dreadfulness of being acquired by other mobile carriers. It is categorized EU as “one standard in multiple incumbent mobile carriers in one country (=EU).” (ii) U.S. There were several mobile incumbent carriers, including Baby Bells, in U.S., U.S. launched the policy of frequency assignment in up to 493 regions. All mobile carriers including incumbent need roaming with other mobile carriers to make services available in nationwide. To avoid the control and taking over bit by other mobile carrier, major mobile carriers voluntarily selected the GSM, led by equipment manufacturers. It is categorized U.S. as “one standard in multiple incumbent mobile carriers in one country.” (iii) Japan The condition in Japan was different. There was only one dominant mobile carrier, NTT DOCOMO, in Japan. And, Government of Japan (GOJ) requested only one standard in 2G. It is categorized Japan as “one standard in one incumbent mobile carrier in one country.” NTT DOCOMO and its families (=equipment manufacturers which had the closest relationship with DOCOMO) outstandingly led the standardization (Kushida (2011)), and they took enclosure strategy and launched fabulous services such as i-mode launched in 1999. After launch of smartphones, such as iPhone and Android after 2007, many Japanese equipment manufacturers could not leave the closest relationship with DOCOMO, and finally lost the market share in handset in smartphones era and left equipment market. Result and discussion This paper revealed why Japanese mobile services became “Galapagos,” by comparing trilateral.

REFERENCE

Kushida, Kenji E. (2011) "Leading without Followers: How Politics and Market Dynamics Trapped Innovations in Japan's Domestic "Galapagos" Telecommunications Sector," Journal of Industry, Competition and Trade, Vol. 11, Issue 3, pp 279-307

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1139 GEOECONOMICS IN CENTRAL AND EASTERN EUROPE: ECONOMIC DEPENDENCIES OF THE EUROPEAN PERIPHERIES REVISITED

ABSTRACT

The paper investigates the long-term historical problems of capital accumulation in the context of dependency models of varieties of capitalism (Nölke and Vliegenhart, 2009, Myant and Drahokoupil 2011) and the “world system” models (Wallerstein, 1974, Arrighi et al. 2003, Amin, 1977), the systemic and geo-economic features of Central Europe’s post-socialist integration process. The major pattern that emerges is one of a high dependency on FDI, foreign multinational firms, European Union funds and exports to Western Europe. The economic transition of Central and Eastern Europe, and Visegrad 4 countries in particular, was fuelled by neoliberal ideologies and political agendas of “East-West convergence” that involved marketization and privatization. Both of these created a moral, legal and structural environment that rapidly cemented new modes of dependent integration into the EU and the global division of labour. At the same time, the most important historical dependencies of the CEE region, such as financial, technological and market ones, have remained constant (Gál and Schmidt, 2017). This is complemented with the large energy dependency of CEECs on Russia and the increasing Chinese economic interest towards this gateway region.. This not only further strengthens the external vulnerability of the region, but also makes re-interpretable the geopolitical and geoeconomic features of Central Europe as a ‘buffer zone’ situated between German and Russian spheres of interest. We will first examine the geo-economic features of the externally managed and financed integration of post-socialist transition countries of CEE into the global economy and the European Union. We will also focus on the impacts of FDI and European Union structural funds on growth, gross fixed capital accumulation, per capita GNI and export in selected Central European countries using OLS regression for the period between 1995-2015. Preliminary results do not indicate a strong correlation between convergence and FDI, rather domestic savings and higher incomes are the most important factors. As a result, domestic policies based on wage competition and that give little support to small and medium-sized enterprises exacerbate core-periphery asymmetries and support an economic buffer zone narrative. In conclusion, we suggest that such economic gaps within the EU could have long-term consequences for political and economic cohesion in the EU as a whole. The research also contributes to policy debates in terms of achievement of transition, EU accession and the impact of the crisis on regional imbalances and tries to answer the question why even the most successful CEECs, being too dependent on foreign capital and multinationals, suffer setbacks from time to time and cannot fill the income gap existing between CEE and Western Europe.

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1743 THE LIFE AND DEATH OF CITIES IN A SPATIAL MODEL WITH HETEROGENEOUS AGENTS

ABSTRACT

We develop an agent-based platform to broaden the empirical grounding of the canonical model of geographical economics. The benchmark algorithm preserves the theoretical base of spatial agglomeration as the replication of the “tomahawk diagram” demonstrates. The paper then makes two contributions, introducing new bottom-up features that produce anomalies that deviate from the canon. First, giving identical agents the full autonomy to move simultaneously causes population to oscillate between regions. Autonomy is thus one impetus driving the rise and fall of cities. Second, the model addresses the heterogeneous nature of migration dynamics brought about by cognitive abilities that differ across individuals. We show that heterogeneity can lead to a complete reversal of the relationship between agglomeration and transportation costs embodied in the tomahawk diagram. In particular, small fortuitous noise can break the symmetry that prevails in the original model at high transport costs. The bottom-up approach thus allows us to explore previously intractable emergent properties that may hold the key to understanding more fully the behavior of complex spatial systems.

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SS19.2. Globalization and Regional Science

1174 ANALYSIS ON THE STRUCTURE OF INTRA-REGIONAL TRADE IN THE GREATER MEKONG SUB-REGION

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ABSTRACT

With the industrialization of Cambodia, Lao PDR and Myanmar, economic linkage within the Greater Mekong Sub-region (GMS) has been strengthening in recent years. It is expected that production network is formulating in the region. Under such situation, this paper aims to verify the structure of production network in the GMS, through the analysis on mutual trade figures. Following the literatures, this paper introduced Grubel and Lloyd index and the unit value of trade ratio to decide the types of division of labor.

The author found that both vertical and horizontal division of labor are taking place with Thailand in the ‘machinery and electric’ industry. Among them, the relationship between Thailand and Vietnam is the key partners of this industry. In the meantime, there are some division of labor in ‘transportation’ industry, and almost all of them are vertical. However, some of them are not only between Thailand and Vietnam, cases between Thailand and Cambodia seem to exist. As the trades are explaining the vertical division of labor, they are consistent with the establishment of satellite plants in Cambodia. However, comparing to the cases between Mexico and the US, production network in the automobile industry in the GMS is still on the primitive stage. If the production of automobile in Vietnam increases, regional division of labor can expand.

Keywords: intra-industry trade, division of labor, Greater Mekong Sub-region (GMS), Grubel and Lloyd index

JEL: F14, F15, R11

1. INTRODUCTION

In this paper, the author tries to verify the formulation of the production network within the Greater Mekong Sub-region⁵²² (GMS). In the GMS, Thailand is relatively the most industrialized country with foreign manufactures since 1980s, followed by other for countries. For example, the production of the automobile is advanced, almost 2 million vehicles were produced in 2015, and it is ranked at 12th in the world (Table 1).

Table 1. Motor vehicle production

Country	2015	2005	Rank in 2005
China	24,567,250	5,717,619	4
USA	12,105,988	11,946,653	1
Japan	9,278,238	10,799,659	2
Germany	6,033,364	5,757,710	3
South Korea	4,555,957	3,699,350	5
India	4,160,585	1,638,674	12
Mexco	3,565,218	1,684,238	11
Spain	2,733,201	2,752,500	7
Brazil	2,429,421	2,530,840	9
Canada	2,283,307	2,687,892	8
France	1,972,000	3,549,008	6
Thailand	1,911,751	1,122,712	14
Vietnam	171,753	—	—

(Note) Statistics of 'International Organization of Motor Vehicle Manufacturers (OICA)'

The progress of industrialization means that per capita income, which can be translated as wage level, has increased. As a result, Thailand is facing the difficulty to continue all the production process inside country, especially labor intensive process. Then the idea that a part of production process is divided and shifted to neighboring countries such as Cambodia and Lao PDR is emerged. Such division of labor in the production process can be observed by trade statistics, because a part of the parts of a product is produced in a different country. For example, according to the press release of Toyota-Boshoku in 2014⁵²³, satellite plant in Lao PDR started production of car sheet in order to complement the sheet production in Thai plant. Other than that, Yazaki started satellite plant in Cambodia to complement the wire harness

522 In this paper, the GMS is defined to be formulated by five countries; Cambodia, Lao PDR, Myanmar, Thailand and Vietnam. Other definition, for example, Mekong Committee, includes Yunnan and Guangxi in China.

523 <https://www.toyota-boshoku.com/jp/news/release/detail.php?id=686> : dated on May 19, 2014 (in Japanese).

production in Thai plant in 2012⁵²⁴. In addition to automobile industry, Nikon, which is a digital camera manufacturer, started its satellite plant operation in 2013 in order to supplement production in Thai plant⁵²⁵.

If these kinds of operation increased, the intra-regional trade of intra-industry should increase. Before observing in detail, the author would like to overview the trend of intra-regional trades in the GMS. Table 2 shows that the share of intra-regional trade in the GMS is increasing in these years. As the trade volume itself has been increasing, the amount of intra-regional trade has increased significantly. We may be able to expect that the accumulation of above mentioned examples has promoted division of labor in the production process.

Table 2. Direction of exports from GMS (Ratio: %)

Direction	2000	2005	2010	2015
GMS: Intra-regional trade	3.6	5.6	7.1	8.7
Japan	14.8	13.1	10.2	8.9
China	5.1	8.4	10.7	11.8
United States	19.2	16.4	13.1	15.1
World total	100.0	100.0	100.0	100.0

(Note) IMF 'Direction of Trade Statistics'.

Under the recognition mentioned above, the author verifies production network in the GMS. After referring the previous literature in the next section, the author analyzed the trade figures to study the division of labor in the production in section 3. This section is divided into three parts. In the first part, intra-regional trade by industry is calculated to distinguish the division of labor in production and only the mutual trade after the categorical aggregation effects. The 'machinery and electric' and 'transportation' industry were selected for further analysis. Secondly, these trades of two industries are precisely analyzed. Finally, comparing to Mexico and the US case of automobile industry, progress of the division of labor in the GMS is discussed. Section four is the conclusion.

2. LITERATURE REVIEW

As for the study in the division of labor in production in the GMS, Nozaki (2016) conducted an empirical study. It tried to clarify that 'transportation' industry has just started vertical division of labor in the GMS. This paper is to extend the analysis of Nozaki (2016), because the latest data of the analysis is of year 2012 and the studied industries are only 'textile' and 'transportation' industries.

In order to measure the progress of division of labor in production, a combination of Grubel and Lloyd index (hereinafter, GL index) and unit value ratio is a popular method. GL index was introduced in Grubel and Lloyd (1971). The definition of the index is expressed as: $GL_i = \frac{(X_i + M_i) - |X_i - M_i|}{X_i + M_i}$

where X_i presents exports of a country to a partner country for item i , and M_i is imports from the partner country (equal to exports of the partner country to that country). This GL index runs from 0 to 1; when the index is near to 1, intra-industry trade is active, whereas it is inactive when the index is near to 0. This index has been used in many empirical studies. At the same time, the GL index has structural shortage. It is expressed as the influence of categorical aggregation, pointed out by Greenaway and Milner (1983). When we investigate the trade figures more precisely, the high value of GL index sometimes disappears. It does not express the mutual trade of same item but different items which belong to a same rough category. Therefore, we should break down into the most detailed category to know the mutual trade.

The next question is whether such division of labor is vertical or horizontal, when we find mutual trade in a detailed item. One answer is proposed by Greenaway et al. (1995). When the type of intra-industry trade is considered using the GL index, additional information on the relative unit value is helpful in distinguishing the vertical division of labor from the horizontal division of labor. If the ratio of unit values between exports and imports is similar, the trades can be understood as a horizontal division of labor. If the ratio is very different, the trades may be vertical. Greenaway et al. (1995) proposed the threshold line of the unit value gap as plus or minus 15%, which gives a wedge of 30%. With imperfect information the threshold is widened to plus or minus 25%, which gives a wedge of 50%.

3. RESULTS OF ANALYSIS

3.1 Intra-regional trade by industry

Firstly, the author analyzed the intra-regional trade volume by industry. Industries whose GL indexes are more than 0.3 in 2015 are described on Table 3. It shows that intra-regional trades seem to be occurring in almost all industries. Then we notice that some of the industries are not fit in intra-industry trade. They are 'animal and animal products', 'vegetable products', 'mineral products', 'plastics and rubbers' and so on. In this context, we find the effects of categorical aggregation as Greenaway and Milner (1983) pointed out.

524 Press release by Obayashi Corp., http://www.obayashi.co.jp/news/news_20121227_1: dated on Jan. 11, 2013 (in Japanese).

525 Press release by Nikon, https://www.nikon.co.jp/news/2013/0321_01.htm: dated on Mar. 21, 2013 (in Japanese).

Table 3. GL indexes by industry in 2015

Industry	Country A	Country B	GL Index	Industry	Country A	Country B	GL Index
Animal & Animal Products	Cambodia	Lao PDR	0.340	Footwear / Headgear	Cambodia	Thailand	0.453
	Myanmar	Thailand	0.521		Lao PDR	Thailand	0.784
	Thailand	Vietnam	0.852		Lao PDR	Vietnam	0.968
			Thailand		Vietnam	0.407	
Vegetable Products	Cambodia	Thailand	0.724	Stone / Glass	Cambodia	Vietnam	0.401
	Lao PDR	Thailand	0.997		Lao PDR	Vietnam	0.909
	Myanmar	Thailand	0.626		Thailand	Vietnam	0.475
Foodstuffs	Lao PDR	Vietnam	0.906	Metals	Lao PDR	Thailand	0.965
	Thailand	Vietnam	0.312		Thailand	Vietnam	0.802
Mineral Products	Lao PDR	Thailand	0.759	Machinery / Electrical	Cambodia	Lao PDR	0.948
	Myanmar	Thailand	0.326		Cambodia	Thailand	0.374
Plastics / Rubbers	Cambodia	Lao PDR	0.773		Lao PDR	Thailand	0.648
	Cambodia	Vietnam	0.793		Lao PDR	Vietnam	0.421
	Lao PDR	Vietnam	0.420	Thailand	Vietnam	0.749	
Raw Hides, Skins, Leather, & Furs	Lao PDR	Vietnam	0.955	Transportation	Cambodia	Lao PDR	0.593
	Myanmar	Vietnam	0.392		Cambodia	Myanmar	0.507
Wood & Wood Products	Cambodia	Lao PDR	0.667		Thailand	Vietnam	0.411
	Lao PDR	Vietnam	0.561	Miscellaneous	Cambodia	Myanmar	0.768
	Myanmar	Thailand	0.642		Lao PDR	Thailand	0.387
			Thailand		Vietnam	0.761	
Textiles	Cambodia	Myanmar	0.479				
	Lao PDR	Vietnam	0.830				
	Thailand	Vietnam	0.622				

(Note) The United Nations 'UN-Comtrade Database'

The author selected two industries; 'mineral products' and 'plastics and rubbers'. Their HS 2-digit codes are HS 25-27 and HS 39-40, respectively. As for the 'mineral products', high score of GL index was recorded between Thailand and Lao PDR, Thailand and Myanmar, and as for 'plastic and rubbers', high score of GL index was recorded between Cambodia and Lao PDR, Cambodia and Vietnam, Lao PDR and Vietnam. When the author broke down HS 2-digit level, it was found that not all HS 2-digit items formulated large GL index. HS 27 between Thailand and Lao PDR, HS 39 between Vietnam and Lao PDR, and HS 40 between Cambodia and Vietnam. With further breaking down into HS 6-digit level, only three items recorded GL indexes of 0.3 or more in 2015. They are HS 271600 (electrical energy) between Thailand and Lao PDR, HS 390210 (plastics; plates, sheets, film, foiled strip of polymers of ethylene) between Vietnam and Lao PDR, and HS 401590 (Rubber; vulcanized, article of apparel and clothing accessories) between Cambodia and Vietnam. Furthermore, even three items remained, they do not seem to formulate division of labor in production process. Trade volume of HS 390210 and HS 401590 are not so much; each amount of one-way trade are less than 100,000 US dollars. Another item of HS 271600 is a specific item. Needless to say, production process of electric energy cannot be divided into parts. This mutual trade happens due to the cost of power transmission. Although the Lao PDR has long exported hydro power to Thailand, remote area from power plants in Lao PDR should import electricity from Thailand in cheaper price than to convey from Lao plants. In any case, it is not the scope of intra-industry trade.

Accordingly, the author verified the effects of categorical aggregation, in particular, in the industries whose production process is not so complicated. On the other hand, in industries of complicated production process such as 'machinery and electrical' and 'transportation', we can expect the phenomenon to explain division of labor in production, although we may face the same categorical aggregation effects

3.2 Intra-regional trade in the selected sector

In this sub-section, analysis on 'machinery and electrical' and 'transportation' is focused on. On the industrial base, between Cambodia and Lao PDR, Cambodia and Thailand, Lao PDR and Thailand, Lao PDR and Vietnam, and Thailand and Vietnam are the combinations which GL indexes recorded high score in 2015 for 'machinery and electrical'. As for the 'transportation', between Cambodia and Lao PDR, Cambodia and Myanmar, and Thailand and Vietnam are the combinations of high GL index score.

Before investigating the individual items of HS 6-digit level, the author verifies the HS 2-digit level, namely HS 84 to 85 for 'machinery and electric' and HS 86 to 89 for 'transportation'. The combinations with high GL index in 2015 are between Cambodia and Lao PDR, Cambodia and Vietnam, Lao PDR and Vietnam, Myanmar and Thailand, and Thailand and Vietnam for HS 84. As for HS 85, they are between Cambodia and Thailand, Lao PDR and Thailand, Lao PDR and Vietnam, and Thailand and Vietnam. As for HS 86 and HS 88, there is no combination with high score of GL index. As for HS 87, between Cambodia and Lao PDR, Cambodia and Myanmar, Thailand and Vietnam are the high score. As for HS 89, between Lao PDR and Thailand and Vietnam are such combination. However, the transaction volume of HS 89 was small, and it also means that categorical aggregation effects appeared in these industries. Therefore, the author calculated the indicators of HS 6-digit level of HS 84, HS 85, and HS 87.

The author calculated GL indexes of all items of bilateral trades in the GMS in 2015. When we see HS 6-digit, there are 569, 381 and 87 items for HS 84, HS85, and HS 87, respectively. Among them, 99 combinations whose GL indexes are 0.3 or more. In detail, 88 combinations are 'machinery and electric', and 11 combinations are 'transportation'. Then the

author calculated GL indexes and unit value ratio for 10 years (from 2006 to 2015) of such 99 combinations. The result of the calculation is as follows.

3.2.1 Machinery and electric

It is possible to categorize the 88 combinations by two dimensions. One dimension is whether bilateral trade has occurred for long years or just for recent years. Another dimension is whether the unit value is similar or not, in this paper, criteria is set as plus or minus 25%. The list of the combinations is on Table 4. We found that Thailand is almost always the partner of bilateral trades, only two cases between Vietnam and Lao PDR (HS 841451), and Vietnam and Cambodia (HS854420) are exceptional. We can say that production network is centered by Thailand in the ‘machinery and electric’ sector. When we observe in detail, most of mutual trades for long years are between Thailand and Vietnam, 39 cases among 44 cases. On the other hand, newly started mutual trades include between Thailand and Cambodia, between Thailand and Myanmar, and between Thailand and Lao PDR, although trades between Thailand and Vietnam are still majority, 26 cases among 44 cases.

Table 4. Mutual trade items in machinery and electric

Trade type	Trade partner	HS code
A	Thailand-Lao PDR	850431
	Thailand-Vietnam	841451, 841480, 842123, 844331, 847989, 848310, 850110, 850152, 850431, 851680, 851762, 854449
B	Thailand-Vietnam	841459, 848390, 851290, 851829, 853650
C	Lao PDR-Vietnam	841451
	Thailand-Lao PDR	850450, 854430, 854442
	Thailand-Vietnam	840999, 841490, 841899, 845290, 846694, 847330, 848079, 848140, 848410, 848490, 850300, 850450, 852990, 853400, 853630, 853690, 853929, 854419, 854420, 854430, 854442, 854890
D	Cambodia-Vietnam	854420
	Thailand-Cambodia	847989, 850110, 851770, 852990, 853650, 854449
	Thailand-Lao PDR	847330, 850490, 850590, 851718, 852990, 854411, 854449
	Thailand-Myanmar	841391, 842940, 850790, 854390
	Thailand-Vietnam	841330, 841370, 841590, 842121, 843131, 844332, 844399, 847180, 847710, 848071, 848180, 848340, 848790, 850140, 850151, 850490, 850720, 850819, 851220, 852859, 853620, 853641, 853720, 854232, 854239, 854520

(Note) 1. United Nations 'UN-Comtrade Database'.
 2. 'Trade type' is defined as A: Mutual trade started before 2010 and the unit value of exports are close. B: Mutual trade started before 2010 and the unit value of exports are close only in recent years. C: Mutual trade started before 2010 and the unit value of exports are different.
 D: Mutual trade started after 2010.

As for the long year transaction of 44 cases, 13 cases can be considered to formulate horizontal division of labor, while 26 cases are considered vertical division of labor. The rest of 5 cases are difficult to determine, perhaps they are shifting from vertical division of labor to horizontal. This means that the quality of items, which Vietnam has produced and exported for long years, is high enough to substitute the Thai products.

As for the recent transaction of 44 cases, only one case can be considered as a horizontal division of labor. The rest of 43 cases are vertical division of labor or unclear. Production of these items has not been matured yet to formulate horizontal division of labor. Furthermore, we found that some items seem to be substitute the production from in Vietnam to Cambodia or Lao PDR. In this category, there are 6 cases between Thailand and Cambodia, and 6 cases between Thailand and Lao PDR among 18 cases, which are not cases between Thailand and Vietnam. 6 cases, equivalent to a half of 12 cases, are the items of which mutual trade have continued for long years between Thailand and Vietnam. No similar case is not observed between Thailand and Myanmar. This phenomenon may have happened because logistic cost is cheaper to have a production base at the mid-point of Thailand and Vietnam. It also explains that Cambodia and Lao PDR have increased the capability to produce such items, and the division of labor in production is progressing.

To summarize the analysis on ‘machinery and electric’, we found that some items have been mutually traded between Thailand and Vietnam, some of which formulated horizontal division of labor. In addition to that, some of such items have started to be produced in Cambodia or Lao PDR to supplement the production in Vietnam.

3.2.2 Transportation

As the number of items of ‘transportation’ is 94, around one tenth of ‘machinery and electric’, the number of items, whose GL index is 0.3 or more, is not so large, 11 items (Table 5). Among such 11 items, 4 of them are for motorcycle or bicycle. Then 7 items are vehicle parts. Although one item, HS 870790 between Thailand and Vietnam, has been traded for long

years and the unit value is close, which we understand that it is a horizontal division of labor, it is body of tractor. Therefore, it is difficult to say that horizontal division of labor is occurring in automobile industry. However, regarding on vertical division of labor, we could find some items of parts or accessories of vehicle.

As for the regional characteristics, although we could not find mutual trade items between Thailand and Lao PDR, we found 3 vehicle items between Thailand and Cambodia. Although Nozaki (2016) pointed that vertical division of labor between Thailand and Vietnam was observed, the present research suggests that the production network is expanding.

Table 5. Mutual trade items in transportation

Trade type	Trade partner	HS code
A	Thailand-Vietnam	870790
B	Thailand-Vietnam	870895
C	Thailand-Cambodia	870323, 870422
	Thailand-Vietnam	871492
D	Thailand-Cambodia	870421
	Thailand-Vietnam	870829, 870840, 871120, 871410, 871499

- (Note) 1. United Nations 'UN-Comtrade Database'.
 2. 'Trade type' is defined as Note of Table 4.
 3. Contents of each HS codes are listed at Appendix.

3.3 Automobile industry in Mexico

Focusing on the automobile industry in the GMS, a characteristic is production of the finished car is concentrated in Thailand, although the number in Vietnam has just started to increase. In this sub-section, relationship between the US and Mexico, both of them are major automobile producers, is studied. According to the Table 1, while the US keeps the number of automobile production around 12 million, both Mexico and Thailand increased the production. The circumstances for automobile production in Thailand are then different from that in Mexico because Thailand does not have a large supplier and market like the US for Mexico. It is easy to imagine that the structure of automobile industry in Mexico is different from that in Thailand. Then the author calculated GL index and unit value ratio between Mexico and the US. The result is on Table 6.

Table 6. Mutual trade items in transportation between Mexico and the US

Trade type	HS code
A	870324, 870810, 870829, 870830, 870840, 870850, 870870, 870880, 870891, 870892, 870893, 870894, 870895, 870899, 871690
B	871499
C	870190, 870210, 870710, 870919, 871120, 871420, 871492, 871493, 871620, 871640, 871680
D	870130, 870432, 870490, 870600, 871410, 871494

- (Note) 1. United Nations 'UN-Comtrade Database'.
 2. 'Trade type' is defined as Note of Table 4.
 3. Contents of each HS codes are listed at Appendix.

Different from the GMS situation, there are 33 items whose GL index is 0.3 or more among 99 items. Even eliminating of bicycle-related and motorcycle-related, 26 items remain. Among them, 15 items including the vehicle parts are traded under the horizontal division of labor. It is explained that manufacturers exchange the parts, which are used for the same purpose but have different function, between Mexico and the US. It may mean that the production capacities of some parts in Mexico is as advanced as in the US. At the same time, 11 items conform the vertical division of labor, which may mean that the wage gap between Mexico and the US facilitated the production fragmentation.

Through the comparative research to the case of the US and Mexico, the production network in the automobile industry in the GMS is still a primitive stage. In the future, when Vietnam increased the number of automobile production, we can expect the more advanced production network.

4. CONCLUSION

This paper analyzed trade figures in the GMS. The author found that both vertical and horizontal division of labor are taking place with Thailand in the 'machinery and electric' industry. Among them, the relationship between Thailand and Vietnam is the key partners of this industry. In the meantime, there are some division of labor in 'transportation' industry, and almost all of them are vertical. However, some of them are not only between Thailand and Vietnam, cases between Thailand and Cambodia seem to exist. As the trades are explaining the vertical division of labor, they are consistent with the establishment of satellite plants in Cambodia. However, we could not find the evidence of division of labor, between Thailand and Lao PDR. We should wait and see the newer information. In any case, comparing to the cases between

Mexico and the US, production network in the automobile industry in the GMS is relatively primitive stage. If the production of automobile in Vietnam increases, regional division of labor can expand.

REFERENCES

Greenaway, D. and Milner, C. (1983). On the Measurement of Intra-Industry Trade. *The Economic Journal*, 93(372), 900-908
 Greenaway, D., Hine, R. and Milner, C. (1995). Vertical and Horizontal Intra-Industry Trade: A Cross Industry Analysis for the United Kingdom. *The Economic Journal*, 105(433), 1505-1518
 Grubel, H. G. and Lloyd, P. J. (1971). The Empirical Measurement of Intra-Industry Trade. *Economic Record*, 47(4), 494-517
 Nozaki, K. (2016). Progress in Intra-industry Trade in the Greater Mekong Sub-region. *Foreign Trade Review*, 51(2), 147-161

Appendix: List of the HS code and Item

(1) HS 84	
Code	Item
840999	Engines; parts for internal combustion piston engines (excluding spark-ignition)
841330	Pumps; fuel, lubricating or cooling medium pumps for internal combustion piston engines
841370	Pumps; centrifugal, n.e.c. in heading no. 8413, for liquids
841391	Pumps; parts thereof
841451	Fans; table, floor, wall, window, ceiling or roof fans, with a self-contained electric motor of an output not exceeding 125W
841459	Fans; n.e.c. in item no. 8414.51
841480	Pumps and compressors; for air, vacuum or gas, n.e.c. in heading no. 8414
841490	Pumps and compressors; parts, of air or vacuum pumps, air or other gas compressors and fans, ventilating or recycling hoods incorporating a fan
841590	Air conditioning machines; with motor driven fan and elements for temperature control, parts thereof
841899	Refrigerating or freezing equipment; parts thereof, other than furniture
842121	Machinery; for filtering or purifying water
842123	Machinery; filtering or purifying machinery, oil or petrol filters for internal combustion engines
842940	Tamping machines and road rollers; self-propelled
843131	Lifts, skip hoists or escalators; parts thereof
844331	Printing, copying, and facsimile machines; machines which perform two or more of the functions of printing, copying or facsimile transmission, capable of connecting to an automatic data processing machine or to a network
844332	Printing, copying, and facsimile machines; single-function printing, copying or facsimile machines, capable of connecting to an automatic data processing machine or to a network
844399	Printing machinery; parts and accessories, n.e.c. in item no. 8443.91
845290	Sewing machines; furniture, bases and covers for sewing machines and parts thereof, and other parts of sewing machines
846694	Machine-tools; parts and accessories, for the machines of heading no. 8462 or 8463, n.e.c. in heading no. 8466
847180	Units of automatic data processing machines; n.e.c. in item no. 8471.50, 8471.60 or 8471.70
847330	Machinery; parts and accessories of the machines of heading no. 8471 (other than covers, carrying cases and the like)
847710	Machinery; injection-moulding machines, for working rubber or plastics or for the manufacture of products from these materials
847989	Machines and mechanical appliances; having individual functions, n.e.c. or included in this chapter
848071	Moulds; for rubber or plastics, injection or compression types
848079	Moulds; for rubber or plastics, other than injection or compression types
848140	Valves; safety or relief valves, for pipes, boiler shells, tanks, vats or the like
848180	Taps, cocks, valves and similar appliances; for pipes, boiler shells, tanks, vats or the like, including thermostatically controlled valves
848310	Transmission shafts (including cam shafts and crank shafts) and cranks
848340	Gears and gearing; (not toothed wheels, chain sprockets and other transmission elements presented separately); ball or roller screws; gear boxes and other speed changers, including torque converters
848390	Transmission components; toothed wheels, chain sprockets and other transmission elements presented separately; parts
848410	Gaskets and similar joints; of metal sheeting combined with other material or two or more layers of metal
848490	Gasket sets or assortments of gaskets and similar joints; dissimilar in composition, put up in pouches, envelopes or similar packings
848790	Machinery parts; not containing electrical connectors, insulators, coils, contacts or other electrical features, n.e.c. in chapter 84

(2) HS 85	
Code	Item
850110	Electric motors; of an output not exceeding 37.5W
850140	Electric motors; AC motors, single-phase
850151	Electric motors; AC motors, multi-phase, of an output not exceeding 750W
850152	Electric motors; AC motors, multi-phase, of an output exceeding 750W but not exceeding 75kW
850300	Electric motors and generators; parts suitable for use solely or principally with the machines of heading no. 8501 or 8502
850431	Electrical transformers; n.e.c. in item no. 8504.2, having a power handling capacity not exceeding 1kVA
850450	Electrical inductors; n.e.c. in heading no. 8504
850490	Electrical transformers, static converters and inductors; parts thereof
850590	Magnets; electro-magnets, holding devices and parts n.e.c. in heading no. 8505
850720	Electric accumulators; lead-acid, (other than for starting piston engines), including separators, whether or not rectangular (including square)
850790	Electric accumulators; parts n.e.c. in heading no. 8507
850819	Vacuum cleaners, with self-contained electric motor, n.e.c. in item no. 8508.1
851220	Lighting or visual signalling equipment; electrical, of a kind used on motor vehicles (excluding articles of heading no. 8539)
851290	Lighting or signalling equipment; electrical, (excluding articles of heading no. 8539), windscreen wipers, defrosters and demisters; parts, of those kinds used for cycles or motor vehicles
851680	Resistors; electric heating, other than those of heading no. 8545
851718	Telephone sets n.e.c. in item no. 8517.1
851762	Communication apparatus (excluding telephone sets or base stations); machines for the reception, conversion and transmission or regeneration of voice, images or other data, including switching and routing apparatus
851770	Telephone sets and other apparatus for the transmission or reception of voice, images or other data, via a wired or wireless network; parts
851829	Loudspeakers; not mounted in their enclosures
852859	Monitors other than cathode-ray tube; other than of a kind solely or principally used in an automatic data processing system of heading 84.71
852990	Reception and transmission apparatus; for use with the apparatus of heading no. 8525 to 8528, excluding aerials and aerial reflectors
853400	Circuits; printed
853620	Electrical apparatus; automatic circuit breakers, for a voltage not exceeding 1000 volts
853630	Electrical apparatus; for protecting electrical circuits, n.e.c. in heading no. 8536, for a voltage not exceeding 1000 volts
853641	Electrical apparatus; relays, (for a voltage not exceeding 60 volts)
853650	Electrical apparatus; switches n.e.c. in heading no. 8536, for a voltage not exceeding 1000 volts
853690	Electrical apparatus; n.e.c. in heading no. 8536, for switching or protecting electrical circuits, for a voltage not exceeding 1000 volts
853720	Boards, panels, consoles, desks and other bases; for electric control or the distribution of electricity, (other than switching apparatus of heading no. 8517), for a voltage exceeding 1000 volts
853929	Lamps; filament, (excluding ultra-violet or infra-red), n.e.c. in item no. 8539.2
854232	Electronic integrated circuits; memories
854239	Electronic integrated circuits; n.e.c. in heading no. 8542
854390	Electrical machines and apparatus; parts of the electrical goods of heading no. 8543
854411	Insulated electric conductors; winding wire, of copper
854419	Insulated electric conductors; winding wire, (of other than copper)
854420	Insulated electric conductors; co-axial cable and other co-axial electric conductors
854430	Insulated electric conductors; ignition wiring sets and other wiring sets of a kind used in vehicles, aircraft or ships
854442	Insulated electric conductors; for a voltage not exceeding 1000 volts, fitted with connectors
854449	Insulated electric conductors; for a voltage not exceeding 1000 volts, not fitted with connectors
854520	Carbon brushes; with or without metal, used for electrical purposes
854890	Electrical parts of machinery or apparatus; n.e.c. in chapter 85

(3) HS 87	
Code	Item
870130	Track-laying tractors
870190	Wheeled tractors nes
870210	Motor vehicles for the transport of 10/more persons incl. the driver, with C-I internal combustion piston engine (diesel/semi-diesel)
870323	Vehicles; spark-ignition internal combustion reciprocating piston engine, cylinder capacity exceeding 1500cc but not exceeding 3000cc
870421	Vehicles; compression-ignition internal combustion piston engine (diesel or semi-diesel), for transport of goods, (of a gvw not exceeding 5 tonnes), n.e.c. in item no 8704.1
870422	Vehicles; compression-ignition internal combustion piston engine (diesel or semi-diesel), for transport of goods, (of a g.v.w. exceeding 5 tonnes but not exceeding 20 tonnes), n.e.c. in item no 8704.1
870432	Vehicles; spark-ignition internal combustion piston engine, for transport of goods, (of a g.v.w. exceeding 5 tonnes), n.e.c. in item no 8704.1
870490	Vehicles; for transport of goods, n.e.c. in heading no. 8704
870600	Chassis; fitted with engines, for the motor vehicles of heading no. 8701 to 8705
870710	Vehicles; bodies (including cabs) for the motor vehicles of heading no. 8703
870790	Vehicles; bodies (including cabs) for the motor vehicles of heading no. 8701, 8702, 8704 or 8705
870829	Vehicles; parts and accessories, of bodies, other than safety seat belts
870840	Vehicle parts; gear boxes and parts thereof
870870	Vehicle parts; road wheels and parts and accessories thereof
870880	Vehicle parts; suspension systems and parts thereof (including shock-absorbers)
870891	Vehicle parts; radiators and parts thereof
870892	Vehicle parts; silencers (mufflers) and exhaust pipes; parts thereof
870893	Vehicle parts; clutches and parts thereof
870894	Vehicle parts; steering wheels, steering columns and steering boxes; parts thereof
870895	Vehicle parts; safety airbags with inflator system; parts thereof
870899	Vehicle parts and accessories; n.e.c. in heading no. 8708
870919	Vehicles; (not electrical), self-propelled, without handling equipment, used for short distance transport of goods in factories, airports and such, and tractors of the type used on railway station platforms
871120	Motorcycles (including mopeds) and cycles; fitted with an auxiliary motor, reciprocating internal combustion piston engine, of cylinder capacity exceeding 50cc but not exceeding 250cc, with or without side-cars; side-cars
871410	Motorcycles (including mopeds); parts and accessories
871420	Carriages for disabled persons; parts and accessories thereof
871492	Cycles; parts thereof, wheel rims and spokes
871493	Cycles; parts thereof, hubs (other than coaster braking hubs and hub brakes) and free-wheel sprocket-wheels
871494	Cycles; parts thereof, brakes, including coaster braking hubs and hub-brakes, and parts thereof
871499	Cycles; parts thereof, n.e.c. in item no. 8714.9
871620	Trailers and semi-trailers; self-loading or self-unloading, for agricultural purposes
871640	Trailers and semi-trailers; n.e.c. in item no. 8716.3
871680	Vehicles; n.e.c. in heading no. 8716
871690	Trailers, semi-trailers and other vehicles not mechanically propelled; parts thereof for heading no. 8716

1232 TRANSFORMATION OF ECONOMIC POSITION OF CAPITAL CITIES IN CENTRAL AND EASTERN EUROPE

ABSTRACT

The main driving force of economic growth continues to be the service sector which is concentrated in the capital cities in Central and Eastern Europe (CEE) and South Eastern Europe (SEE). The unambiguous winners of the post-socialist transition process are capital regions, exploiting their role as metropolitan growth areas. Flows will orient even more towards national capitals, and advanced producer services concentration in capital cities can be expected to encourage not only the backwash of local resources from the periphery (capital and human resources alike) but further de-industrialisation and accelerated tertiarization; the clear winners are the capital-city regions resulting in a dramatic increase in regional disparities. Convergence processes have been most beneficial for capital cities. Nowadays, many studies focusing on the ranking of cities, as well as the classification of the world's leading cities (world cities, global cities) on the basis of ABS concentration. Central and Eastern European big cities are given just a minor role in these researches. The paper focuses on the growth and spatial expansion of the advanced producer service sector (APS) in Central and Eastern European and South Eastern European capital cities based on the methodology elaborated by Taylor and the GAWC (2001) for the examination of global cities, global hierarchies. This process highlights the heavily metropolitan character of knowledge-intensive high-technology services concentration, as well as the command and control functions. The first part of the paper will determine the ranking of large cities in the Central European region primarily with respect to their foreign direct investment, the revenue of the TOP companies and the APS concentration in relation to the quality-driven services investments. Accordingly the paper classifies these capital cities according to the GAWC methodology demonstrating changing global hierarchy of CEE/SEE capitals. The study argues that the development of the APS in CEE is characterized by external dependency, which appears in the form of hierarchical command and control functions over CEE APS and financial services subsidiaries within global MNCs network. The second part of the paper examines the concentration of quality-driven services investments. Three selected service industries differ in terms of their vertical or horizontal nature: in business services FDI is predominantly vertical, in financial services predominantly horizontal, while in ICT-related services both types can be found. It was found that the export oriented vertical services due to their less embedded nature do not contribute to the same extent to the metropolitanization process than services firms founded by horizontal investments.

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1234 GLOBALIZATION AND CONVERGENCE AMONG BIG-CITIES

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ABSTRACT

A new urban revolution begun in the second half of the XX century and it is going to challenge the relation between the size and economic role of cities: on one side, the last decades have witnessed the emergence and the never seen growth of a number of Mega-cities, with more than 9 million inhabitants, most of them being located in less developed countries. On the other side, the globalization of the post-industrial economy generates a new urban spatial organization where a few number of cities concentrate a disproportionate part of economic power, creation, decision and control. These global cities have been called World-cities or World metropolises. Most of the largest cities are in the less developed countries, while the most powerful world cities are mainly located in the developed countries. It results that size seems to be neither a necessary nor a sufficient condition for obtaining the status of global city. A condition to be a global city is the access to the economic power. The convergence or divergence processes among Mega and Global cities could be related to the level of development of the countries where Mega-cities are located, and its globalization degree. The main aim of this paper is to analyze the comparison between the real convergence-divergence among 43 Mega-cities of the World, and the convergence-divergence among its corresponding countries, using several growth models, studying the possible existence of Clubs convergence among Megacities.

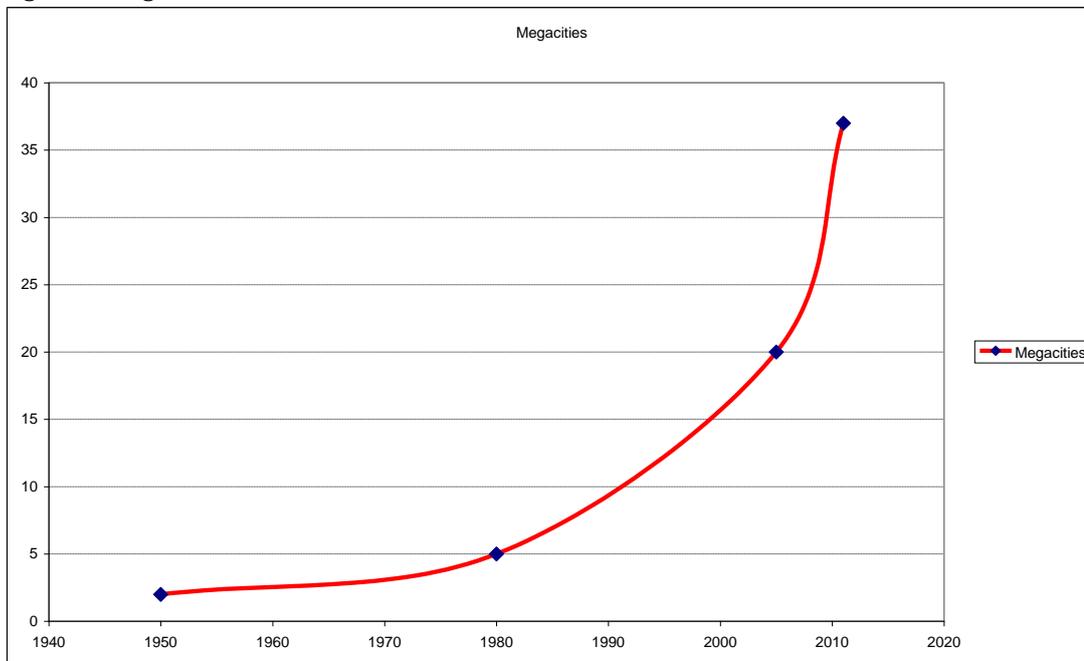
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Keywords: Urban economics, Globalization, Clubs convergence, Economic growth, Mega-cities, Competition.

1. INTRODUCTION

According to the theorists of global capitalism it was during the 1960's that the organization of economic activity entered a new period expressed by the altered structure of the world economy: the dismantling of industrial centers in the United States, Europe and Japan; accelerated industrialization of several Third World nations; and increased internationalization of the financial industry into a global network of transactions. On the other hand, the globalization of the post-industrial economy generates a new urban spatial organization where a few number of cities, so-called Global cities, concentrate a disproportionate part of economic power, creation, decision and control. Throughout the XX Century these global cities were growing in quantity and inhabitants until transforming in megacities. At the same time, other cities without economic power, generally belonging to emergent and poor countries were growing until become megacities. (see Figures 1 and 2)

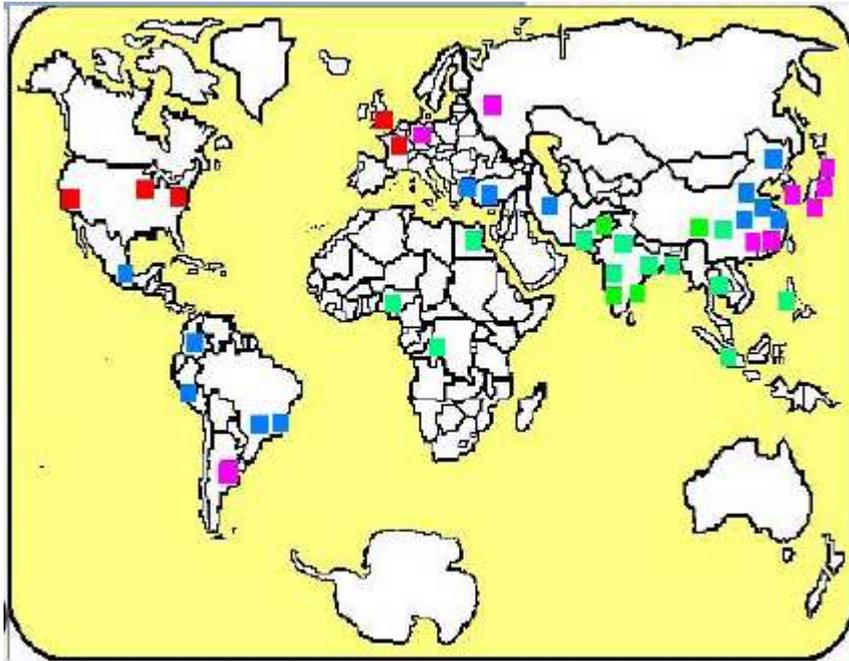
Figure 1. Megacities evolution



Source: own elaboration.

A global city, also called World city or sometimes alpha city, is a city generally considered to be an important node in the global economic system. The most complex of these entities is the Global city, whereby the linkages binding a city have a direct and tangible effect on global affairs through socio-economic means. The use of Global city, as opposed to Mega-city, was popularized by Saskia Sassen (1991), though the term World city to describe cities that control a disproportionate amount of global business is used by Patrick Geddes (1915).

Figure 2. Distribution of the Megacities across the World (2014)



Source: own elaboration.

With the emerging spatial organization of the new international division of labor, John Friedmann (1986) identified a set of these known as the World city hypotheses concerning the contradictory relations between production in the era of global management and political determination of territorial interests. Saskia Sassen (2001, 2000), Brenner 1998, Yeoh 1999, Hall 1996, and Friedmann 1995) have further re-elaborated the global city hypotheses. Global cities, it is argued, have acquired new functions beyond acting as centers of international trade and banking. They have become: i) concentrated command points in the organization of the World-economy that use advanced telecommunication facilities; ii) important centers for finance and specialized producer service firms; iii) coordinators of state power; iv) sites of innovative forms of industrialization and production, and v) markets for the products and innovations produced. These structural shifts in the functioning of cities are argued to have impacted both the international economic activity and urban form where major cities concentrate control over vast resources, while financial and specialized service industries have restructured the urban social and economic order. The big cities enter in some specialization and competition processes. It occurs that during the 1990's New York has specialized in equity trading, London in currency trading, and Tokyo in size of bank deposits. A similar situation happened with Hong Kong: it was said, before China regained control of Hong Kong, that their financial services centers would be in international competition with each other. It turns out that Hong Kong is today the international financial centre for China, while Shanghai is the national financial center. It could be said that there's a comparable difference in the UK between London and Edinburgh. Within the US, again in the financial sector, Chicago is the centre for commodities futures, while New York is the centre for futures on interest rates. Chicago is a centre for commodity futures because of its history as the meatpacking and food processing centre for the mid-west. There exist a kinds of strategic games among the World cities. Some economists argue that competition between cities is indirect, as it derives from competition among businesses based chiefly on productivity. One of these economists is Krugman (1996), who has been critical of promoting competitiveness between cities. His view of competition is between companies, not between cities, regions or countries. Krugman states that cities do not have competitive advantages, only comparative advantages. Comparative advantages occur due to the access of resources others don't have. A competitive advantage can be realized when superior value for customers and profits are achieved by efforts from the provider of the service or product. The competitiveness of cities is, according to Krugman, nothing more than an appropriate aggregate of the competitiveness of the firms they contain. Other economists disagree with Krugman and claim that cities compete directly with other cities. Porter (1996), for example, states that the environment affects the competitive position of firms. Governments can play a role in shaping an environment in which firms can operate optimally. Therefore, cities have according to Porter competitive advantages and do compete with other cities. The behavior of the World cities among them could be explained by means of a spatial competition model, like the core-periphery model in Krugman and Venables (1990), by substituting regions by metropolitan areas. In the other side, like the Mega cities are not necessarily Global or World cities, it can occur that Mega cities and World cities could be diverging, depending partially of its globalization degree. The sequence of this work is the following: section 2 analyses the role of the globalization in general and on the urban process. Section 3 studies the impact of globalization on the convergence-divergence process in the most important World metropolises, and finally section 4 contains some findings.

2. THE ROLE OF THE GLOBALIZATION

The major driving force of economic globalization is the reduction of the transport costs in the private sector, due basically to the fact that technological progress and innovation has reduced the costs of transport and communication. Although globalization was a defining term of the 1990s, O'Rourke and Williamson (2000) distinguish at least three waves of the phenomenon which have taken place through the modern and contemporary history: From 1400 to the 18th

century, facts such as the Renaissance of sciences and arts, the creation of the modern concept of state and the discovery of America gave rise to the first wave of globalization in the modern era which generated a series of small bordering states in the European zone that had similar cultures, technologies and were of a similar size. From this perspective, one can say that Europe was the focus of globalization in its first wave and although not the focus continues to have an important role. The second wave of globalization started in the early 19th century when the rise of trade was centred in basic tradable goods, coincided with the Industrial Revolution, and it was slowly being felt in other regions, besides Europe, especially in North America with USA as a leading country. The third wave of globalization applies to recent times in which trade takes place in both basic and highly differentiated manufactured commodities. This current wave is also generating a new focus of globalization in the Pacific Rim zone. This wave is characterized by the management of the financial markets and the production of the new technologies controlled by Multinational companies (MNCs) established in zones with high levels of human capital, population density and very low levels of labour costs. In this zone, Japan was the initial leading country with Hong Kong and the rest of China, Singapore, Taiwan, and Malaysia following. This third wave of economic globalization shows some specific stylized events. In basic terms these are the fact that trade, investment in research and development (R&D), foreign direct investment and technology links are increasing on a worldwide basis. Other factors include the liberalization of the telecommunications system and the rise of the internet which creates a truly global marketplace that has given rise to new opportunities for the international exchange of information. In addition, the enormous advances made in computer technologies, the fall in computer prices and recent technical progress in telecommunications facilitate access to information and reduce the price of communication, especially in those countries where deregulation and privatization has taken place. Similarly, the worldwide web is reducing cross border barriers to zero. However, distance is still an important barrier to trade, not only due to the existence of transport costs but also due to the role of what is called social distance. There are two forms to eliminate the physical distance: good communications and telecommunications, or to generate cities that contain all goods, markets, services and amenities. Perhaps it can explain the high growth rate and size of some cities until transforming in Mega cities. Another driving force of the globalization is the reduction of policy barriers to trade and investment. The economic analysis of the impact of informational barriers to trade, following Rauch and Cassella (1998), is different to that of conventional barriers because the impact of trade on relative wages across countries causes changes in relative labour supplies. The combined effects of efficient communication systems spanning the globe and the emergence of an internationally mobile community of professionals work towards cultural globalization. These unleashed forces of globalization are crucial drivers in the intensified competition between regions and even more so between big cities which are vying for the best talents and high potentials in the workforce, tourists, grant money from national or international organizations and seek to attract or retain business corporations or mega events. In addition, new telecommunication systems are creating a great service sector that does not depend on the locations of technology production sites but does require advanced technological solutions. This structural change is also accompanied by an increasing proportion of highly qualified employees and an associated increase in wages. These changes are also related to a migration process of skilled labour. Apart from the symptoms of informational globalization in labour markets, capital flow volumes are in themselves an important indicator of globalization, and following Baldwin and Martin (1999), the most spectacular indications of financial globalization in the 1990s are the consecutive financial crisis around 1994 in Latin-America and 1997 in the Pacific Rim countries. Starting from 2007, it is necessary to add to these crises, the current financial crises that affect the developed countries of Europe and North America, among others. The accelerated speed of data exchange and transactions, the upturn of the service sector at the expense of the manufacturing industries as well as the multinational organization of production processes are among the major attributes of the current phase of globalization. With the fall in industrial jobs in large cities, a relatively small group of selected World cities serve as home bases for many multinational headquarters with important ramifications for the local and regional economies of those Global cities.

3. THE CONVERGENCE-DIVERGENCE PROCESS AMONG GLOBAL CITIES

With regard to the last two waves of globalization several authors have analyzed the effects of globalization on income per capita distribution and they have studied some types of resulting disparities. The second wave of globalization (1820-1914) resulted in the industrialized of the North (Europe and the North-American continents) and the de-industrialization of the South, a pattern that was not changed during the period between the second and third waves (1914-70). In the present wave of globalization some income divergence between groups of countries that were not initially disparate has been generated and this amounts to the most important implication of the Industrial Revolution in Europe. The second wave is also influenced by high transport costs and the fact that there was little trade and primitive industry. In the second stage of the process the cost of exchanging goods fell faster than the cost of exchanging ideas and innovations and, once transport costs were sufficiently diminished, the distribution of the industry was achieved by means of agglomeration forces. The third wave of globalization (from 1970 to the present day) began with the consequences of the second wave. In specific terms, it resulted from a very large income gap and a consequential de-industrialization of the North and industrialization of the South, largely caused by the significant fall in the transports costs of technological innovations. In the South, industrial investment rose and income grew whereas the North experienced some de-industrialization and tended to specialize in services. It is in this way that globalization forces first generated a huge divergence of real incomes and later tended to cause an increase in the development and likelihood of income convergence. Considering that, we will observe now if among the big cities of the World there is divergence or convergence in terms of real GDP per capita during the period 2005-2013.

The concept of convergence is based on the principle that poor economies with steady-state low production levels *per capita* tend to grow more rapidly than wealthier economies. Barro (1991) in his first empirical work on growth showed that if differences in the initial level of human capital are controlled for, then the correlation between the initial level of income and subsequent growth rate turn out be negative even in wider sample of countries. This is called absolute beta convergence (also called unconditional convergence because it implies that all countries or regions are converging to common steady state level of income). However, these structural parameters differ across countries and regions and countries may not converge to a common level of income per capita but to their own steady state level (long run potential level of income). When steady states vary from one economy to the next, the concept of convergence used is that of conditional convergence, being a more real concept. The first contributions to this debate came from W. Baumol (1986), who studied convergence among certain countries (Japan and Italy versus the U.S. and Canada), and J. De Long (1988). Barro and Sala-i-Martin (1992) analyzed convergence among the different states in the U.S., whereas Barro (1991) and N.G. Mankiw, D. Romer, and D.N. Weil (1992) point at the importance of educational levels to explain divergence in terms of growth. Boldrin and Canova (2001) using a similar methodology severely criticized the previous results. Using a different data set, which includes 185 EU regions during the period 1980-1986, they concluded that the results are mixed and not supportive of convergence on regional per capita income. Canova and Marcet (1995) also, basing the analysis on per capita incomes for 144 EU regions, found only limited signals of convergence during the period 1980-1982. Others have studied different regions of new developed countries: Keller (1994) for Austria and Germany, Cashin (1995) for Australia and Coulombe and Lee (1993) for regions in Canada; Kangasharju (1999) for Finland and Sala-i-Martin (1996) for the Japanese Prefectures.

The concept of conditional convergence found its more explicit formulation in Barro and Sala-i-Martin(1992) and Mankiw, Romer and Weil(1992). Both these papers emphasized the fact that the neoclassical growth model did not imply that the all countries are converging to the same steady state per capita income. Instead what it implied is that countries would reach their respective steady states. Notwithstanding, from Quah (1996) other concept of convergence emerges: Clubs convergence. This concept explains that the countries belonging to a group spread not to one but to a few steady states. The present study tests the convergence of GDP per-capita within and across 43 Mega cities (population more high than 9 million inhabitants), and other 10 World cities or agglomerations with some economic power: Toronto, Sydney, Amsterdam-Rotterdam, Frankfurt, Zurich, Hong Kong, Johannesburg, Milan, Singapore and Madrid (see Table 1).

Formally, the starting point for analyzing real convergence is the neoclassical growth model, which we consider to be the only one able to predict conditional convergence if the speed (β) at which any given economy converges towards its own steady state is inversely proportional to the time difference separating the current economy from its own steady state.

Table 1. Population of the agglomerations analysed

Agglomerations ordered by population	Population (millions) 2015	Agglomerations ordered by population	Population (millions) 2015
TOKYO-YOKOHAMA	37.126	TIANJIN	13.266
CHONGQUING	29.101	RIO JANEIRO	12.700
JAKARTA	28.019	LAHORE	12.500
GUANGZHOU	25.800	PARIS	11.940
SHANGHAI	25.700	KOLN-RUHR	11.215
SEOUL	25.600	CHENGDU	11.001
MEXICO	24.178	IZMIR	10.046
DELHI	23.500	NAGOYA	10.027
MUMBAI	22.376	WUHAN	10.020
KARACHI	22.100	HARBIN	9.874
NEW YORK	22.000	CHICAGO	9.800
METRO-MANILA	21.951	KINSHASA	9.518
BEIJING	21.900	LIMA	9.400
SAO PAULO	21.100	CHENNAI	9.182
CAIRO	20.384	BANGALURU	9.044
LOS ANGELES	18.100	BOGOTA	9.009
OSAKA-KOBE	17.550		
MOSKOW	17.000	MILAN	8.014
KOLKATA	15.835	JOHANNESBURG	7.900
DHAKA	15.414	HONG KONG	7.134
SHENZHEN	15.250	MADRID	6.600
LONDON	15.211	SINGAPORE	6.500
BANGKOK	14.566	TORONTO	5.900
BUENOS AIRES	14.300	SYDNEY	4.700
ISTANBUL	13.855	FRANKFURT	4.323
TEHRAN	13.500	AMSTERDAM-ROTT	3.004
LAGOS	13.400	ZURICH	1.470

* Agglomerations contained in the grey box are no megacities, but are World cities.

Source: United Nations-Habitat and Price Waterhouse Cooper.

According to Barro (1997), convergence speed is an indicator of the time spent by a country or region to achieve its own steady state. On the other hand, non neoclassical or endogenous growth models are not able to predict convergence,

except for the endogenous growth model with technological dissemination, where technology is spread gradually at no cost; for instance, Rebelo's AK endogenous growth model predicts zero convergence speed, that is, no convergence at all. If we assume some heterogeneity and differences in development levels among the cities analyzed in the present paper, it would be unwise to assume identical steady states for all, and consequently we resorted to the concept of conditional convergence. As we mentioned above, the best model to predict such convergence is the neoclassical growth model developed by R.M. Solow (1956) and T.W. Swan (1956), subsequently widened by N.G. Mankiw, D. Romer and D.N. Weil (1992) through the introduction of the capital production factor, including human capital (H). The way these authors incorporated human capital into the equation was through an indicator (S_H) that remains constant so that no increasing returns to scale are generated in the production function, which would in turn result in creating an endogenous growth model unable to predict convergence. The human capital indicator is related to the steady state in such a way that the interaction parameter is not necessarily related to the steady state, already linked to the human capital indicator. Our aim is to model the growth and convergence processes of any given economy endowed with exogenous technical progress, promoting the labor factor and neutral in the sense of Harrod, symbolized by the letter A , which we assume to grow externally at a constant rate, g_A . In order to maintain the basic hypotheses for the neoclassical growth model, we need the production function to include globally constant returns to scale, nevertheless decreasing with respect to physical capital, which may be expressed as follows:

$$y = K^\alpha \cdot H^\gamma \cdot [A \cdot L]^{1-\alpha-\gamma} \tag{1}$$

Where y stands for production, L for labor factor, K for physical capital factor and α and γ for two parameters such that: $\alpha + \gamma = 1$. Expressing (1) in values *per capita*, we find that:

$$Y = \frac{y}{L} = K^\alpha \cdot H^\gamma \cdot A^{1-\alpha-\gamma} \cdot L^{-(\alpha+\gamma)} \tag{2}$$

Using natural logarithms and operating according to Mankiw, Romer and Weil's method (1992), we obtain the expression for the conditional convergence equation, which explains in turn the value for the real income *per capita* logarithm during a generic period t as a function of some determining factors of the steady state:

$$\ln Y_t - \ln Y_0 = [g_A \cdot t + (1-b) \ln A_0] + \sigma \ln(n + 0.05) + \lambda \ln S_K + \mu \ln S_H - (1-b) \ln Y_0 \tag{3}$$

But the growth rate of real per capita income with respect to the average per capita income accumulated during the

period $(0, T)$ will be $\sum_{t=0}^{t=T} \frac{\Delta Y_t}{Y_t}$; and taking the limit we have:

$$\int_0^T \frac{dY}{Y} = \ln Y_T - \ln Y_0 = \ln \frac{Y_T}{Y_0} \tag{4}$$

Once the equation (3) has been regressed, convergence speed rate (β) is measured by estimator b for the initial income logarithm, since the relationship between both is: $b = e^{-\beta t}$. If coefficient β is larger than or equal to zero then, given convergence, relatively poorer regions should grow faster than wealthier ones. If coefficient β takes on a negative value, it means that for the period analyzed the regions should be experiencing a divergence process in their income *per capita*. In equation (3), S_K and S_H stand for certain levels of physical and human capital that reveal a steady state, staying constant in order to avoid the appearance of increasing returns in these accumulative factors; S_K and S_H are ratios between final and initial amounts; t reflects the time lapsed between the initial and final situation and the current one. We can chose as indicator of human capital the enrollment rate in high schools that takes into account the proportion of individuals with high school and university education. The indicator can be obtained from the 2000-2011 reports on human development for the United Nations Development Program (UNDP). As for physical capital, we used the ratio between private investment and real income as a *proxy* for the frequency of use of the capital factor in the steady state. A_0 is the initial value for the coefficient of technical progress; n represents population growth rate; and Y_0 stands for initial level of real income *per capita*. The interaction parameter of the equation's regression (3) is $[g_A \cdot t + (1-b) \ln A_0]$.

Moreover, into a globalization process, many world cities tend to have similar determinants of their steady-states, mainly on the determinants on the human capital, like education, enrollment in schools or high quality in secondary schools. Hence it could be interesting testing absolute convergence among these world cities rather conditional convergence, although it is know that it does not occur among their respective countries. In this sense we will take as the intercept parameter (a) the term:

$$a = ([g_A \cdot t + (1-b) \ln A_0] + \sigma \ln(n + 0.05) + \lambda \ln S_K + \mu \ln S_H) / T \tag{5}$$

And the parameter (a) embodies all the determinants of the common steady-state. The equation to determine the speed of absolute convergence has hence the following aspect:

$$\ln \frac{Y_T}{Y_0} = \ln B - (1-b) \ln Y_0 \tag{6}$$

where $b = e^{-\beta T}$, and β is, in the dynamic transition toward the steady-state, the coefficient that indicates the speed of convergence of the real per capita income towards steady state. Then, the average rate of per capita real income in relative terms will be:

$$\frac{1}{T} \cdot \ln \frac{Y_T}{Y_0} = a - \left[\frac{1 - e^{-\beta \cdot T}}{T} \right] \cdot \ln Y_0 \tag{7}$$

By developing the term $e^{-\beta T}$ by means of a Taylor-McLaurin series we have that:

$$e^{-\beta t} = 1 - \beta t, \text{ that is, } \beta = \frac{1 - e^{-\beta t}}{t} . \text{ And the equation (7) will be transformed then in:}$$

$$\frac{1}{t} \sum_{t=0}^t \frac{\Delta Y_t}{Y_t} = \frac{1}{t} \ln \frac{Y_t}{Y_0} = a - \beta \ln Y_0 \tag{8}$$

This expression denotes how the growth rate of relative real per capita income is related negatively with the logarithm of the initial level of relative real per capita income ($\ln Y_0$). Alternatively explained, for a determined level of the interaction term (a) related with each steady state, the higher the per capita income in a country the lower the growth rate will tend to be. If the value of b is positive, and a is the same in all countries of the sample, then there will exist absolute convergence; if b is zero or negative it means that there is divergence. The coefficient β represents the speed of convergence, and if $\beta \geq 0$ and the interaction term (a) is the same for all countries, then the poor economies grow more quickly than the richer ones, and in such cases absolute convergence is said to exist.

Notwithstanding, our purpose in this analysis is to verify whether among the group of World cities considered can exist one only or several steady states. In this sense we can remember the concept of clubs convergence. Quah (1996, 1997) noticed that, in 1960, the world distribution of income was uni-modal whereas, in the 1990s, the distribution became bi-modal. He then used Markov transitional matrices and non-parametric methods to estimate the probabilities that countries improve their position in the world distribution. Using these matrices, he then forecasted the evolution of this distribution overtime. His conclusion was that, in the long run, the distribution would remain bi-modal. Cheung and Pascual (2004), however, use panel time series procedures for cross section correlated panels because their ability to reject a false null hypothesis is higher than the corresponding univariate procedures.

In our analysis we will use panel data techniques applied to the absolute convergence equation (8) across 47 World cities and Mega-cities during the period 2005-2011 with annual data, using a fixed effects model for knowing the fixed effect of each city. These fixed effects reflect the complete determinants of the steady state of the corresponding city. Therefore when after the regression of the convergence equation, some fixed effects appear concentrated around a certain value, this will reflect the existence of a steady state common to the cities that belong to this group of concentrated fixed effects. On the contrary, big separations among groups of fixed effects will reflect different steady states. Hence the fixed effects model can help us to find clubs convergence in our sample. Other subject is the estimation of the speed of convergence. In this case, compared with cross country analysis, the time series approach generally used to predict clubs convergence, yields less convincing findings for the absolute and conditional convergence hypothesis. Consequently, with a panel data, we will use first a fixed effects model to find in our sample some clubs convergence corresponding to several steady states, and secondly, we will use a panel cross sectional model (between groups) to analyse the speed of convergence among cities towards one or several steady states.

The equation used to estimate the speed of convergence among all cities considered, by means of panel data techniques, came from the equation (8):

$$\left(\frac{\Delta Y}{Y} \right)_{it} = \alpha + \mu_i - \beta \ln Y_{0it} + \varepsilon_{it} \tag{8}$$

Where the endogenous variable is the real per capita GDP growth rate measured in power parity purchasing units, Y_{0it} is the initial real per capita GDP (in 2005) and its coefficient β reflects the speed of convergence towards the steady state; α is the intercept parameter when there is not significant the fixed effects model, and μ_{it} are the spatial fixed effects when the fixed effects model is significant. The data necessary for analyzing the structure of the world city system are difficult to obtain because most statistical information is aggregated at the national level rather than at the city level, mainly with respect to the indicators of the human and physical capital at the respective steady states. However, the data of the 53 metropolitan areas for the period 2005-2015 on GDP, population, and per capita GDP at power parity purchasing has been collected by several data bases: Penn. World Tables version 7.1, International Monetary Fund, United Nations, United Nations-Habitat, U.S. Department of Commerce, Brookings Institution, and Price Waterhouse Coopers. The results of the estimation are collected in Table 2. Following the Table 2, the best regression to predict is coming from the fixed

effects model. Notwithstanding, between groups model explain convergence better than fixed effects, excepting Clubs convergence.

Table 2. Estimation of the absolute convergence among Mega and World cities

Endogenous variable	OLSQ-AR1	Between Groups	Fixed Effects model (within groups)	Random Effects model (variance component model)
Growth rate				
Explanatory Variables				
Ln Yo (-β)	-0.034066 (-4.015)	-0.025534 (-2.706)	-0.301895 (-14.871)	-0.093257 (-4.284)
Rho	-0.29825 (-0.288)			
Intercept	0.15416 (6.199)	0.130772 (4.729)	Fixed Effects	0.316767 (4.872)
Tests				
DW	2.0128			
Lagrange Multiplier			1.08	1.08
Hausman			152.417	152.417
R ² -Adjusted	0.13	0.12	0.84	-
R ²	0.14	0.14	0.92	0.28

Note: t ratios in parenthesis

The high value of the Hausman test rejects the random effect model in favour the fixed effects model. Moreover, the low value of the Lagrange multiplier test does not reject the OLSQ plains, nor the between groups models. The best model to predict the economic growth rate in cities is also the fixed effects model (R² = 92 %). All methods yield absolute convergence among all cities because the coefficient of LnYo (-β) is negative and significant in all cases. The value of this coefficient in the fixed effects model is overestimated with respect to the speed of convergence because it embodies a temporary component in the variable LnYo. Notwithstanding, the intercepts estimated this model (the fixed effects) reflect the determinants of each steady state corresponding with each city. When the values of several fixed effects are very similar, this minds the existence of a steady state common to the cities which its fixed effects appear together. In reverse, when the separation between two groups of fixed effects is too large, this reflects different steady states for each group. Table 3 collects the ordered fixed effects of cities coming from the estimation of the within groups model, and the first differences among these fixed effects, for assessing the existence of several steady states in the sample (clubs convergence). In this sense, from Table 3 we can deduce seven groups of fixed effects separated by intervals more high than 0.04, which reflect seven possible steady states for all considered cities, although it can be reduced to tree: the first, which contains cities of high economic power and development level.

Table 3. Ordered Fixed Effects by City and Steady States selection

	Agglomerations ordered by fixed effects	MARKETS		Population Ranking 2015	Per capita GDP-PPP US\$ 2015	Fixed ordered Effects	First Differences
		SE	CM				
1	NEW YORK	SE	CM	10	65.891	1.25790	
2	LOS ANGELES		CM	16	59.184	1.22708	0.03082
3	CHICAGO		CM	34	56.333	1.21171	0.01537
4	ZURICH	SE		47	63.236	1.20476	0.00695
5	PARIS	SE		30	54.430	1.19193	0.01283
6	SINGAPORE		CM	42	57.505	1.19094	0.00099
7	LONDON	SE	CM	22	51.466	1.18422	0.00672
8	FRANKFURT	SE		45	50.411	1.17033	0.01389
9	AMSTERDAM-R	SE	CM	46	47.523	1.16051	0.00982
10	HONG KONG	SE	CM	40	49.342	1.15535	0.00516
11	SYDNEY	SE	CM	44	43.267	1.12972	0.02563
12	NAGOYA		CM	33	42.777	1.12423	0.00549
13	MILAN	SE		38	41.540	1.12022	0.00401
14	MADRID	SE		41	40.978	1.11845	0.00177
15	TORONTO	SE		43	41.323	1.11727	0.00118
16	TOKYO	SE	CM	1	40.543	1.11135	0.00592
17	KOLN-RUHR			31	39.183	1.09556	0.01579
18	OSAKA		CM	17	34.372	1.06064	0.03492
19	BUENOS AIRES		CM	23	32.696	1.02834	0.03230
20	SHENZHEN	SE		21	25.945	1.01199	0.01635
21	GUANGZHOU			4	22.164	0.97625	0.03574
22	MOSKOW	SE		18	26.128	0.97117	0.00508
23	SEOUL	SE		5	26.183	0.97016	0.00101
24	SAO PAULO	SE	CM	12	22.472	0.92988	0.04028
25	MEXICO			7	21.551	0.91497	0.01491

26	SHANGHAI	SE	CM	6	19.344	0.88086	0.03411
27	WUHAN			35	14.419	0.87706	0.00380
28	BEIJING			14	19.311	0.87406	0.00300
29	RIO JANEIRO			29	18.755	0.86877	0.00529
30	JOHANNESBURG	SE		39	17.067	0.84656	0.02221
31	TIANJIN			27	18.561	0.83755	0.00901
32	ISTANBUL			25	15.964	0.81468	0.02287
33	TEHRAN		CM	26	15.875	0.80082	0.01386
34	LIMA			37	14.817	0.79581	0.00501
35	IZMIR			32	14.526	0.78562	0.01019
36	BANGKOK		CM	24	12.505	0.74429	0.04133
37	MANILA			11	11.214	0.71345	0.03084
38	DELHI			8	9.982	0.68333	0.03012
39	CAIRO			15	9.295	0.66044	0.02289
40	JAKARTA		CM	3	9.044	0.64715	0.01329
41	MUMBAI	SE	CM	9	6.326	0.53468	0.11247
42	CHONGQUING			2	7.017	0.52893	0.00575
43	KOLKATA			19	3.744	0.34254	0.18639
44	KARACHI		CM	13	3.110	0.32263	0.01991
45	DHAKA			20	2.908	0.28222	0.04041
46	LAGOS			28	2.800	0.25907	0.02315
47	KINSHASA			36	1.429	0.09077	0.16830

Notes: 1) Main Stock Exchanges in the World (SE). 2) Main Commodity Markets (CM)

Source: International Monetary Fund, Brookings Institution, and own elaboration.

The second group contains Mega cities corresponding to emerging economic areas, and the third group with Mega cities belonging to less developed areas. The highest steady state is common to the cities 1 (New York) to 23 (Seoul), included. The following group is separated from the first one by an interval of 0.04028. The cities belonging to the first group have high economic power. These cities have the most important stock exchanges (SE) and commodity markets (CM) in the World (see Table 3). All these cities are World or Global cities and are situated generally in developed areas. The most part of these agglomerations are also Mega-cities (more than 9 million inhabitants) but others have less inhabiting, like Zurich, Frankfurt or Amsterdam-Rotterdam. In the following group, the cities belong to some emerging countries or areas. In this group only a few number of cities have World economic power: mainly Sao Paulo, Shanghai and Mumbai. The group includes cities from 24 (Sao Paulo) to 42 (Chongqing). The separation between this second group and the third is very high (0.18639), but into the second group there are other two irrelevant separations. The third group of cities contains the poorest Mega cities in the World, which belong to less-developed countries: Kolkata (India), Karachi (Pakistan), Dhaka (Bangladesh), Lagos (Nigeria) and Kinshasa (Congo Democratic Republic).

With respect to the estimation of the speed of absolute convergence, we must use cross country regression approach instead time series approach, which is used to analyze clubs convergence. The speed of convergence obtained from a panel data by means of the fixed effects model is related with the clubs convergence concept, but not with the absolute convergence, because the initial per capita GDP is different for each panel data time period. In this sense, knowing that in the regression of the equation (8), the Lagrange Multiplier statistic does not reject OLSQ neither Between groups, the cross country regression must be applied to estimate the speed of absolute convergence, and the best method for that is the Between groups model, rather than OLSQ. The results of the regression of the equation (8) indicate that there is absolute convergence among all cities of the sample, and the speed of convergence towards a hypothetical common steady state is 0.0255. That implies a speed of convergence among all cities of 2.55 % annually. This speed of convergence among the Mega cities considered is higher than among the corresponding countries, where there is normally divergence. Moreover, following the clubs convergence concept, the speed of absolute convergence towards the specific steady state of each group of cities must be bigger and significant than among all cities considered in this work.

Table 4. Estimation results for Megacities and Countries convergence

Megacities Convergence toward its own Steady States		Method: Between groups
Endogenous variable: Per capita Income Growth rate		<i>t</i>
lnYo (RICHEST)	-0.034960	-3.897
LnYo (RICH)	-0.033708	-3.671
LnYo (POOR)	-0.031784	-3.307
LnYo (POOREST)	-0.029788	-2.496
Population Growth (POOR)	-0.078814	-2.496
Population Growth (POOREST)	0.151105	6.025
Intercept parameter	0.276868	3.450
R ² Adjusted: 0.66		

Convergence among all Megacities (37)		Method: Between groups
Endogenous variable: Per capita Income Growth rate		<i>t</i>
lnYo (-β)	-0.021591	-3.121
Intercept parameter	0.196648	2.782
R ² Adjusted: 0.13		

Convergence among all Megacities and World cities (47)		Method: Between groups
Endogenous variable: Per capita Income Growth rate		<i>t</i>
lnYo (-β)	-0.025534	-2.706
Intercept parameter	0.130722	4.729
R ² Adjusted: 0.14		

Convergence among Countries that have Megacities		Method: Between groups
Endogenous variable: Per capita Income Growth rate		<i>t</i>
lnYo (-β)	-0.0070035	-2.109
Intercept parameter	0.0410390	5.279
R ² Adjusted: 0.18		

Source: own elaboration.

In the other hand, the evidence seems to be unequivocal: different regions in different countries are converging. Most rates of convergence are around 2% per annum. However, the same cannot be said about the whole world. With data of the past 30 years for 110 countries, the evidence shows that the world is not converging. They are diverging. Poor countries are getting relatively poorer and the rich countries getting richer. The argument put forth to reconcile these two facts is that there is not too much diffusion of technology across different countries. However, within a country, regions are more closely related. But due to the globalization, the rise of high technology applied to the telecom networks, the expansion of the financial markets, generally located around the big cities, together the great multinational companies, and the strong development in multimodal transportation networks, cause a great growth in some places of the World, attracting immigration and amenities. Nevertheless, although it seems to have convergence among all big cities considered in this work, not all these cities are similar. There are many differences among the three groups of cities above mentioned and within each group. Measuring inequality, whereas the Gini coefficient of Johannesburg is 0.75 (strong social inequality), in Beijing is only 0.22. Or with respect to the poverty, while Mexico has a 14.4 percent of slum population in the urban area, Dhaka has 70.8 percent.

4. FINDINGS

At the end of the XX Century, a great part of the global economic activity is developed mainly around metropolitan areas, which are converting in big cities that compete among them for the economic power. Competition makes economic convergence, and it explains that although among the different countries of the World usually exist divergence, this is not the case among the Global cities, as the results of this work indicate. Due to the revolution in communication and transportation technologies the Global city has more in common with, and more closely integrated with other Global cities than its own hinterlands. A conventional city has a region behind, and there is no region without city, neither city without region. But a Mega city has, at least, a country behind. When in a country there are several Mega cities, competition for the specialization emerges among them. However, as the results of this work indicate, there are at least three steady states among the group of 53 cities analysed. Globalization mainly affects to the cities which have the steady state more high. Almost all of these 23 cities have high economic power and possess strong indicators of a globalization process, such as the major stock exchanges in the World, the main commodity markets, the most important airports and hubs; these cities are very important nodes in the communication network by air, road, railways or boat. Around these cities the most important banks and multinational companies devoted to new technologies and tele-communications have its headquarters. These cities are hence Global or World cities and generally are situated in high developed countries. In the second group of cities, corresponding with an intermediate steady state, there are a few number of them that have a strong economic power, such as Sao Paulo or Shanghai, but normally the effects of the globalization on these sub-group of cities is lower than in the first group. These cities belong to emerging countries and some of them can to become in World cities. In the third group, the cities belong to less developed countries, and no globalization effects have had. They are very populous cities, but there is not any economic power. This implies that they are not World or Global cities, but only Mega cities. However, as a result of our research, we can say that there is absolute convergence in real per capita income among all 53 big cities analysed, although really in the group of cities there are at least three steady states. In reverse, among the countries they belong there is normally divergence. This implies that the relation among big cities is not the same than among countries whose cities belong. Globalization seems stronger in cities than in countries.

REFERENCES

- Baldwin, R.E. and P.Martin (1999), "Two waves of globalization: superficial similarities, fundamental differences", *NBER Working Paper* No. 7784, National Bureau of Economic Research.
- Barro, R.J. (1991), "Economic Growth in a Cross Section of Countries", *Quarterly Journal of Economic*, Vol. 106, 2, pp. 407-443.
- Barro, R.J. (1997), *Determinants of Economic Growth: A Cross-Country Empirical Study*, Cambridge, Mass., US: The MIT Press.
- Barro, R.J. and X. Sala-i-Martin (1992), "Convergence", *Journal of Political Economy*, 100.

- Baumol, W. (1986), "Productivity growth, convergence, and welfare: what the long-run data show", *American Economic Review* Vol. 76, pp.1072-1085.
- Boldrin, M., and F. Canova (2001), "Regional Policies and EU Enlargement", *CEPR Discussion Papers*, 3744 / C.E.P.R. Discussion Papers (RePEc:cpr:ceprdp:3744)
- Brenner, N. (1998), "Global Cities, Global States: Global City Formation and State Territorial Restructuring in Contemporary Europe." *Review Of International Political Economy* 5, pp.1-37.
- Brookings Institution (2011), *Global Metro Monitor: Volatility, Growth, and Recovery*, B.I., Metropolitan Policy Program.
- Canova, F., and A. Marcet (1995), "The Poor Stay Poor: Non Convergence Across Countries and Regions", *Universitat Pompeu Fabra, Working Paper* 137, October
- Cashin, P., (1995), "Economic growth and convergence across the seven colonies in Australia: 1861-1991", *Economic Record*, volume 71, no. 213, June, 128-40.
- Cheung, Y.W., and A.G. Pascual (2004), "Testing for Output Convergence: A Reexamination", *Oxford Economic Papers*, Oxford University Press, 56, 45-63
- Coulombe, S. and F.C. Lee (1993), "Regional economic disparities in Canada", *Unpublished Manuscript*.
- DeLong, J. (1998), "Productivity Growth, Convergence, and Welfare: Comment", *American Economic Review*, Vol. 78, 5, pp. 1138-1154.
- Friedmann, J. (1986), "City hypothesis", *Development and Change*, Vol. 17, pp.69-84.
- Friedmann, J. (1995), "Where We Stand: A Decade of World City Research.", In *World Cities in a World-System*, ed. Paul Knox and Peter Taylor. New York: Cambridge University Press.
- Geddes, P. (1915): *Cities in Evolution: an Introduction to the Town Planning Movement and to the Study of Civics*, ed., Williams & Norgate, London.
- Hall, Peter. 1996. "The Global City." *International Social Science Journal* 48, pp.15-23
- Heston A., Summers R., and B. Alten (2011), *Penn World Tables version 7.1*, PWT
- International Monetary Fund (2012), *World Economic Outlook Data Base*, Washington, D.C., US: IMFS.
- Kangasharju, A. (1999), "Relative economic performance in Finland: Regional convergence, 1934-1993", *Regional-Studies*, 33, Vol. 3.
- Keller, W. (1994), "On the relevance of conditional convergence under divergence growth paths: The case of east and West German regions, 1955-88", *Working paper*, Yale University.
- Krugman, P. and A.Venables (1990), "Integration and competitiveness of peripheral industry", *CEPR Discussion Papers*, 363, C.E.P.R. Discussion Papers.
- Krugman, P. (1996), "Making sense of the competitiveness debate", *Oxford Review of Economic Policy*.
- Mankiw, N.G, Romer, D and D.N. Weil (1992), "A Contribution to the Empirics of Economic Growth", *Quarterly Journal of Economics*, 107, pp. 407-437.
- O'Rourke, K, and G. Williamson (2000), "When Did Globalization Begin?", *NBER*.
- Porter, M.E. (1996), "Competitive advantage agglomeration economics and regional policy", *International Regional Science Review*.
- Price Waterhouse Cooper (2012), *Cities of the Future: Global Competition, Local Leadership*, PWC.
- Quah, D. (1997), "Empirics for Growth and Distribution: Stratification, Polarization, and Convergence Clubs", *Journal of Economic Growth* 2, pp. 27-59.
- Quah, D. (1996), "Empirics for economic growth and convergence", *European Economic Review*, Vol. 40, pp. 1353-1375.
- Rauch, J.E. and A. Casella (1998), "Overcoming informational barriers to international resource allocation: prices and group ties", *NBER Working Paper* No. 6627, Cambridge, Mass.
- Sala-i-Martin, X. (1996), "The classical approach to convergence analysis", *The Economic Journal*, 106, pp.1019-36.
- Sassen, S. (2000), *Cities In A World Economy*, Thousand Oaks, California: Pine Forge Press.
- Sassen, S. (1991), *The Global City: New York, London, Tokyo*, Princeton, New Jersey: Princeton University Press.
- Sassen, S. (2001), *The Global City. New York, London, Tokyo*. Second Edition. Princeton University Press: Princeton and Oxford.
- Solow, R.M. (1956), "A Contribution to the Theory of Economic Growth", *Quarterly Journal of Economics*, 70 pp. 65-94
- Swan, T.W. (1956), "Economic Growth and Capital Accumulation", *Economic Record*, 32 pp. 334-361.
- U.S. Department of Commerce (2012), *Current Dollar GDP by Metropolitan Area*, US Deptm of Commerce, Washington, USA.
- United Nations (2000-2010), *United Nations Development Program 2000-2010*, Communications Development Incorporated, New York.
- United Nations Habitat (2009), *State of the World's cities 2010-2011*, United Nations Human Settlements Programme, Earthscan UK, London.
- Working Paper* No.7632, National Bureau of Economic Research, Cambridge, Mass.
- Yeoh, B. (1999), "Global/Globalizing Cities." *Progress In Human Geography* 23, pp. 607-616.

1242 SUSTAINABILITY IN THE WORLD'S ENERGY RICH REGIONS: A WEALTH APPROACH

ABSTRACT

Regions around the world endowed with energy resources have experienced the unprecedented inflow of capital investments in the form of megaprojects to explore, extract, refine or transport these resources. In some cases, barren lands have turned into vibrant regions with extensive transportation and telecommunication networks and other infrastructure supporting flourishing urban population centers. In other cases, energy boomtowns have turned into ghost towns as soon as the resources are depleted. Energy-rich regions (ERRs) produce the world’s energy and collectively play a crucial role in the world economy. More efficient and transportable energy sources developed in these regions since the mid-19th century has had a marked effect on the state of the world’s energy, environment, and economics. Financial capital will continue to flow to energy-rich economies, particularly those with abundant oil and gas, and will continue to do so in the foreseeable future as the world transitions from its dependence on exhaustible resources to renewables. These substantial investments alter the composition of wealth and capital within these regions and determine sustainability and regional development path. There is a growing necessity for comprehensive frameworks for analyzing the sustainability of economic development in ERRs and understanding of the national and global implications of such regional development pattern. There is an increased recognition of wealth as a key indicator of well-being and economic sustainability. Wealth is generally measured in the various assets or capital forms in which it is embodied. The World Bank, for example, uses three capital forms of natural, produced, and intangible assets. On the other hand, the UN

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1347 GEOGRAPHICAL PERSPECTIVES ON INDIA'S INTERNATIONAL TRADE

ABSTRACT

Regionalisation is a widespread feature of globalisation via international trade. Regional economic and trade cooperation, including bilateral and regional trade agreements (RTAs), has intensified in a number of developing economies. Regional arrangements offer important possibilities to enlarge economic space, attract FDI to the region on better terms, and pool economic, human, institutional, technological and infrastructural resources and networks of participating countries. The regional arrangements were slow to take off in the beginning, which is still the case with many. However, as complementarities among economies emerged, confidence in opening up to one another also developed. More recently, developing countries have joined their developed partners under new varieties of regional arrangements, such as North-South RTAs and North-South-South RTAs, reflecting growing North-South interdependence. Deepening integration among developing countries can provide further opportunities for enhanced South-South trade. Trade between India and ASEAN is one such example. It is important to note that the Southeast Asian countries and India are not only geographically proximate, but also share deep rooted historical, cultural and economic ties. Connectivity is important as it encourages trade, and brings regions closer and integrates economy with the world. However, at present the market is fragmented and is often a hindrance to free flow of goods and services, and technical barriers in the market lead to expensive mobility within Asia. Undoubtedly, distance is a key determinant of a region's trade prospects and in the absence of an adequate connectivity, vast opportunities created by the dynamic growth poles of Asia may fade at their international borders. India's trade with ASEAN 3 countries is the most acknowledged development that the world has experienced in the recent years. ASEAN has become India's one of the largest trading partners in recent years. India-ASEAN trade and investment relations have been growing steadily, with ASEAN being India's fourth largest trading partner. India's trade with ASEAN has increased from US\$ 7.13 billion in 2000 to US\$ 65.04 billion in 2015-16. India's trade, primarily due to FTAs, is expected to increase manifolds in the coming years. ASEAN-India FTA is central to India's growing engagement with her eastern neighbours. Accompanying this growth will be an increase in the demand of both national and international infrastructure, for both production and consumption, and international trade purposes. Undoubtedly, failure to respond to this demand will slow down the regional integration and growth process. In this context, the current paper attempts to analyse the nature and pattern of regional inter dependencies via trade flows existing between India and ASEAN economies from the geographical perspectives. The major objectives are: (i.) to compare the volume of trade, and commodity composition of export and import between India and ASEAN members; (ii.) to study the relationship between economic attributes/distance and trade. The major techniques used in the paper are regression models for relating the economic structures/distance and trade pattern, residual mapping, flow maps etc. Data analysis is done for the period covering 1990 to 2015.

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SS19.3. Globalization and Regional Science

1261 REPRESENTATION OF SOCIO-ECONOMIC CLASS IN THE MASSACHUSETTS LEGISLATURE**Jason D. Wright**

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Minorities, women, and the working-class are all under-represented in state legislatures. However, representation of the working-class has declined even as gains have been made for minorities and women. Descriptive representation matters for policy outcomes that affect the lives of each of these groups. While existing research on class representation is rigorous, it has relied only on cross-sectional data. The current study will add to prior research by investigating long-run trends in class representation in Massachusetts as well as the effects of class representation on policy outcomes.

LITERATURE REVIEW**Operationalizing “Working Class”**

It is critical to operationalize “working-class” before investigating representation of this group or the effects of such representation on policy outcomes. Socio-economic class can be defined in multiple ways, and there has long been debate over which definition is superior for research purposes. Wodtke (2017) notes two main divisions in the literature: the technical perspective and the social-relational perspective. The technical perspective emphasizes division based on types of industries or occupations, whereas the social-relational perspective emphasizes “the distribution of effective control over resources deployed within the production process (Wodtke, 2017, p. 1482).” The social-relational perspective divides the population into proprietors (e.g., business owners), managers, and workers. In other words, the social-relational perspectives emphasizes the level of control over productive resources rather than the educational attainment, skill, or prestige associated with specific occupational classes. Carnes (2016) claims that there is agreement among many contemporary class analysts that measures of class should be rooted in occupational data. However, Wodtke (2017) used longitudinal data to demonstrate that the social-relational perspective is useful for explaining class differences in life conditions and political attitudes, even when controlling for occupation type.

Yet, there are good methodological reasons to use an occupation-based definition of class. For instance, Connelly, Gale, and Lambert (2016, p. 1) note that sociologists have long recognized occupation as “...the most powerful single indicator of levels of material reward, social standing, and life chances” in industrialized societies. Furthermore, occupation may be a more stable measure of lifetime earning potential, and hence social position, in modern capitalist societies (Connelly et al., 2016, p. 2). Finally, it is difficult to access data on the degree to which individual legislators control the means of production, making it difficult to use the social-relational perspective. Thus, the author used the technical perspective of class for reasons largely rooted in pragmatism and lack of access to appropriate data.

Measures of class built on occupation must account for changing occupational structures over time. This is especially challenging in the current study given that the data on legislator occupation are available back to the 1920 legislative session. Fortunately, while specific occupations have changed over time, occupational groupings can be compared across periods.

How does one sort occupational groups by class structure in the United States? Wright, Costella, Hachen, and Sprague (1982) examined the class structure underlying specific occupational categories and found that the professional, teacher, manager, technician, farmer, and foreman categories were less likely to contain workers (as opposed to managers). Occupational categories are often called “Major Occupational Groupings (MOGs),” and these have been used to compare the distribution of jobs in the economy over time. For instance, Leon (2016) demonstrated a rise in professional and technical jobs since 1915. Thus, this study will utilize the technical definition of class, operationalized as the share of legislator occupations falling into specific MOGs.

Descriptive Representation of Class

The working-class has held less than two percent of seats in Congress since 1901 (Carnes, 2016, Figure 1, p. 84). Furthermore, representation of the working-class in state legislatures fell from five to three percent from 1976 to 2007 (Carnes, 2016, p. 100). This figure varies widely by state, with 10 percent of Alaska’s legislative seats held by the working class in 2007 compared to less than one percent in New York and California. In this research, working-class includes those engaged in manual labor or service industry jobs in their last occupation before taking office (Carnes, 2016). How does representation compare to the size of the working-class in society? Data on education requirements of existing jobs, the percentage of workers earning the minimum wage, and the share of workers in specific occupations (e.g., construction and production) all suggest that the working-class is under-represented in state legislatures.

An important limitation of this research is its reliance on cross-sectional data. This is because the use of cross-sectional data prevents researchers from establishing historical trends. Cross-sectional data on occupation is available from two sources, the National Conference of State Legislatures (data for 1993, 1995, 2007) and the Insurance Information Institute (data for 1979). The present study utilizes a new data set, from the State Library of Massachusetts, to examine class representation from 1920 to 2004.

Importance of Descriptive Representation

Descriptive representation in legislatures is a critical issue because under-representation has been shown to bias policy outcomes against women (Berkman & O'Conner, 1993), minorities (Owens, 2005), and the working-class (Carnes, 2012). For instance, controlling for demand and both citizen and government ideology, greater African American representation in state legislatures is associated with higher spending on healthcare and welfare (Owens, 2005). Moreover, Temporary Aid for Needy Families (TANF) eligibility criteria are less restrictive in states with more, and more powerful, women legislators (Reingold & Smith, 2012).

The study of legislative outcomes has emphasized gender and race over class (Carnes, 2016), but class effects have been demonstrated. For instance, Griffin and Anewalt-Rensburg (2013) found that, controlling for constituent views and other factors, wealthier members of Congress were more likely to vote for and cosponsor legislation to reduce or repeal the Estate Tax. Carnes (2012) found that the average member of Congress would have voted with the AFL-CIO more frequently had Congress been representative of the population in terms of class. Moreover, Carnes (2013, p. 124) found that, controlling for factors like per capita income, intergovernmental transfers, poverty, racial composition, political ideology, and union density, a 10-point increase in the percentage of working class legislators is associated with a four- to five-point increase in the percentage of the state budget devoted to welfare programs. Given the very low participation of working-class individuals in most U.S. lawmaking bodies, increases of that magnitude are not impossible. Carnes (2013) also found that states with lower working-class representation had higher income inequality. Furthermore, Scruggs and Hayes (2017) find that income replacement rates for welfare and unemployment benefits, which are the average benefit divided by the average after-tax wage, have decreased over time and that the "plutocratic tendencies" of state political economies are a contributing factor. In other words, low working-class representation has led to reduced public benefit generosity at the state level.

Mechanisms of Effects

By what mechanisms may more descriptive representation translate into policy outcomes that are less biased toward traditionally under-represented groups? A key potential mechanism is the inclusion of a more diverse set of views in the policymaking process. Prior research makes it clear that Americans with lower incomes are more liberal on economic issues (e.g., favor more redistribution) than their wealthier counterparts (Gilens, 2009; Rigby & Wright, 2013; Page, Bartels, & Seawright, 2013). Furthermore, differences in psychology have been identified between social classes that may function as a potential source of these different attitudes. That is, social psychologists have demonstrated that increased economic well-being is associated with less pro-social behavior, decreased empathy, and increased narcissism (Scruggs & Hayes, 2017). Thus, both material interests and psychological factors may drive class differences in attitudes toward economic policies.

In turn, the connection between representation of a more diverse set of views and policy action could manifest through an effect on the public agenda. For instance, Brown and Banks (2014) demonstrated that African American women legislators had a unique effect on the legislative agenda in Maryland in 2005 and 2011. Items on the public agenda are more likely to gain attention and receive public action. So, working-class legislators may have different views on economic issues that are reflected in the public agenda, and putting issues of relevance to the working-class on the agenda increases the likelihood of public action.

The Case of Massachusetts

Existing research on class representation in the Massachusetts General Court also utilized cross-sectional data and employed the technical view of class. These data suggest that working-class individuals held less than one percent of seats in the Massachusetts General Court in 2007 (Carnes, 2016). The present study will add to our understanding of class representation in the Massachusetts General Court by providing descriptive evidence of representation over a long period (1920 to 2004). This study will also examine if some relationships observed in studies of cross-sectional data hold over the long run in one state. There is an important caveat: *this study will actually use the share of non-working-class occupations in the legislature as a way to measure working-class representation*. This is because available historical data on the occupational profile of Massachusetts state legislators is voluminous and the author did not have adequate time to fully code working-class occupations into MOGs. It makes sense to code the professional occupations first given that there are a smaller number of these professions and their titles are more stable. For instance, lawyer and doctor/physician are quite stable titles in this dataset. Specifically, the following hypotheses will be tested:

Hypothesis one. Considering documentation of declining working-class representation in prior research, the share of Massachusetts legislators with professional occupations should have increased over time.

Hypothesis two. Considering the findings of prior research on the effect of descriptive representation, an increasing share of legislators with professional occupations in Massachusetts should be associated with lower top state tax rates, reduced spending on unemployment, and higher inequality. This is assuming the inclusion of relevant control variables, as available and appropriate.

METHOD

One of the main outcomes of this project will be a descriptive analysis of class in the Massachusetts General Court from 1920 to 2004. The author is unaware of any such analysis in the existing body of literature. Descriptive analyses are an important first step in understanding the ultimate effects of representation of class on policymaking in the long run. Why is it important to examine historical trends? Time series data allow for the identification and analysis of patterns like trends and cycles (Montgomery, Jennings, & Kulahci, 2008, p. 5).

An important part of data analysis involves examining the data, because this helps the researcher understand how to best go about analyzing the data. That is, time series plots, numerical summaries (e.g., mean, standard deviation), and scatter plots help to identify patterns and outliers in the data (Montgomery et al., 2008, p. 13). The primary outcome of this study as of now is a descriptive analysis along with preliminary inferential analyses based on correlations. These analyses will help identify trends in class representation in the Massachusetts legislature and provide a starting point for further analysis. The author plans to continue the analysis using multivariate regression where possible and appropriate.

Main Variable: Legislator Occupation

The main independent variable in the current study will be the share of legislators in each legislative session who disclosed holding occupations in specific Major Occupational Groups (MOGs). Data on the occupation of each state legislator from 1919 to 2004 are available from the State Library of Massachusetts (2017). These data were compiled by the State Library from *Public Officers of the Commonwealth of Massachusetts*, which is a periodical published by the state government that tracks the demographic characteristics of legislators for each legislative session. Thus, this is a state-level administrative dataset. The State Library transcribed data from *Public Officers of the Commonwealth of Massachusetts*. This transcription stopped at 2004, so future work will include transcribing additional issues of this periodical. Moreover, the author will take care to ensure the accuracy of the transcription, although this is an ongoing effort due to the size of the dataset.

Occupations will be assigned the class status of the occupational grouping to which they belong, which is consistent with the technical approach to class discussed earlier. The broader framework of Wright et al. (1982) will be used to operationalize the class status of occupational groupings. For instance, lawyers are not working-class because that occupation is part of the professional occupational grouping, which itself contains significantly fewer workers (as opposed to managers) than other groupings. The author coded occupations into Major Occupational Groupings (MOGs) based on the list of occupations in each MOG provided by the Bureau of Labor Statistics (BLS, 2001). For instance, an elementary or secondary school teacher was coded as a professional worker (MOG A), consistent with the BLS guidelines. The author performed the initial coding.

As previously referenced, the author will take multiple actions to ensure the reliability of the data. First, random samples of individual cases will be cross-checked in both the electronic dataset and the original publication to ensure that data were not incorrectly transcribed. Second, the data will be coded by a second researcher when funds become available to do so. Third, the proportion of legislators reporting each occupation will be cross-checked between this dataset and the cross-sectional datasets available for 1993, 1995, and 2007 from the National Conference of State Legislatures (NCSL). This will establish the level correspondence between this dataset and prior datasets used in published research.

The exact form of the legislator occupation variable will be the percent of legislators in each legislative session reporting occupations in a specific MOG. It is important to note that legislative sessions in Massachusetts are two years in length, so the other relevant variables must be transformed from annual to two-year figures. This will be accomplished by taking the unweighted average of the variable in both years.

Dependent variables. The literature suggests that class representation will affect the following variables: taxes (Griffin & Anewalt-Remsburg, 2013), unemployment benefit generosity (Scruggs & Hayes, 2017), and inequality (Carnes, 2013; Franko, Kelly, & Witko, 2016; Kraus & Callaghan, 2014). Annual top state income and capital gains tax rates are available from the National Bureau of Economic Research (Feenberg, n.d.). Unemployment benefit data are available from the U.S. Bureau of Economic Analysis (BEA, 2017b), and these data will be transformed into constant dollars for inclusion in the regressions. Inequality in this analysis will be operationalized as the share of income going to the top one percent of earners. Data on the annual share of income (in percent) held by the top one percent of earners is available from Frank (n.d.).

Control variables. Statistical control is used in social science research to see if the relationship between X and Y remains after holding constant the effect of confounding variables (Agresti & Finlay, 2009, p. 304). Carnes (2013, p. 124) controlled for the following in an analysis of the effect of class representation in state legislatures on the share of state budgets devoted to social spending: per capita income, intergovernmental transfers, poverty, racial composition, political ideology, and union density. Per capita income is an indicator of well-being, albeit an imperfect one (Valdmanis, 2015). Annual per capita income data, in dollars, are available from the U.S. Bureau of Economic Analysis (BEA, 2017a). Data on intergovernmental transfers are not available over the period under consideration. Poverty is a proxy for the demand for social welfare spending, and annual poverty rate data are available from the Census Bureau (2017, September 8). Racial composition of states has been shown to affect social welfare spending (Hahn et al., 2017, June), and annual racial data are available from the National Cancer Institute (NCI; 2017, December). These data are specially tabulated for the NCI by the Census Bureau. Political ideology and union density reflect the changing political environment in which spending decisions are made. For instance, declining union density is associated with increased inequality, holding other factors constant (Jacobs & Myers, 2014). Annual union density data, which is the percent of nonagricultural workers who are union members, are available from Hirsch, Macpherson, and Vroman (2017). Voter enrollment data, which includes the total number enrolled as well as the number enrolled by each party, are available from the Massachusetts Secretary of State (Galvin, n.d.). These data will be transformed into percentages of voters enrolled as Democrats, Republicans, or Unenrolled and will be used as a proxy for voter ideology. The cost of campaigns is an important barrier to taking office and would thus be an important control variable. However, the author is not aware of any existing sources of data on campaign costs over the time periods under consideration in this study.

Control variables will only be included in later regression analyses of the data. Thus, they will not be referred to in the preliminary results. However, control variables are worth mentioning now to point out the future direction of this research. Unfortunately, none of the control variables are available back to 1920, so regression analyses will be restricted to years for which control variables are available.

PRELIMINARY RESULTS

Professions by Occupational Group

The first step in analyzing the occupational data involved visual examination of each variable followed by the generation of descriptive statistics. Figure 1 displays the change in the share of all state legislators in each legislative session who reported an occupation in one of four Major Occupational Groups (MOGs). The MOGs are described by the Bureau of Labor Statistics (2001) and are designed to assist in the classification of jobs into larger categories. "MOG A" consists of professional and technical occupations such as doctor, lawyer, and teacher. While there is variation over time in the share of legislators reporting MOG A occupations, representation of MOG A in the legislature increased between the 1920 and 2004 legislative sessions. Moreover, the share of all legislators reporting a MOG A occupation increased steadily since the legislative session ending in 1980. The increase in MOG A occupations among legislators in Massachusetts is consistent with the rise in employees working in MOG A occupations over time (Leon, 2016). Moreover, the rise in MOG A occupations supports hypothesis one.

Two major MOG A occupations are lawyers and public school teachers, and these are the MOG A occupations with the most representation in the legislature. Figure 2 presents the share of legislators working in these two occupations. The share of legislators working as lawyers increased from the 1920s to the 1960s, after which the share of lawyers declined before increasing again in the 1990s. The share of legislators working as teachers increased from the 1940s through the legislative session ending in 1990, after which the share of teachers declined.

Table 1 summarizes each occupational variable. Professional occupations (i.e., MOG A) have played a consistent and substantial role in the legislature since 1920. That is, at least 23.5 percent of Massachusetts state legislators disclosed having professional occupations in each legislative session between 1920 and 2004. Lawyers, part of MOG A, have also played a consistent role in the legislature. At least 16 percent of legislators disclosed working as lawyers in all legislative sessions between 1920 and 2004. One interesting finding from descriptive analysis is that MOG A occupations were represented at a higher rate in the legislature than they are in the workforce at various points in the data series. For instance, 32.5 percent of all legislators disclosed having a MOG A occupation in 2004, but MOG A occupations represented 22.2 percent of all jobs nationally in 2005 (Hajiha, n.d.). Unfortunately, 2005 is the closest year for which the Bureau of Labor Statistics performed an analysis of the breakdown of jobs in occupational categories.

The next step in analyzing the occupational data involved examining scatterplots displaying the relationship between relevant independent (i.e., occupation variables) and dependent variables. These scatterplots revealed some non-linear relationships. This presents a challenge in analyzing the data. Either the data can be transformed or methods can be utilized that are not as sensitive to non-linearity. Spearman correlations were used to examine the association between occupational variables and relevant dependent variables because this method can be used for non-linear relationships and is less sensitive to outliers (Gravetter, & Wallnau, 2007). Regression analyses will be utilized in the future as additional resources become available.

Income inequality was the primary dependent variable because it is the only dependent variable for which data are available back to the beginning of the occupational data series (i.e., 1920). Income inequality in this study is operationalized as the share of income held by the top one percent of earners. The following results show significant relationships between multiple occupational variables and income inequality. The share of legislators with MOG A occupations was significantly positively associated with the share of income held by the top one percent of earners ($r_s = .27$, $n = 43$, $p < .01$). Note that this association was only significant at the 10 percent significance level. Of course, correlation does not demonstrate causation. However, this association is consistent with prior research demonstrating that increased representation of professional occupations across states is associated with higher inequality (Carnes, 2013). Interestingly, the share of legislators indicating a primary occupation of public school teacher was significantly negatively related to the share of income held by the top one percent of earners ($r_s = -.37$, $n = 43$, $p < .05$). The author is unaware of prior research examining the effect of representation of specific occupations on inequality. The following were not significantly related to the share of income held by the top one percent of earners: MOG B/C share, MOG D share, and lawyer share of legislators. Thus, even though professional occupations (i.e., MOG A) are related to inequality as an occupational group, the two main occupations in this group (i.e., lawyer and teacher) are differentially related to inequality. Regression analyses of this relationship will be included in a later version of this paper.

Taxes were specified as another dependent variable because wealthier legislators are more likely to cut taxes, even when controlling for constituent views (Griffin & Anewalt-Remsburg, 2013). Data are available for state tax rates on both capital gains and wages, but only between the 1978 and 2004 legislative sessions. This is too little data for a regression. However, a spearman correlation was performed to examine the relationship between occupational variables and tax rates. The share of legislators reporting MOG A occupations was significantly negatively associated with the capital gains tax rate ($r_s = -.47$, $n = 14$, $p < .10$). Note that this association was only significant at the 10 percent significance level. This highlights the role of legislature professionalization in policy outcomes and will be discussed later. These results are

weak evidence because of the small sample size, so additional data is needed. Nonetheless, results from prior research support the existence of the relationship between representation of professional occupations and tax rates.

State unemployment benefit expenditures were also examined due to the relationship between occupational representation and unemployment insurance policy (Scruggs & Hayes, 2017). Unemployment expenditure data are available back to the 1948 legislative session. These data were adjusted for inflation prior to analysis by utilizing the Consumer Price Index for All Urban Consumers (CPI-U), which is indexed to 1982 dollars. Representation of all MOG A occupations was not related to unemployment expenditure, but two of the main occupations within this category were. That is, the share of legislators reporting lawyer as an occupation was significantly negatively associated with unemployment expenditures ($r_s = -.54$, $n = 29$, $p < .05$), and the share of legislators reporting public school teacher as an occupation was significantly positively associated with unemployment expenditures ($r_s = .73$, $n = 29$, $p < .05$).

Professionalization

An interesting finding was that the share of legislators reporting a primary occupation of “legislator” increased dramatically since the 1960s. This trend was not an original focus of this study, but it is addressed below. Figure 4 below shows the share of all Massachusetts state legislators who indicated a primary occupation of “legislator.” There is a break in the data around 1963. This corresponds to the rise in full-time state legislators from at least the 1970s, the earliest data available from the National Conference of State Legislators (NCSL, 2009).

Professionalization of legislatures involves increases in legislator salary and resources along with changes in legislative sessions (often longer). Results from Bowen and Zachary (2014) also confirm the trend toward legislative professionalization across the states from the mid-1970s to the mid-2000s. See Figure 5 below for trends in legislator salary and per-legislator expenditures in Massachusetts. Moreover, Bowen and Zachary (2014, p. 288) categorize Massachusetts as a “...professional, full-time” legislature in recent times.

The share of legislators reporting their primary occupation as “legislator” can serve as an indicator, albeit a rough one, of how professionalization was internalized by legislators. “Legislator” was only embraced as an occupational identity by a substantial share of legislators near the end of the data series (e.g., 43 percent in 2004). This is interesting because the General Court had been professionalized for decades by this point.

What effect has professionalization had on policy and economic outcomes? The share of legislators reporting a primary occupation of “legislator” was significantly positively associated with income inequality ($r_s = .86$, $n = 21$, $p < .05$) and unemployment benefit expenditures (real dollars, indexed to 1982; $r_s = .97$, $n = 21$, $p < .05$). These analyses involve only data from 1963 on because this is the point at which the Massachusetts legislature began to professionalize significantly. Furthermore, the share of legislators reporting “legislator” as their primary occupation was significantly negatively associated with a decrease in the state capital gains tax rate ($r_s = -.64$, $n = 14$, $p < .05$).

CONCLUSION

Research on descriptive representation suggests that, on average, state legislatures do not look like state populations in terms of class, gender, and race. This is not because these populations are incapable of serving as legislators, but rather because they face barriers to entering politics (Carnes, 2016). Critically, under-representation in state legislatures has been shown to bias state policy outcomes and increase inequality.

While prior research has been rigorous, it has relied on cross-sectional data over a limited time frame. This study complements prior work by examining class representation in the Massachusetts General Court from 1920 to 2004. In addition to describing the long-run trend in descriptive representation of the class in Massachusetts, the analyses performed in this study examined, in a preliminary manner, the relationship between class representation and policy outcomes and income inequality. Spearman correlations demonstrated that the share of legislators with professional occupations was significantly associated with capital gains tax rates, income inequality, and spending on unemployment benefits. The only difference between the results and the hypotheses was that the share of professional occupations in the legislature was positively related to unemployment expenditures rather than negatively related.

The preliminary analysis also identified the influence of legislature professionalization. The share of legislators reporting “legislator” as their primary occupation increased starting in the 1960s. Professionalization was significantly associated with capital gains tax rates, income inequality, and spending on unemployment benefits. While this was not the original focus of this study, it is an interesting finding that should be pursued further.

It is critical to state that the significant correlations do not demonstrate causality. However, these significant associations are mostly consistent with the results of prior research using cross-sectional data across states. The author intends to extend the analysis, especially using multivariate regression. However, this will occur only after the author is able to fully verify the reliability and validity of the transcription and coding. This will require additional resources, most notably a second coder.

One major drawback of this study is that it relies on data from one state. However, Massachusetts does make an interesting case to study because, at least in recent history, it is a liberal state (Caughey & Warshaw, 2015) with low working-class representation in the General Court. This seems anomalous in the context of prior research. Tavory and Timmermans (2014) note that such anomalous cases can help to improve existing theory and generate new theory through the logic of abduction. Thus, examination of the case of Massachusetts may help to improve existing theories on descriptive representation.

REFERENCES

- Agresti, A., & Finlay, B. (2009). Introduction to multivariate relationships (chapter 10). In *Statistical methods for the social sciences* (4th ed). Upper Saddle River, NJ: Pearson.
- Berkman, M.B., & O'Connor, R.E. (1993). Do Women Legislators Matter? Female Legislators and State Abortion Policy. *American Politics Quarterly* 21, 102- 124.
- Bowen, D.C., & Zachary G. (2014). Should We Measure Professionalism with an Index? A Note on Theory and Practice in State Legislative Professionalism Research. *State Politics & Policy Quarterly* 14(3), 277-296. doi: 10.1177/1532440014536407
- Brown, N., & Banks, K.H. (2014). Black women's agenda setting in the Maryland State Legislature. *Journal of African American Studies*, 18, 164-180.
- Bureau of Economic Analysis (2017a). Per capita personal income in Massachusetts (MAPCPI). Retrieved from <https://fred.stlouisfed.org/series/MAPCPI>, December 9, 2017.
- Bureau of Economic Analysis. (2017b). State unemployment benefits in Massachusetts. Retrieved from <https://fred.stlouisfed.org/series/MAOBEN>
- Bureau of Labor Statistics. (2001, October 16). Occupational Classification System Manual. Retrieved from <https://www.bls.gov/ncs/ocs/ocsm/comMOGADEF.htm>
- Carnes, N. (2012). Does the Numerical Underrepresentation of the Working Class in Congress Matter? *Legislative Studies Quarterly*, 37, 5- 34.
- Carnes, N. (2013). *White-Collar Government: The Hidden Role of Class in Economic Policy Making*. Chicago, IL: The University of Chicago Press.
- Carnes, N. (2016). Why are there so few working-class people in political office? Evidence from state legislatures. *Politics, Groups, and Identities*, 4(1), 84-109.
- Caughy, D., & Warshaw, C. (2016). The dynamics of state policy liberalism: 1936-2014. *American Journal of Political Science*, 60(4), 899-913. doi: 10.1111/ajps.12219
- Connelly, R., Gayle, V., & Lambert, P.S. (2016). A review of occupation-based social classifications for social survey research. *Methodological Innovations*, 9, 1-14. doi: 10.1177/2059799116638003
- Feenberg, D. (n.d.). Maximum state income tax rates 1977-2015. Retrieved from <http://users.nber.org/~taxsim/state-rates/>
- Frank, M. (n.d.). Top income shares by state since 1917 using US thresholds. Retrieved from http://www.shsu.edu/eco_mwf/inequality.html
- Franko, W.W., Kelly, N.J., & Witko, C. (2016). Class bias in voter turnout, representation, and income inequality. *Perspectives on Politics*, 14(2), 351-368.
- Galvin, W.F. (n.d.). Massachusetts registered voter enrollment: 1948-2017. Retrieved from <http://www.sec.state.ma.us/ele/eleenr/enridx.htm>
- Gilens, M. (2009). Preference Gaps and Inequality in Representation. *PS: Political Science and Politics* 42, 335- 341.
- Gravetter, F.J., & Wallnau, L.B. (2007). Correlation (chapter 16). In *Statistics for the Behavioral Sciences* (7th ed). Belmont, CA: Thomson Higher Education.
- Griffin, J.D., & Anewalt-Remsburg, C. (2013). Legislator wealth and the effort to repeal the Estate Tax. *American Politics Research*, 41(4), 599-622.
- Hajih, F. (n.d.). Employment and wages by Major Occupational Group and industry. Washington, DC: Bureau of Labor Statistics. Retrieved <https://www.bls.gov/oes/major.pdf>
- Hirsch, B.T., Macpherson, D.A., & Vroman, W.G. (2017). Union density estimates by state: 1964-2016. Retrieved from <http://unionstats.gsu.edu/MonthlyLaborReviewArticle.htm>
- Jacobs, D., & Myers, L. (2014). Union strength, neoliberalism, and inequality: Contingent Political Analyses of U.S. Income Differences since 1950. *American Sociological Review*, 79(4), 752-774.
- Kraus, M.W., & Callaghan, B. (2014). Noblesse Oblige? Social status and economic inequality maintenance among politicians. *PLoS ONE*, 9(1), e85293. doi: 10.1371/journal.pone.0085293
- Leon, C.B. (2016, February). The life of American workers in 1915. *Monthly Labor Review*. Washington, DC: Bureau of Labor Statistics.
- Montgomery, D.C., Jennings, C.L., Kulahci, M. (2008). Introduction to Forecasting (chapter 1). In *Introduction to time series analysis and forecasting*. Hoboken, NJ: John Wiley & Sons, Inc.
- National Cancer Institute (NCI). (2017, December). U.S. population data: 1969-2016. Retrieved from <https://seer.cancer.gov/popdata/>
- National Conference of State Legislatures (NCSL). (2009, July/August). Statestats: Working full-time in state legislatures. Retrieved from http://www.ncsl.org/Portals/1/Documents/magazine/articles/2009/sl_0709-statestats.pdf
- Owens, C.T. (2005). Black substantive representation in state legislatures from 1971-1994. *Social Science Quarterly*, 86(4), 779-791.
- Page, B.I., Bartels, L.M., & Seawright, J. (2013). Democracy and the policy preferences of wealthy Americans. *Perspectives on Politics*, 11(1), 51-73.
- Reingold, B., & Smith, A.R. (2012). Welfare policymaking and intersections of race, ethnicity, and gender in U.S. state legislatures. *American Journal of Political Science*, 56(1), 131-147.
- Rigby, E., & Wright, G.C. (2013). Political parties and representation of the poor in the American states. *American Journal of Political Science*, 57(3), 552-565.
- Scruggs, L., & Hayes, T.J. (2017). The influence of inequality on welfare generosity: Evidence from the U.S. states. *Politics & Society*, 45(1), 35-66.
- State Library of Massachusetts. (2017). Massachusetts Legislators Database.
- Tavory, I., & Timmermans, S. (2014). *Abductive analysis: Theorizing qualitative research*. Chicago, IL: The University of Chicago Press.
- U.S. Census Bureau (2017, September 8). Number of poor and poverty rate, by state: 1980 to 2016 (Table 21). Retrieved from <https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-poverty-people.html>
- Valdmanis, V.G. (2015). Factors affecting well-being at the state level in the United States. *Journal of Happiness Studies*, 16, 985-997.
- Wodtke, G.T. (2017). Social relations, technical divisions, and class stratification in the United States: An empirical test of the death and decomposition of class hypothesis. *Social Forces*, 95(4), 1479-1508.
- Wright, E., Costello, C., Hachen, D., & Sprague, J. (1982). The American class structure. *American Sociological Review*, 47(6), 709-726.
- Wyatt, I.D., & Hecker, D.E. (2006, March). Occupational changes during the 20th Century. *Monthly Labor Review*, 35-57.

APPENDIX A: FIGURES AND TABLES

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
Legislator as Primary Occupation (1963 on)	21	26.9	14.21	1.03	43
Major Occupational Group A (Professional)	43	28.86	2.88	23.53	34.78
Major Occupational Group B/C (Managers/Sales)	43	12.02	4.08	4.35	18.86
Lawyer as Primary Occupation	43	22.46	3.23	16.34	26.74
Teacher as Primary Occupation	43	2.74	1.99	0	6.25

Table 1: Descriptive statistics for occupational variables.

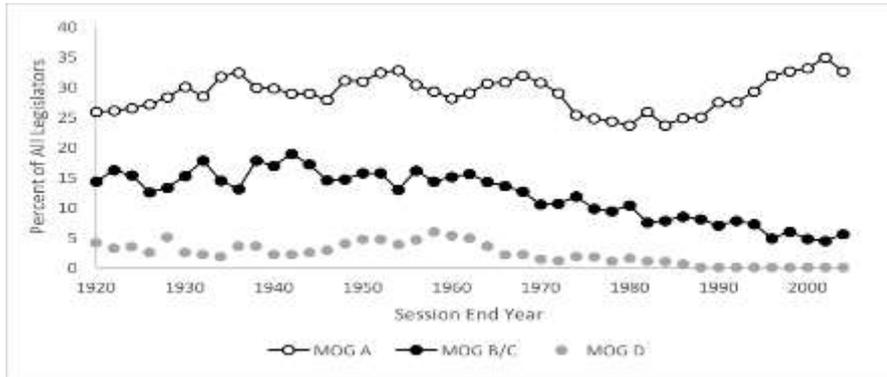


Figure 1: Share of all Massachusetts Legislators Holding positions in specific Major Occupational Groups (MOGs). Occupational data are sourced from the State Library of Massachusetts. MOG descriptions are taken from the BLS (2001).

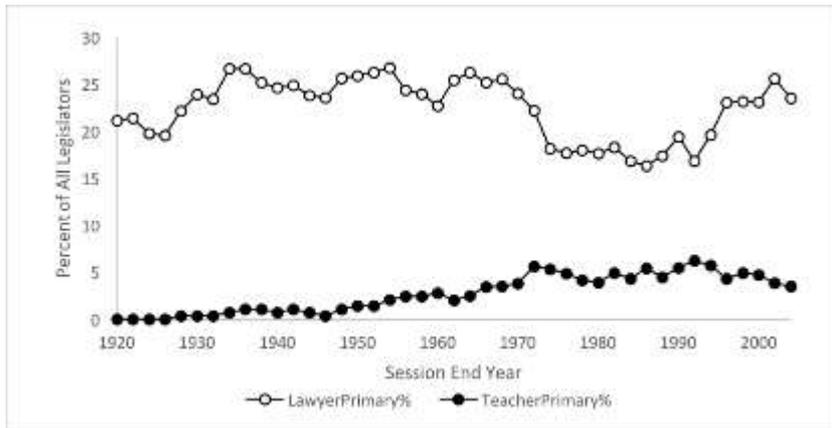


Figure 2: Share of all Massachusetts Legislators holding jobs as lawyers or public school teachers. Occupational data are sourced from the State Library of Massachusetts.

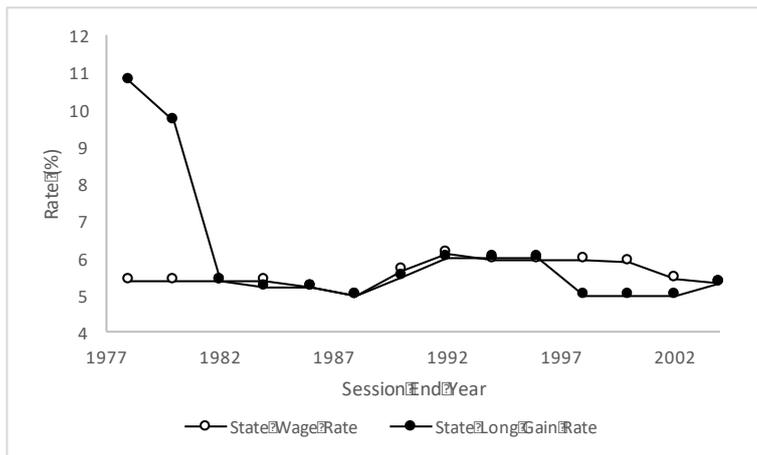


Figure 3: State tax rates for wages and long-term capital gains. Data are sourced from Frank (n.d.).

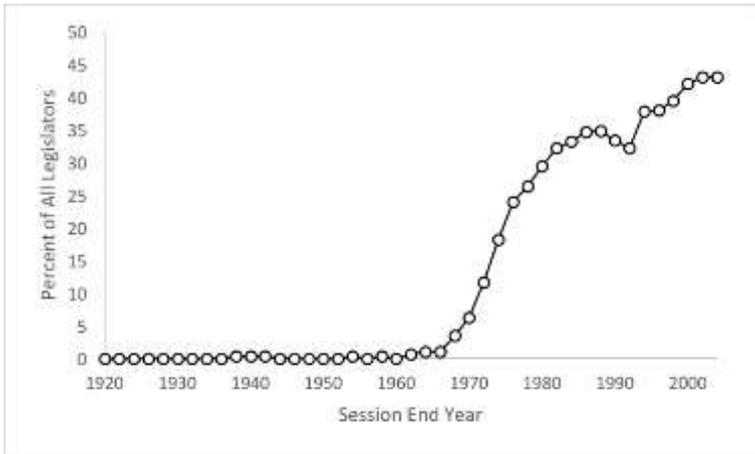


Figure 4: Share of all Massachusetts Legislators indicating a *primary* occupation as “legislator.” Occupational data are sourced from the State Library of Massachusetts.



Figure 5: Both salary and expenditures per legislator are in thousands of 2010 dollars. The data are sourced from Bowen and Zachary (2014).

1275 AGRICULTURAL LAND PROPERTY RIGHTS AND HOUSEHOLD FOOD INSECURITY IN RURAL CAMBODIA

ABSTRACT

My study examines the empirical link between land property rights and food insecurity, using primary data from a household survey in which I participated in conducting in 2014 among rice-growing households in 32 rural villages in Cambodia. The results show that a 1-unit increase in land property rights (from the average of 8.22) is associated with a 2-percent lower probability of household food insecurity annually. Similarly, a 1-unit increase in land property rights from the average of 8.22 is likely to reduce the length of food insecurity by about half a day to one day per annum per household. The results also indicate that land property rights potentially improve farmers' access to credit, land-based collateral usage and rice revenue-cost ratio, or 'input efficiency'. Relatedly, a wider usage of titled agricultural land as collateral to obtain a loan and enhanced rice revenue-cost ratio through the strengthening of agricultural land property rights can be an option for reducing rural food security in Cambodia.

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1304 ENERGY AND EMISSIONS CONFLICTS IN A GLOBALIZED WORLD: THE ASIAN CASE STUDY

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ABSTRACT

The main aim of this paper is to observe the environmental behaviour in some countries of the world, focusing the study on the Asian case, by analyzing the trend of the energy consumption and emissions indicators in each country. At the same time, we also consider the life expectancy at birth as an endogenous variable to observe the carbon dioxide (CO₂) effects on the population health. The paper also examines some conflicts coming from competition for energy resources, energy dependence and the spillover effects of the emissions on the proper and neighboring areas. To quantify how affect changes in carbon dioxide emissions, and energy consumption on some countries life expectancy, climate change, and labour and energy productivities, we use econometric techniques across some Asian countries and also some metropolitan areas, considering IEA annual data. Only carbon dioxide emissions are addressed in this paper, but it does not address other emissions such as NO_x or SO_x. The paper relates issues to central questions of international politics and theoretical debates concerning to the levels of energy consumption, carbon dioxide emissions and the role of the renewable energies on the climate change and the wellbeing of the consumers.

Keywords: Emissions, Renewable Energy, Cities, Economic Conflicts, Political Conflicts.

JEL Class: Q01, Q42, Q47, Q53.

ECONOMIC INTRODUCTION TO THE ASIAN COUNTRIES

The environment is an area of complex study where physical, chemical, biological, cultural and social factors are involved and related, and where the hand of man is omnipresent. The environment becomes part of a globalized world. The involvement of every continent, country, city, or village is important for managing and channeling energy resources, and use of them must be made in the most optimal way possible. Much has been done and written about the use of energy resources produced in each location: how to get them, exploit them, treat them, use them, recycle and manage waste. But when a man hits on the environment, the environment, in turn, impacts on man by air pollutants, water and earth, causing sometimes illness and even deaths. Technology is an important factor to obtain a better management of energy resources. Increased technology is usually associated with less pollution, and the application of technology can solve some environmental problems associated with technological development. The problem associated with the global overpopulation is a factor to consider in terms of environment and waste aggression. We will focus on the air pollution and its impact on cities and megacities in terms of pollution, health, potential border disputes; and possible solutions.

The Asian countries, have a large population, estimated in more of 40% of the world population; an extensive territory; a lot of natural resources; common views on global economic problems; a very high growth of its gross domestic product, estimating a joint GDP of approximately 135 billion dollars, and participation in world trade in recent years, being countries very attractive to investors. The World Bank's requirement to promote equality among countries and greater participation in the International Monetary Fund and the obtaining of concessions for the granting of intellectual property rights have been common objectives at the economic-political level.

The Asian countries, are dominant global providers of technology and services, Russia become dominant as suppliers of raw materials, including food, with a large increase in their industrial resources. These countries may form a powerful economic bloc. To can compete, these countries must obtain greatly strengthened education, direct investment, internal consumption and spirit of domestic enterprise. According to the study, the Asian countries, especially India and China, have the fastest growth potential among the countries for the next 30 years. An important reason for that is the decline in the working-age population.

India is considered as the third world energy power, since it produces coal, biofuels and waste, crude oil and natural gas. Its majority consumption is in biofuel, oil products, coal, electricity and natural gas. India has been involved in the use of renewables betting on wind and solar energy. China is today the first energy power in the world, but above all in the development of renewable energy. The production of coal, crude oil, bio-fuels, hydro and nuclear is still very prominent, but it is betting very strongly on wind energy, solar photovoltaic and thermal, geothermal and marine energy. Russia produces natural gas, crude oil, coal, nuclear energy and hydro, in this order, being its majority consumption natural gas, oil products, heat and electricity. The great extension of Russia allows the development of renewable energies, being the most developed the geothermal energy, followed by solar and wind energy. Its consumption coming from coal, oil products, electricity, natural gas, biofuel, heat and renewable energy.

A MICROECONOMIC MODEL FOR ENERGY CONSUMPTION

Although a prediction model is not the same as a causal model, a prediction model must be designed based on the past data and available theory. If such a theory does not exist, then the prediction model will be based only on the sequence

of historical data. But respect to demand functions, and hence demand of energy, theory exists. And not only the theory exist, but also the econometric specification for a linear regression model, as is the case of the linear demand systems or almost ideal demand systems (Deaton and Muellbauer 1980). The theoretical specification of energy demand is very simple: Energy is a consumption good and at the same time a production factor, with a behavior similar to that of land.

Simplifying Hypotheses:

Suppose then that in the economy there are a small number F of oligopolistic companies in charge of supplying energy to the population, H consumers and a large number N of firms that for simplicity we assume in perfect competition. By assuming no political or governmental intervention, being e quantity of energy and c and R respectively the sets of goods and production factors different from the energy and p_e, p_c and p_R its respective unitary prices, assuming by simplicity Cobb-Douglas utility function:

$$U(e, c) = e^\alpha c^{1-\alpha} \tag{1}$$

And knowing that m is the consumer monetary income or monetary per capita income and P the general level price of the X goods, if each firm produces a similar good X , the behaviour of the individual agents in each period will be the following:

Consumer behaviour.

It consist in to maximize the utility sbject to the budget constraint:

$$Max\langle U(e, c) = e^\alpha c^{1-\alpha} \rangle \text{ subject to: } p_e + p_c = m. \tag{2}$$

Solving this maximization we have: $m = \frac{p_e}{\alpha} e$, but $Hm = Y$ (total monetary income), hence $Y = \frac{p_e}{\alpha} He$. Therefore, the aggregate demand of energy as consumption good will be:

$$He = \frac{\alpha Y}{p_e} \tag{3}$$

Firms behaviour.

It consist in to maximize the profit to shell the good X , by assuming that the production function of the X good has a Cobb-Douglas features:

$$X = Ae^\beta R^{1-\beta} \tag{4}$$

where A is the technical progress coefficient or total factor productivity. The producer problema is:

$$Max\langle Benefit \rangle = Max\langle PAe^\beta R^{1-\beta} - p_e e - p_R R \rangle \tag{5}$$

From the first condition for maximizing benefit (B), we have:

$$B'_e = 0 = \beta PA \frac{e^{\beta-1}}{e} R^{1-\beta} - p_e = \frac{\beta PX}{e} - p_e = 0 \tag{6}$$

Hence: $e = \frac{\beta PX}{p_e}$. The aggregate demand of energy as production factor will be then:

$$Ne = \frac{\beta Y}{p_e} \tag{7}$$

And the total energy demand (E_D):

$$E_D = He + Ne = (\alpha + \beta) \frac{Y}{p_e} \tag{8}.$$

Energy supplier companies.

We will assume that energy supply companies, which generally are oligopolistic companies, are similar and, by simplicity, have a quadratic cost function of type:

$C = p_R R + \frac{1}{2} e^2$. Then the unit price to which they sell the energy (p_e) is imposed by a mark-up ($\mu > 1$) on their marginal costs: $p_e = \mu C'_e$, that is: $p_e = \mu e$. Hence: $p_e F = \mu(Fe)$. But Fe is the total energy supplied (E_S) by all companies in the global market and therefore:

$$E_S = \frac{p_e F}{\mu} \tag{9}$$

Equilibrium:

Equaling supply and demand of energy, $E_S = E_D = E$, by means of the equations 8 and 9 we have that:

$$E = \frac{p_e F}{\mu} = (\alpha + \beta) \frac{Y}{p_e} \tag{10}$$

but from the first part of equation 10, or form 9, we know that the enegy price is: $p_e = \frac{\mu E}{F}$ and substituting this result in the second par of the equation 10 we will know the total consumption of energy in the market: $E^2 = \frac{(\alpha+\beta)F}{\mu} Y$. And so-calling $\frac{(\alpha+\beta)F}{\mu}$ as λ^2 , we have that:

$$E = \lambda \sqrt{Y} \tag{11}$$

And taking natural logarithms: $\log_e E = \log_e \lambda + \frac{1}{2} \log_e Y$. Generalizing it, the final equation to be estimate for energy consumption is:

$$\log_e E = \gamma_0 + \gamma_1 \log_e Y + \varepsilon \tag{12}$$

where E is the effective energy consumption and Y the nominal income or GDP at current prices. The term γ_0 must collect the rest of the explanatory variables including the intercept parameter and climatic variables. Another econometric specification may come from the breakdown of nominal income into its two components:

$$\log_e E = \gamma_0 + \eta_1 \log_e y + \eta_2 \log_e P + \varepsilon \tag{13}$$

where y is now the real income or GDP at constant prices. If the period for the forecast horizon were longer it would have to resort to growth models. By assuming that the growth model were neoclassical and suppsing that energy is a cumulative factor without depreciation rate, then at the steady state we will have that:

$$E = \left(\frac{s}{n+g}\right) y \tag{14}$$

being y the real income, s the saving rate, n the population growth rate and g the technology growth rate.

Suppose now that a percentage of the contaminant emissions (Em) are coming from energy consumption (E); then: $Em = \rho E^\theta$, where ρ and θ are parameters. Taking natural logarithms we have: $\ln (Em) = \ln \rho + \theta \ln E$. Hence, we have found the following lognormal relationship between emissions (Em) and energy consumption (E):

$$\log_e (Em) = \vartheta_0 + \vartheta_1 \log_e E + \varepsilon \tag{15}$$

to estimate.

DATA AND EMPIRICAL RESULTS FOR EMISSION IMPACTS

From the World Bank, a series of estimates have been made relating energy consumption to nominal GDP, as well as the relationship between carbon dioxide emissions with the energy consumption. The ratio between emissions and energy consumption gives us a value that if it turns out to be greater than the ratio between energy consumption and GDP, would indicate a great use of fossil fuels and great emissions that would affect proper cities and even neighboring countries, affecting the health of the people exposed to these emissions. On the other hand, if the relationship between emissions and energy consumption turns out to be lower than the ratio between consumption and GDP, it would indicate that fossil fuels are being replaced by alternative and renewable or green energies without or small pollution.

Based on the model developed in section 2, an application has been made with data of the five BRICS countries in a period between 2000 and 2015, with annual data collected in the IEA and the World Bank. The equation that is applied as the first estimate is equation (12) that relates the consumption of energy with nominal GDP, that is, how much the nominal GDP consumption depends; then the equation (15) that relates the carbon dioxide emissions to the energy consumption is applied as a second estimate, that is, how much CO2 emissions depend on the energy consumption. The estimation of these both relationships are collected in Table 1 and Table 2. In the Table 1 the dependent variable is the total energy consumption by country, represented by E and the independent variable used is the natural logarithm of the nominal GDP of each country. We have compared with some economically and energetically emerging countries like Brazil or South Africa.

Table 1.- Estimation of the relation between energy consumption and GDP (2000-2015)

	Brazil	Russia	India	China	South Africa
Dependent variable: ln(E)					
Intercept	10824.3 (1.21)	349596.0 (9.71)	166459.0 (9.74)	517456.0 (3.99)	24764.8 (6.32)
ln GDP	91.64 (20.40)	58.72 (2.37)	181.51 (16.74)	162.36 (7.27)	118.89 (10.63)
Tests					
R2-adj.	0.99	0.60	0.98	0.94	0.97
DW	2.02	2.52	3.31	1.99	3.40

t-ratios in brackets

Source: own elaboration

In the estimation collected in Table 2, the dependent variable is the total emissions per country, represented by Em and the independent variable used is the energy consumption, represented by E .

Table 2.- Estimation of the relation between emissions and energy consumption (2000-2015)

	Brazil	Russia	India	China	South Africa
Dependent variable: ln(Em)					
Intercept	- 26.80 (- 0.31)	1497.85 (1877.26)	- 552.88 (- 8.34)	- 956.88 (- 2.39)	- 156.96 (- 1.55)
ln E	0.0020702 (4.53)	0.0000053 (2.88)	0.0045554 (30.66)	0.0053263 (18.99)	0.0080303 (5.27)
Tests					
R2-adj.	0.86	0.70	0.99	0.99	0.89
DW	2.22	2.72	2.80	2.29	2.00

t-ratios in brackets
Source: own elaboration

In these two regressions, the estimated parameters of the coefficients for lnGDP and lnE mind respectively the elasticity of the energy consumption (E) respect to the GDP, and the elasticity of the emissions with respect to energy consumption. That is respectively:

$\frac{\partial \ln E}{\partial \ln Y} = \frac{\Delta E/E}{\Delta Y/Y} = \varepsilon_{E,Y}$, and $\frac{\partial \ln(Em)}{\partial \ln E} = \frac{\Delta Em/Em}{\Delta E/E} = \varepsilon_{Em,E}$ The product of $\varepsilon_{E,Y}$ by $\varepsilon_{Em,E}$ is equal to $\frac{\Delta Em/Em}{\Delta Y/Y} = \varepsilon_{Em,Y}$. This allow us to compare the emission growth rate in relation to the nominal income and energy consumption growth rates. When comparing the growth rates it will be possible to observe what causes more number of emissions, whether the consumption of energy or the nominal product of economic activity. The values of the elasticity $\varepsilon_{Em,Y}$ for each country are: Brazil: 0.1897; Russia: 0.0003; India: 0.8259; China: 0.8638; South Africa: 0.9547. The values of the elasticity $\varepsilon_{Em,E}$ for each country are: Brazil: 0.0021; Russia: 0.000005; India: 0.0045; China: 0.0053; South Africa: 0.0080.

Table 3.- Estimation of the relation between elasticity $\varepsilon_{Em,Y}$ and elasticity $\varepsilon_{Em,E}$ (2000-2015)

	Brazil	Russia	India	China	South Africa
$\varepsilon_{Em,Y}$	0.1897	0.0003	0.8259	0.8638	0.9547
$\varepsilon_{Em,E}$	0.0021	0.000005	0.0045	0.0053	0.0080

Source: own elaboration

As we can observe in Table 3, the values of the elasticity $\varepsilon_{Em,Y}$ are greater than the values of $\varepsilon_{Em,E}$, indicating that the greater emissions come from the all production are more higher than of which coming from the consumption of energy. By countries, there is greater pollution by energy production in South Africa, followed by China, India, Brazil and Russia. In a much smaller proportion and by countries, there is a greater number of emissions per energy consumption in South Africa, followed by China, India, Brazil and Russia.

EFFECTS OF AIR POLLUTION ON CITIES

Air pollution has negative influences in the environment and in humans. Increasing the carbon dioxide concentration in the atmosphere (CO₂), because of different combustion processes of different materials, means that there is a greater absorption of infrared radiation escapes off the earth, which causes an increase in the atmosphere temperature and in the Earth's temperature, causing the ice caps to melt and a greenhouse effect. Acid rain, destruction of the ozone layer and smog are problems associated with air pollution. But it is at the local level where pollution control is important, especially to the people. It is important to know the standard values of air quality.

Dust, fiber, soot, fumes, mist, fog, haze and smog (the union of both the smoke haze and photochemical due to solar radiation), load the environment so that these particles greater or lesser degree affecting not only the health of individuals, but also the visibility and environmental degradation.

The CO₂ in natural proportions is not harmful, but as mentioned above, as a result of the combustion of fossil fuels, the concentration in the atmosphere is increasing, become a pollutant greenhouse gas. Other pollutants that directly affect health are: i) Carbon monoxide (CO), mainly associated with traffic and the effect on man is the interference of oxygen transport in the blood, causing intoxication and whose symptoms are drowsiness, headache, fatigue, dysfunction in the central nervous system, heart and lung, followed by coma, respiratory failure and ultimately death; ii) Sulphur dioxide (SO₂), associated with the combustion of coal and petroleum products. The effect in man focuses on respiratory and whose symptoms are irritation of nose and throat, runny nose, breathing problems, pulmonary edema and death; iii) Nitrogen oxides (NO_x), associated with the combustion of fossil fuels, with the effect in humans reducing blood oxygen transport to a lesser extent than the CO and inflammation of lung tissue; iv) Suspended particles, called aerosols, are particles depending on their size can be inhaled (deleted by mucus) or respirable. It influences the formation of sulfurous smog; v) Hydrocarbons (CH_x), substances that contain only hydrogen and carbon and influences the formation of photochemical smog; vi) Lead (Pb), toxic element affecting the hematopoietic, nervous system and kidney.

The union of the concentration of pollutants in the atmosphere, the weather and the topographical conditions are the problem of air pollution, where we must pay attention to the source of the contaminant, to the proper contaminant and to the receptor of pollution when it is dispersed. All these affects the health of human beings, but also fossil fuels can be a source of conflict between neighboring countries and even between neighboring cities, due to contamination by toxic gas emissions to a less polluted area. Energy production, energy consumption, the PM10 pollution index, life expectancy, deaths from emissions, CO₂ emissions, to clean the environment and the relationship between population and area, are the main indicators to be treated in this paper.

We performed a study on megacities and countries ranging from the poorest to the richest in the world, considering that most populous places with small technology to less populated places with highest technology, also considering the area in km² of each city and country. Besides the countries which contains mega-cities, other countries that have been analyzed in this paper are: Saudi Arabia, Azerbaijan, Bahrain, Belgium, Brunei Darussalam, Canada, United Arab Emirates, Finland, Iceland, Kazakhstan, Kuwait, Luxembourg, Malaysia, Norway, Oman, Qatar, Singapore, Turkmenistan and Uzbekistan. The megacities studied are collected in Table 4.

Table 4.- Population of the agglomerations analysed

Agglomerations population	ordered by	Population (millions)	2015	Agglomerations ordered by population	Population (millions)	2015
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TOKYO-YOKOHAMA	37.126	TIANJIN	13.266
CHONGQUING	29.101	RIO JANEIRO	12.700
JAKARTA	28.019	LAHORE	12.500
GUANGZHOU	25.800	PARIS	11.940
SHANGHAI	25.700	KOLN-RUHR	11.215
SEOUL	25.600	CHENGDU	11.001
MEXICO	24.178	IZMIR	10.046
DELHI	23.500	NAGOYA	10.027
MUMBAI	22.376	WUHAN	10.020
KARACHI	22.100	HARBIN	9.874
NEW YORK	22.000	CHICAGO	9.800
METRO-MANILA	21.951	KINSHASA	9.518
BEIJING	21.900	LIMA	9.400
SAO PAULO	21.100	CHENNAI	9.182
CAIRO	20.384	BANGALURU	9.044
LOS ANGELES	18.100	BOGOTA	9.009
OSAKA-KOBE	17.550		
MOSKOW	17.000	MILAN	8.014
KOLKATA	15.835	JOHANNESBURG	7.900
DHAKA	15.414	HONG KONG	7.134
SHENZHEN	15.250	MADRID	6.600
LONDON	15.211	SINGAPORE	6.500
BANGKOK	14.566	TORONTO	5.900
BUENOS AIRES	14.300	SYDNEY	4.700
ISTANBUL	13.855	FRANKFURT	4.323
TEHRAN	13.500	AMSTERDAM-ROTT	3.004
LAGOS	13.400	ZURICH	1.470

Source: United Nations-Habitat and Price Waterhouse Cooper.

The indicators used in this paper for estimating the effects of pollution on health are those indicated below: i) POP / S: population density, is the ratio between the population and the urban area or country. A high value indicates a higher concentration of inhabitants per km², which leads to a mass per unit area and greater possibility of contamination per capita, especially in less developed or emerging countries, because they could use more dirty energy for consumption. Turn to be more exposed to contamination risk to health is higher, and increased risk of mortality. In fossil fuel producing countries, a high value indicates that although there is high technology, the level of contamination is high. The processes of production and distribution are the major cause of environmental emissions, followed by the transport and the use of energy industries, businesses, institutions and homes. In developed countries, a high value indicates a high technology and low emissions, as there are no industries that require combustion of fossil fuels. The crowds here are usually temporary, the most important being the risk of CO₂ emissions due to traffic. In Table 5 are listed some megacities with a high population density.

Table 5.- Megacities with high population density

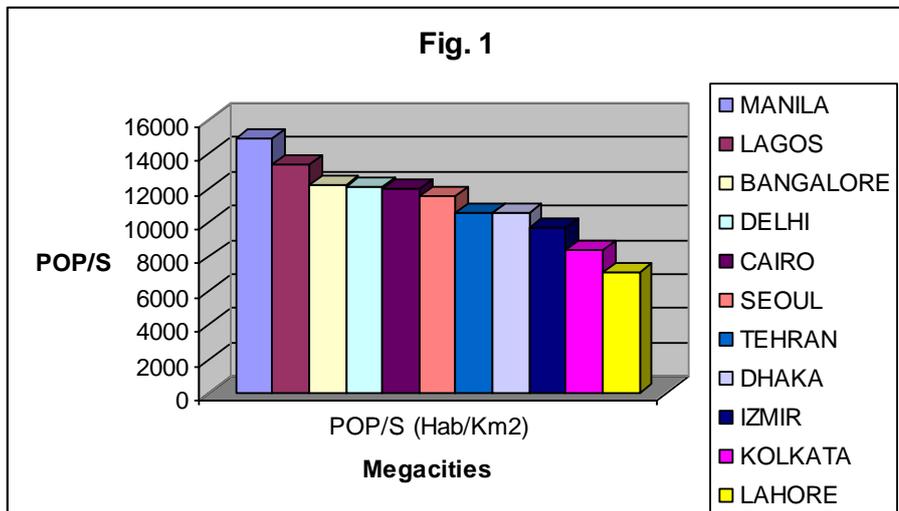
CITY	POP/S (Hab/Km ²)
MANILA*	14882,03
LAGOS*	13400,00
BANGALORE**	12205,13
DELHI*	12094,70
CAIRO**	11927,44
SEOUL***	11541,93
TEHRAN*	10596,54
DHAKA*	10535,88
IZMIR*	9706,28
KOLKATA*	8391,62
LAHORE*	7054,17

*Cities in development process; **Emerging Cities; ***Developed Cities

Source: World Bank Data

It is noted that in the case of Manila, Lagos, Delhi, Bangalore, Cairo, Dhaka or Tehran population density is very high, being between megacities and developed process emerging, fulfilling the first case. Seoul's case is peculiar, since there is high level of contamination, and a high concentration of inhabitants per km². (See Figure 1).

Figure 1. Megacities with high population density.



Source: own elaboration

This may be due to the use of other energy sources alternative such as nuclear, which employs about 18% of the total energy produced. Some megacities with low population density are below in Table 6 and Figure 2:

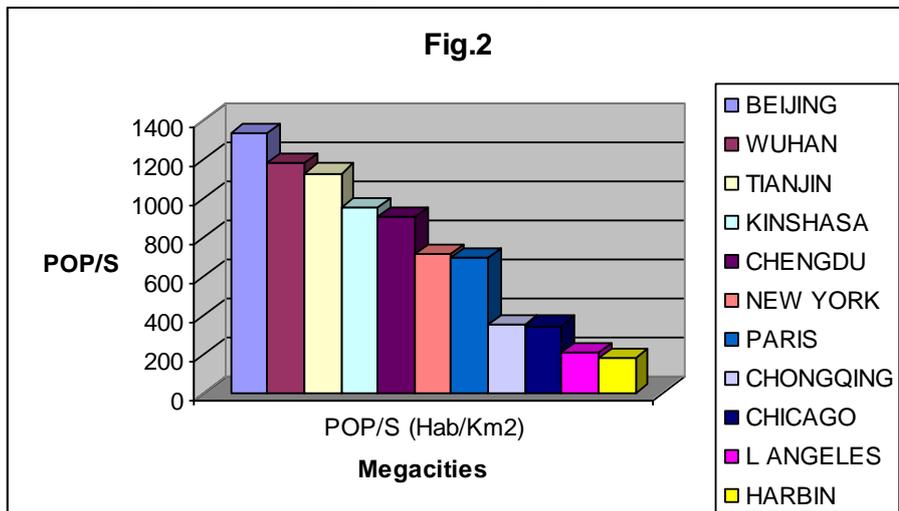
Table 6.- Megacities with low population density

CITY	POP/S (Hab/Km ²)
BEIJING***	1334,47
WUHAN**	1179,51
TIANJIN***	1128,06
KINSHASA*	955,14
CHENGDU**	906,77
NEW YORK****	717,31
PARIS****	695,23
CHONGQING**	353,15
CHICAGO****	348,50
L ANGELES****	206,88
HARBIN***	185,95

*Cities in development process; **Emerging Cities; ***Developed Cities; ****High Developed Cities

Source: World Bank Data

Figure 2. Megacities with low population density



Source: own elaboration

In this case, it appears that less-developed or emerging megacities have a very low population density, because they have a large area, despite having more than 9 million people. This does not indicate that pollutes less, but has much more surface to pollute. The most developed cities like Los Angeles, Chicago, Paris or New York, have a high tech and less pollution index, mainly due to traffic and some industries outside the urban core. Countries like Bangladesh, South Korea, India, Japan and Bahrain are overcrowded and cover all ranges of development. Conversely if you have a small population country like Iceland with 3.0 inhabitants per square kilometer, Canada with 3.3 Inh/Km², Oman, Norway, Finland and Brunei, all with a population density of less than 100 Inh/Km². ii) PM10, particulate matter, are small solid or liquid particles of dust, ashes, soot, metal particles, cement or pollen dispersed in the atmosphere. The PM10 includes values less than 10 microns (micrometers). The daily limit value for the protection of human health is 50 ug/m³ PM10 not to be

exceeded more than 7 times per year and the annual limit value for the protection of human health is 20 ug/m³. Megacities of further development are most close to the limit of PM10, which could be interpreted as the safest places for health and are indicated in the following table 7:

Table 7.- No air pollution Megacities

CITY	PM10
MOSCOW**	33
SAO PAULO*	38
PARIS***	38
B. AIRES**	38
NEW YORK***	21
L ANGELES***	25
LONDON***	29
KOLNRUHR**	23
TOKYO**	23
CHICAGO***	22
OSAKA**	27

*Emerging Cities; **Developed Cities; ***High Developed Cities

Source: World Bank Data

If the PM10 limit is exceeded, it may imply a less developed technology, being very harmful to health and, therefore, life expectancy will be lower. (See Table 8).

Table 8.- Air pollution Megacities

CITY	PM10
DHAKA*	134
LAGOS*	122
CAIRO**	138
KARACHI*	193
KOLKATA*	148
MUMBAI**	132
BEIJING***	121
DELHI**	198
LAHORE*	200
CHONGQING**	105
CHENGDU	111

*Cities in development process; **Emerging Cities; ***Developed Cities

Source: World Bank Data

For countries that have an index close to PM10 are Russia, Brazil, France, Argentina, USA, UK, Germany, Japan, Iceland, Finland, Norway, Belgium, Canada, Luxembourg and Malaysia. The highest PM10 countries are Pakistan, Bangladesh, Nigeria, Egypt, India, China, Saudi Arabia, UAE and Kuwait, this latter, associated with the production and distribution of fossil fuels.

CONCLUSIONS

We can conclude by saying that one of the most important reasons in the emissions of polluting gases is the total production of economic activity, above the consumption of energy. There is a commitment in the Asian countries to reduce the consumption of fossil fuels and to invest in renewable energies or even to recycle pollutants, converting them into heat or using other technologies to cleanse these pollutants. The main conclusions on the sources of conflicts are the energy dependence between neighbouring countries or cities, CO2 emissions to a neighbouring country or city, and the neighboring countries with different levels of development. As to the impact of emissions, the impact on health, especially in the respiratory tract and blood oxygen, the environmental impact and the emissions cause conflicts in neighbouring countries. Finally, on the solutions of conflicts, we must reach a compromise for reduce CO2 emissions, if possible, it is necessary to reduce fossil energy (coal and oil) using a convenient treatment in the production of recycling the gases expelled, the augment the use of renewable energy (non-dependence between countries).

BIBLIOGRAPHY

- Barreiro, F. (2006), *Determinantes espaciales del equilibrio económico*. Consejería de Economía e Innovación Tecnológica. Madrid. ISBN: 84-451-2884-1
- Brenner, N. (1998), "Global Cities, Global States: Global City Formation and State Territorial Restructuring in Contemporary Europe." *Review of International Political Economy* 5, pp.1-37.
- Contreras, A., and Molero, M. (2009), *Ciencia y Tecnología del Medioambiente*, UNED University Press. Madrid.
- Deaton, A., Muellbauer, J. (1980), "An almost ideal demand system", *American Economic Review*, 70 (3), 312-326.
- Friedmann, J. (1986), "City hypothesis", *Development and Change*, Vol. 17, pp.69-84.
- Friedmann, J. (1995), "Where We Stand: A Decade of World City Research.", In *World Cities in a World-System*, ed. Paul Knox and Peter Taylor. New York: Cambridge University Press.
- Geddes, P. (1915), *Cities in Evolution: an Introduction to the Town Planning Movement and to the Study of Civics*, ed., Williams & Norgate, London.
- Goldman Sachs (1999), *The Culture of Success*. Lisa Endlich. Little, Brown and Company.

- Hall, Peter. (1996). "The Global City." *International Social Science Journal* 48, pp.15-23
- Helm, D. (2013): *The Carbon Crunch*, ed., Yale University Press, New Haven. USA
- Heston A., Summers R., and B. Alten (2011), *Penn World Tables version 7.1*, PWT
- Price Waterhouse Cooper (2012), *Cities of the Future: Global Competition, Local Leadership*, PWC.
- Sassen, S. (2000), *Cities In A World Economy*, Thousand Oaks, California: Pine Forge Press.
- Sassen, S.(1991), *The Global City: New York, London, Tokyo*, Princeton, New Jersey: Princeton University Press.
- Sassen, S.(2001), *The Global City. New York, London, Tokyo*. Second Edition. Princeton University Press: Princeton and Oxford.
- Tester, J., E., Drake, M., Driscoll, M., Goyal and W., Peters. *Sustainable Energy*. MIT.
- Yeoh, B. (1999), "Global/Globalizing Cities." *Progress In Human Geography* 23, pp. 607-616.

SS19.4. Globalization and Regional Science

1360 EMPIRICAL ANALYSIS OF LOCATION CHOICE FOR JAPANESE MNFS IN EAST ASIA: THE CASES OF ELECTRONICS AND AUTOMOTIVE AUTOMOBILE INDUSTRIES

ABSTRACT

This paper conducted an empirical analysis using an NEG model to investigate the relationship between industrial agglomeration and overseas location choice for target Japanese MNF's' final and intermediate production sites from 1995 through 2009 in East Asia. In doing so, the researcher focused on three major Japanese industries: the Japanese food industry, which has a relatively high proportion of its business overseas in order to source agricultural products, natural resources, and other local resources; the global-type Japanese electrical/electronics industry; and the pyramid-type Japanese automotive industry. Then, the researcher divided the Japanese companies' production sites into those producing final goods and those producing intermediate goods, because of the vertical structure of coagglomeration and in view of the important role played by the intermediate goods sector, as set forth by Venables (1996). The results illustrate the following four points. The results showed the importance not only of the traditional location factors of the wage and infrastructure variables, but also of such variables based on the NEG model as market potential and domestic supplier access variables and Japanese industrial agglomeration variables, especially the Japanese horizontal industrial agglomeration and vertical industrial agglomeration variables.

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1406 SOCIO-ECONOMIC DEPRIVATIONS IN NORTH EAST INDIAN STATES

ABSTRACT

Deprivation is a condition of living below the majority of the population in a particular society. It restricts individual to satisfy their basic needs and hinders active social participation in the development process. Economic transformation, globalisation and privatisation are enhancing deprivations among human beings by increasing the incidences of spatial segregation, social polarisation and spatial inequalities. The present paper is an attempt to evaluate the general socio-economic condition of the North-Eastern States of India and to map the various areas of deprivation. An examination of various socio-economic factors is done to measure deprivations indirectly for the state at urban and rural levels. A set of 17 indicators are drawn from the Census of India 2011, representing the physical environment, socio-economic environment and distribution of opportunities and accessibility. Various statistical techniques like descriptive statistics and so on are used to analyse the data. An analysis of the gaps between best and worst-performing regions is also done to identify the intensity of deprivation across the states. Also, deprivation Index is devised to have a general representation of the importance of this phenomenon in the space using Z score. The Results are then mapped to have a visual illustration of the spatial distribution of the socio-economic deprivations. The politico-geographic region of North East is unique and diverse in terms of topography, natural resources, socio-economic and geographic characteristics making it stand apart from the rest of the country. This heterogeneous region, however, is relatively similar in terms of underdevelopment and deprivations. The region lags behind in most of the social, economic and human development parameters when compared to the rest of the country. Its isolation and poor connectivity, from the mainland; ethnic conflicts and insurgency further add to its backwardness. The region consists of less than 4 percent of the total population of India, but on the other end, it accounts for over 12 percent of India’s total tribal population. Except for Assam and Tripura, most of the North-Eastern states are mainly rural with a relatively low density of population but comparatively high population growth owing to the high influx of international migrants from Bangladesh and Myanmar. In the context of literacy, the regions seem to have done better compared to the national average. However, huge inter disparities exist between different states of North-East. Despite high literacy, the educational attainment levels are quite poor in the region with high drop-out levels and a wide gap between male and female literacy. The region is again quite poor in terms of housing and basic amenities. Most of the region shows great inadequacy with respect to toilet and sanitation facilities. Other facilities like electricity, clean drinking water, availability of electricity, LPC connections are again far from satisfactory. Moreover, massive inter disparities exist in the NER. The region is also lacking in adequate banking facilities, entertainment and communication facilities. The foregoing discussion brings to the fore the spatial variations in socio-economic deprivations in the Northeast region. The deprivation Index is a pointer to this effect.

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1535 ADEQUATE EMPLOYMENT AND MOBILITY OF DOCTORAL GRADUATES IN GERMANY

ABSTRACT

In the past decades numbers of granted doctoral degrees have increased rapidly in many OECD countries. This has raised concerns about potentially negative consequences of skill misallocation in the labor market. In this paper we report first results from a large-scale record matching project that links data on all doctoral dissertations completed in Germany with social security records providing detailed information about individual career trajectories. This approach allows us to reconstruct the non-academic careers of doctoral graduates for different fields and gender over a 10-year period after graduation. We find that a substantial share of doctoral graduates are overeducated for their positions. There is considerable variation in outcomes across fields. In addition, while few doctoral graduates are unemployed, less than 60 per cent of the female doctorate holders are in full-time employment ten years after graduation, and those who are have a lower likelihood of obtaining a high income. Those doctoral graduates who leave the university region after degree awarded are more likely to find a job that matches their academic skills. In addition, the results show that the regional environment determines the probability of adequate employment among doctoral graduates at earlier and later stages of their careers. In this respect, the degree of agglomeration, and the regional economic conditions (e.g., unemployment rate) play a decisive role.

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SS19.5. Globalization and Regional Science

1544 TESTING THE ROBUSTNESS OF TRADE AND FOREIGN DIRECT INVESTMENT BARRIERS IN GRAVITY MODELS

ABSTRACT

This paper tests the robustness of the various types of trade and investment barriers identified in the literature. Taking advantage of a large number of datasets, the paper provides a comprehensive analysis of the gravity literature on trade and FDI. We use multiple dimensions of distance, including cultural distance, institutional quality, costs of importing and exporting and political stability of both country of origin and destination. The paper assesses multiple dimensions of robustness: not only the sign and significance of coefficient estimates, but also the variation in the magnitude of the estimated effects by using response surface analyses. Preliminary results show that cultural distance, and the dummy variables for colony and a shared religion have a robust effect on FDI. The effect of cultural distance on FDI is negative and statistically significant in over 95 per cent of the regressions. This confirms that cultural distance is an important barrier to FDI. As for trade, we find that, within the overall barrier consisting of contracting costs and insecurity, only cultural aspects have a robust effect. Institutions, whether level or distance, do not appear to matter. Interestingly, we find that preferential trade agreements or common trade blocs have a robust, negative effect on FDI. The effect of the depth index for increasing integration is negative as well (though not always statistically significant). So, where integration has a positive effect on trade, this is not the case for FDI. These results indicate that (deepening) integration does not raise FDI. Overall, one third of the variables we tested are robust for trade and only one fourth for FDI.

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1599 GLOBALIZATION AND WATER. THE DYNAMICS OF PRIVATIZATION IN THE RURAL DRINKING WATER SECTOR

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ABSTRACT

Semantics behind the Washington Consensus have given rise to free market shibboleths, which in tune with the neoliberal intellectual air, find market as a 'solution' to efficiently manage scarce resources. According to Scholte⁵²⁶, the analytical lynchpin for understanding social change in the contemporary world is provided by the intuitive concept of 'globalization' that renders the best entry point for such an enquiry. For the water sector, this has translated into a corporate theft of 'blue gold' – simply put, a process of commodification of water, meant to be an unfettered trade and sale of water within informal or formal institutional arrangements. Interestingly this has been possible courtesy the increasing mediation of public opinion by the State as well as the supra national institutions, backed by the advent of globalization, that has successfully woven the imagery of 'safe drinking water' as a precondition for healthy and standard living. The alarming imposition is that, its provision is not solely a State responsibility anymore, inviting newer players in the supply side of the drinking water sector.

Keywords: Globalisation, privatisation, water policies, safe drinking water, rural water sector

INTRODUCTION

The crux of the paradigmatic shift in the water sector policies is to be understood in the light of the broader economic thinking in the era of globalisation, allowing the primacy of the social sector provisioning to be replaced by a central focus on the 'markets'. This reinstates the changing role from 'welfare' to a 'neoliberal state' as neoliberalism emerged as a radical anti-Keynesian movement that sought to dismantle major Keynesian institutions and policies and viewed the former entity as a part of the 'problem' that should be subject to the neoliberal 'solution' (Kus, 2006)⁵²⁷. However, the narrative of this change unfolds under the initiative of the supra-national institutions advocating for the demand responsive approaches in water sector thereby packaging the water reforms as a sugar-coated welfare enhancing scheme. The seemingly neutral, technical policy provisions are in fact deeply political because they entail far-reaching redistributions of water and of water rights, water power and water based profits (Boelens and Zwartveen, 2005, 2010)⁵²⁸. The rational choice paradigm of neoliberalism clinging on to the language of efficiency, utility maximisation and private property rights intends to turn the 'backward' water delivery and management institutions into more efficient 'modern' ones drawing on its inspirations from the 'neoliberalist utopian dreams' to pave the way for an unequivocal celebration of market forces and private ownership. These are justified on grounds of looming water crisis and by constructing the 'new moral political project' of instillation of fear about health if one is not consuming 'safe water', delivered through prior treatment processes. The construction of the larger economic cum social imaginary resting on the ideas that scarcity hinders the economy's potential growth and more specifically in case of water – posing a threat for the very human existence, makes it convincing enough for the public to attest for the market mechanisms to be favoured, to operate at the earliest. Locally and practically this translate into efforts to build 'unconscious and uncritical habitual modes of thought of ordinary citizens, useful for the governing regime which is ruling the country on behalf of the domestic and corporate interests' (Sood & Baruah, 2017:1).

Bakker ⁵²⁹ identifies neoliberalism as a heterogenous and contested political project, consisting of an 'interaction of two processes of transformation- privatization and commercialization which are concerned with the reorganization of water allocation, with resources and assets that used to be publicly owned being made available for private ownership and for idle capital to invest in and speculate with'. Implicitly making water resources, land (for further ground water exploitation) and other services available to the market at 'very low or zero cost' and putting them to the centre of profitable use goes behind the very essence as well as the economics of Harvey's 'accumulation by dispossession' ⁵³⁰ that characterise 'water privatization' as part and parcel of such larger on-going processes of capitalist transformation. The utopian project thus skilfully etches out a theoretical design for the reorganisation of international capitalism or to re-establish the conditions for capital accumulation through economic deregulation as well as institutional devolution to create competitive markets, encashing on the 'scarcity' as an opportunity to enter the market or expand it for more surpluses. Moreover, the riveting fact is that despite the call for the withdrawal of the state in providing public utilities and services, the implicit idea of neoliberal governance is to use the state machinery for legal, administrative and social measures to facilitate private entrepreneurs and 'appropriate functioning of markets', making the deregulation associated with globalisation- a sort of re-regulation in its creation of new governing structures and discourses that

526Scholte, J.A.(2005). Globalization: A critical introduction. Palgrave Macmillan.

527Kus, B. (2006). Neoliberalism, institutional change and the welfare state: The case of Britain and France. *International Journal of Comparative Sociology*, 47(6), 488-525.

528Zwartveen, M., Roth, D., &Boelens, R. (2005). Water rights and legal Pluralism. *Liquid Relations: Contested water rights and legal complexity*, edited by Dik Roth, RutgerdBoelens and MargreetZwartveen, 254-268.

529Bakker, K. J. (2003). Apolitical ecology of water privatization. *Studies in political economy*, 70(1), 35-58.

530Accumulation by dispossession refers specifically to practices that operate and evolve through the violent expulsion of peasants through land privatization, the conversion of common property rights, the suppression of alternative and indigenous forms of production and consumption, and the appropriation of natural resources (Harvey, 2003)

sustain neoliberalism (Harvey, 2005: 19; 2007⁵³¹; Boelens and Zwartveen, 2010: 45⁵³², Peck and Tickell, 2002⁵³³; Castree, 2008⁵³⁴).

Understanding the dynamics of social change that is inevitably associated with the institutionalisation of these ideas brings to fore the conflicting interests of the irreconcilable economic classes which have their basis in the structure of the society. Using the dialectical method to interpret the superstructural manifestations of the structural contradictions, it is evident how these conflicts spell out in the water sector in terms of the tensions between the market forces and its players, that treat water as an economic good versus the consensus of viewing water as a basic human right when at the superstructural realm, commercialization of water supply across globe, posits the 'blue gold' as 'an increasingly vital component in the relentless quest of capital for new sources of accumulation', creating newer 'enclosure of the commons' - an objective of state policies (Swyngedouw, 2005: 87⁵³⁵; Luxemburg, 2003⁵³⁶).

Objectives: The paper aims to sketch out the dynamics of water privatization in the rural drinking water sector in India whereby it intends to introspect the various dimensions that have shaped up the interplay between State and Non-State actors regarding issues of provision of potable water for people. The objectives are –

- ✓ To trace the policy trajectory that provides the backdrop behind the emergence of private players in drinking water sector
- ✓ To review the changing role of the State associated with such developments
- ✓ To analyze rural water market scenario in India, primarily looking into the Water ATM business and Community Purifier Systems and locating them within a broader theoretical framework of understanding the logic of capital behind its operations

Research Question: What is the extent of privatization in the rural drinking water sector and how has its dynamics being shaped up in India?

Data Sources: The data on the status of access to drinking water sources have been obtained from-

1. *Format H4 (A) RWS coverage of Habitation in ODF Verified Villages, NRDWP, Miscellaneous Reports, 2016-2017*
2. *Table HH-6, Household by Main Source of Drinking Water and Location, Census House and House-listing Data, 2011*

Data on the private companies involved in the water purification business in rural areas have been compiled from various company websites while the three National Water policies of 1987, 2002 and 2012 have been referred to for the textual references on provisions.

Methodology: The paper intends to carry out an exploratory research on the topic based on the secondary information available over online sources like individual company websites, blogs, newspaper articles and reports that help in listing out the major players in the water sector in rural areas and the market operations in general. Since, drinking water in India is a part of the broader sub-head of 'Water Supply and Sanitation', some of the major policy documents in this field have been critically reviewed in relation to the national and international developments in the water sector to understand the subtle nuances in policy language that have often fuelled considerable changes in terms of State schemes and programs. Maps have been prepared to show the spatial correlation between the bases of the private water players if any with coverage status in the rural areas of those districts.

The feminist analytical framework for defining the changing role of the State and the dialectical method are used as lenses to carry out the analysis to understand the deeper logic of capital sculpting out the structural changes in the concerned sector.

1. A LOOK BACK AT THE POLICY LANDSCAPE

A look back at the international and national milestones and policies in the water sector, illustrates before us the journey unfolded so far and how brilliantly the policy texts have paved the way for the unravelling of privatization and advent of water markets even in case of rural drinking water.

Phase 1. Before 1987 : The early laws of the land

In case of hydraulic civilizations such as India, water rights have been mostly understood in terms of riparian rights since ancient times. These rights were primarily customary rights over water resources enjoyed by the communities and subject to mutual settlements. At the domestic level, colonial legislation first focused explicitly on the regulation of water for economic reasons, commercial interests; for instance, through the development of legislation concerning irrigation and navigation (Cullet, 2007: 1). Otherwise water law in India closely associated with the land policies. India Easements Act of 1882 granted 'every landowner with the right to collect and dispose, within his own limits, all water under the land and on the surface'. As a consequence of this law, owner of a piece of land has been allowed to dig wells and extract water based on availability and his discretion without any legal liability for any damage caused to water resources as a result

531Harvey D (2007) A Brief History of Neoliberalism. Oxford: Oxford University Press.

532Achterhuis, H., Boelens, R., &Zwartveen, M. (2010). Water property relations and modern policy regimes: neoliberal utopia and the disempowerment of collective action. Out of the Mainstream: Water Rights, Politics and Identity, London: Earthscan, 27-56.

533Peck, J., & Tickell, A. (1994). Jungle law breaks out: neoliberalism and global-local disorder. *Area*, 317-326

534Castree, N.(2008). Neoliberal singnature : the logics of deregulation and reregulation. *Environment and Planning A*, 40(1),131-152.

535Swyngedouw, E. (2005). Dispossessing H2O: The contested terrain of water privatization. *Capitalism Nature Socialism*, 16(1), 81-98.

536Luxemburg, R. (2003). The accumulation of capital. Routledge

of over-extraction. Interestingly, the focus on drinking water in India comes much later in the country, in the form of the Bhore Committee on hygiene which pointed out that causes behind the low status of health in India was primarily because (among other reasons), **totally inadequate provision of protected water supply and drainage, recommending the safe supply of water to cover 90% of India's population in a time frame of 40 years**, ie. by 1989 (Bhore Committee Report, 1946 : 11) In the absence of any comprehensive water law in the colonial phase, the state could only exert its explicit control in the post independence era, following the **declaration of water as a State subject** (Entry 17 of List II ie. State List, 7th Schedule) under Article 246 of the Indian Constitution in 1950. The Constitution also mandated through Article 47, conferring the duty to the State to provide safe drinking water in order to raise the standard of living in the country and improve public health conditions. Thus the focus on drinking water supply was more of a ramification of the alarming concern on 'hygiene' borne out of the escalating morbidity, mortality rates in the country. The post Independence era saw the translations of the then relevant nation building perspectives backed by Nehruvian socialist, nationalist ideals in the structure and design of welfare and development projects undertaken by the State (**National Rural Drinking Water Supply program of 1969, Accelerated Rural Drinking Water Supply Programme of 1972-73, Minimum Needs Programme** etc.)

Rationale behind the inception of NWP

The need for national water policies was raised in the **Mar del Plata Action Plan** (following the United Nations Water Conference, held in Mar del Plata, Argentina in March 14-25, 1977) which made sure, there is a commitment on behalf of the national governments to '*provide all people with water of safe quality and adequate quantity and basic sanitary facilities by 1990, according priority to the poor and less privileged and to water scarce areas*' while Part B of the recommendations for action, framed provisions for each country to establish '*goals for 1990 which match as far as possible the global targets*'.

During the 1960s and 1970s, international and national efforts focused on the achievement of coverage figures (Nicol, 2000) with a **strong footing on qualitative assessment of water meant for provision**, bringing to the fore, a comprehensive lens of viewing water supply issues along with sanitation facilities. Although, it was long back in 1954 that Water Supply and Sanitation were brought under the purview of the Central Public Health and Engineering Organization (CPHEO) of the Ministry of Works and Housing, Government of India, '**Rural Sanitation Programme**' in India had been receiving consistent attention ever since the formulation of the **Centrally Sponsored Rural Sanitation Programme (CRSP)** in 1986 and subsequent inclusion of Rural Sanitation in the **Minimum Needs programme (MNP)** in 1987. These were given a series of institutional backing through the setting up of a multi-donor partnership programme called Water and Sanitation Programme (WSP) launched by UNDP and World Bank in 1978, the WHO Guidelines on the Drinking Water Quality, 1983-'84, 1st Edition, nationally - the establishment of a separate Department of Drinking Water Supply in 1980 and **National Drinking Water Mission** in 1986 under the MoRD and most importantly, in compliance with the spirit imbibed by the proclamation of the **International Drinking Water Supply and Sanitation Decade between 1980-1991**⁵³⁷, during which '*member states would assume a commitment to bring about a substantial improvement in the standards and levels of services in drinking water supply and sanitation by the year 1990*'. This decade coincided with the 6th and 7th FYP (1980-'85, 1985-'90) in India and led to the formulation of a 'common set of technical guidelines for the rural drinking water sector, established nationally and applied across different state governments in the early 1970s' (Joshi, 2002). The nuances in language of technical guidelines (Joshi, 2004: 8), underpinned the state's increasing priorities towards **quality provisions than quantity concerns**. These were –

- **Complete coverage for all no-source problem villages and partially covered villages**
- **Water supply to be provided within the stipulated norms of 40 lpcd within a maximum distance of 1.6km or at an elevation of 100m in the hilly regions.**
- **Priority of safe water provision where the existing supply sources exhibit health- harming characteristics.**

1987 : Formulation of the National Water Policy

The National Water Policy (NWP) adopted in September 1987 recognised water as a '**basic human need; a precious national asset and one of the most crucial elements in development planning**' (1.1, 1.8, NWP, 1987), something that is repeatedly acknowledged in the national policy documents to follow. The stress on the need for an integrated and environmentally sound management approach in the planning, development and conservation of a '**scarce**' resource like water to cater to the increasing **demands** from rural society made the economic thinking behind it more evident. Interestingly, keeping a separate sub-section on '**water rates**', the policy called for the promotion of **conservation awareness** about the '**efficient utilisation**' of the '**scarce resource**' through '**education, regulation, incentives and disincentives**' and imposition of **water rates for surface and ground water, 'adequate to cover the annual maintenance and operation charges and a part of the fixed costs'** (although that should be '**rationalized with due regard to the interests of small and marginal farmers**') (11. Water Rates; 15. Conservation of Water; 21. Conclusion, NWP, 1987)

Phase 2. Between 1987 and the Revision of Policy in 2002

Pushing the slogan '**Some For All Rather Than More For Some**', the 1990 Global Consultation on safe Water and sanitation, New Delhi Statement preceded the ill famous Dublin Statement of 1992 and was significant for heralding the

⁵³⁷As per the General Assembly Resolution 34/191 of 18th December 1979 and Resolution 25, entitled International Drinking Water Supply and Sanitation Decade, 39th July 1980 adopted by World Conference of the United Nations Decade for Women: Equality, Development and Peace.

ideological battle regarding the role of the State as it provisioned the Government's roles to become that of **'promoters and facilitators'** reasserting the failures of the supply-led approaches of Government programmes of 1980s, as it highlighted the need for a focus on education, training, social mobilisation, **decentralisation of service delivery and community involvements**.

Changing Perspectives: Right to Water – recognition in India

Economic liberalisation marks the year 1991 as the milestone in India's economic history for the reforms initiated thereafter. But for the water sector in India, 1991 marked a different milestone altogether as the then existing legal framework concerning water got complemented by a human rights dimension with Supreme Court recognizing that, **right to life 'includes the right of enjoyment of pollution free water and air for full enjoyment of life'**, implied in Article 21 (right to life) as per *Subhash Kumar v. State of Bihar, 1991*. A watershed in the history of evolution of global water policies has been the **Dublin Statement on Water and Sustainable Development**, issued by the **International Conference on Water and the Environment** (IWCE, held in Dublin, Ireland on 26-31st January 1992) that created major fault lines in policy trajectories so far. Principles 1-3 recognised the **'vulnerability'** and **'finite'** nature of fresh water as a resource whose management requires a participatory approach involving *'users, planners, policy makers at all levels'*. However, these were far outweighed by the impact generated by its **fourth principle** acknowledging that **'water has an economic value in all its competing uses and should be recognized as an economic good'**. The argument put forward vouched for a clear cut deviation from the role assigned to the State so far, dictating a trade off for one's basic right - to have access to clean water and sanitation at an affordable price, for achieving efficient and equitable use, encouraging conservation and protection of water resources and the fact that **'past failure to recognize the economic value of water has led to wasteful and environmentally damaging uses of the resource'**. Winpenny (1994: 18) argued that this new approach to valuation would increase water supply coverage and **encourage private investment as 'low prices depress the profitability of investment in the water sector'**. World Bank and later the Washington Consensus encashed upon the economic valuation of the resource which was eventually to become the core of the emerging consensus and changing paradigm of viewing water (or other environmental resources per se) as an 'economic good', whereby State's role was expected to shrink with the advent of free-market capitalism, legitimising the commoditisation of resources and justifying scope for its privatisation (Finger and Allouche, 2002 ; Mehta, 2010). The Dublin Principle on water as an economic good, Phillip Cullet⁵³⁸ argues, has been the single most important change to water policy, leading to a **focus on demand management and increases in water use efficiency**, for such **economic connotations usually privilege certain types of meaning and beliefs** into cultural and public good aspects that makes it easier to defend the massive gap in access to water supply and sanitation that has persisted till today.

Millennium Declaration – Foundation stone for the future developments goals

Building upon the events like Earth Summit, 1992 (Rio de Janeiro), the First World Water Forum of 1997, followed by the Marrakech Declaration in 1997, 1999- Protocol on Water & Health, United Nations General Assembly adopted the [United Nations Millennium Declaration at the UN Millennium Summit \(Resolution A/res/55/2\)](#) in New York, 2000, which set out the future developmental pillars in the form of 8 [Millennium Development Goals \(MDGs\)](#). With respect to access to drinking water and sanitation, through the set target 7.C of the MDGs, States committed themselves to *"halving, by 2015, the proportion of people without sustainable access to safe drinking water"*, thereby laying the international policy and service level benchmark for the countries worldwide. By the Johannesburg Targets adopted at the 2002 World Summit on Sustainable Development, States committed themselves to the additional target of *"halving, by the year 2015, the proportion of people who do not have access to basic sanitation."* An important event in the global arena concerning water, took place in November 2002 -- with the adoption of the **General Comment No.15, on the 'Right to Water' by the Committee on Economic, Social and Cultural Rights (CESCR)**, presenting a continuum between the provisions formulated in human rights language and other provisions formulated in a regulatory language.

Article 1.1 stated that –

"The human right to water is indispensable for leading a life in human dignity; a prerequisite for the realisation of other human rights".

Comment No.15 also defined 'right to water' as the **right of everyone, to sufficient, safe, acceptable and physically accessible and affordable** water for personal and domestic uses.

Phase 3. Need for a Revision: NWP, 2002 and the period till 2012

A review of the 1987 policy was initiated with the publication of a revised National Water Policy-2002, which in line with the developments made at the larger international level *'underscored the need for the utmost efficiency in water utilisation and a public awareness of the importance of its conservation'*, given the inevitable increase in *'demands for water for diverse purposes'*, due to expansion of growth and economic activities in the period concerned, bearing the potential threat to make a scarce resource like water *'even scarcer in future'* (1.7, NWP,2002). Stress was also laid on the need to monitor quality of water, maintenance of water resources, specially the physical and financial sustainability of existing facilities, to bring about *improvements in existing technologies, innovation of new technology base* resting on science and technical training through a *'multi-sectoral, multi-disciplinary and participatory approach'*. Taking cue from the earlier version of

538Cullet, P. (2007). Water law in India: overview of existing framework and proposed reforms. Geneva: International Environmental Law Research Centre.

NWP, the World Bank recommendations of its 1998 review, the policy of 2002 extended the argument for '*a need to ensure that the **water charges for various uses should be fixed in such a way that they cover at least the operation and maintenance charges of providing the service initially and a part of the capital costs subsequently***' and as a **major digression from its welfare approach**, encouraged **wherever feasible, various combinations of 'private sector participation in planning, development and management of water resources projects'** promoting their potential in '*introducing innovative ideas, generating financial resources and introducing corporate management and improving service efficiency and accountability to users*'.(11. *Financial and Physical Sustainability*; 13. *Private Sector Participation, NWP, 2002*).

In various aspects, the 2002 policy reflected the provisions made by the 73rd and 74th Constitutional Amendment Act to **decentralise power** and pave way for **local governance** in rural and urban areas by **involving Water Users' Associations, local bodies such as municipalities and gram panchayats** (12. *Participatory Approach to Water Resources Management, NWP, 2002*). But the exposition of utmost importance, carrying the impressions of the predominant shift in policy legacy during that phase, is interpreted from clause 22, stating '*there is an **urgent need of paradigm shift in the emphasis in the management of water resources sector; from the present emphasis on the creation and expansion of water resources infrastructures for diverse uses, to the need to give greater emphasis on the improvement of the performance of the existing water resources facilities***' and the 'optimal, economical and equitable use' of the resource, bearing its implications on the changing priorities of allocation of funds and in outlining the guidelines to improve the performance of this sector. To conclude, the policy mandates the **formulation of a State Water Policy**, backed with an operational action plan within two years, also sanctioning provisions for the periodic revision of National Water Policy '*as and when need arises*'.

The Swajal project of 1996, **piloted by World Bank in UP as a Sector Reform Programme in 67 districts across 26 states** was scaled to the **Swajaldhara Programme, initiated on 25th December, 2002**, that emphasized the need for taking up of community based rural water supply programs and initiate reform initiatives in rural drinking water sector, upholding the principles of '**decentralisation and participation**' as mandated by the 73rd Constitutional Amendment Act, reflecting the market ideals as promoted by the World Bank. The Swajaldhara guidelines also suggested that water users have to take up partial responsibility for the capital cost of new drinking water infrastructure and full responsibility for operation and maintenance, **reinforcing the notion that water is an economic good and that all water services must be based on the principle of (full) cost-recovery**. This was a **demand-driven**, integrated approach to rural water supply and sanitation requiring partial (10%) capital cost recovery and 100% O&M financing by users. The guidelines meant to foster a **change in the role of the government from direct service delivery to that of facilitating activities**, largely undertaken by people themselves, proposing the **progressive withdrawal of the state** from the provision of the fundamental right to drinking water.

The stress on water quality, the emphasis on the need to provide 'safe drinking water' through technology based water treatment plants and the projection of water-related services as determined by economic principles continued at the international front with the **Bonn Charter for Safe Drinking Water, framed by the International Water Association in September 2004**, assigning the goal to provide '*good, safe water which has the trust of consumers*', the publication of the **WHO Revised Guidelines for Drinking Water Quality, 3rd Edition** revising its earlier guidelines to focus on the prevention of microbial and chemical contamination of drinking water supplies through the **use of a comprehensive risk assessment and risk management approach that encompasses all steps in water supply from catchment to consumers, called Water safety plans (WSPs)**.

'Water for life' Decade

With a goal to promote efforts to fulfil 'long term sustainable international commitments' (Millennium Declaration, the Johannesburg Plan of Implementation of the World Summit for Sustainable Development and Agenda 21) made on water and water-related issues, 'in terms of both quantity and quality and measures to improve sanitation', by 2015, the United Nations General Assembly in December 2003, proclaimed as per the General Assembly [Resolution A/RES/58/217](#), the period 2005-2015 as the '**International Decade for Action 'Water for Life'**⁵³⁹. The decade also saw the recognition of the '**right to clean water services**' the UN General Assembly Resolution (Resolution 64/292) on the '**Right to Water and Sanitation**' on July 28th, 2010 explicitly recognising the '**human right to water and sanitation**', acknowledging that '**clean drinking water and sanitation are essential for the realisation of all other human rights**' -- all of which provided the legal basis of rights through the decadal developments of right to water and sanitation in the field of international human rights and humanitarian law.

In the Indian context, the decade witnessed the launching of the **National Rural Drinking Water Quality Monitoring and Surveillance Programme** in February 2006, envisaging institutionalisation of community participation for monitoring and surveillance of drinking water sources at the grassroots level by Gram Panchayats and Village Water and Sanitation Committees, followed by checking the positively tested samples at the district and state level laboratories; followed by the upgradation of the former ARWSP to NRDWP (National Rural Drinking Water Program that brought under it all rural submissions. In 2010, Department of Drinking water and Sanitation was set up and the NRDWP operationalised as per the Strategic Plan 2010-2022, ensuring that '*all citizens living in rural areas have access to safe,*

⁵³⁹Resolution adopted by the General Assembly on 23rd Dec 2003, Fifty-Eighth session, Agenda Item-95, [on the report of the Second Committee (A/58/485)] 58/217. International Decade for Action, "Water for Life", 2005-2015

clean water for drinking, cooking, and other domestic needs with the intention of eventually providing piped water to every rural household.'

Phase 4. National Water Policy 2012 and beyond

On June 7, 2012, the Ministry of Water Resources published its Draft National Water Policy 2012 (NWP) seeking to address issues such as the scarcity of water, inequities in its distribution and the lack of a unified perspective in planning, management and use of water resources which was adopted by the National Water Resources Council on August 9, 2012.

The Preamble to the policy and its draft, brought to fore the '**low public consciousness about the overall scarcity and economic value of water results in its wastage and inefficient use**', asserting that the '*objective of the National Water Policy is to take cognizance of the existing situation, to propose a framework for creation of a system of laws and institutions and for a plan of action with a unified national perspective*'. It pointed out that the '**principle of equity and social justice must inform use and allocation of water**' which needs to be managed as a '**common pool community resource held, by the state, under public trust doctrine to achieve food security, support livelihood, and ensure equitable and sustainable development for all**' - clauses that draw the background behind the provisions outlined by the Acts of 2013 and 2016.

National Water Law and Draft national Water Framework Bill, 2013, GOI, MoWR

In the spirit of the precedence set by the European Water Framework Directive of 2000, the South African National Water Act of 1998 and so on, this law incorporates all major legal pronouncements by the Supreme Court with reference to water such as the **Public Trust Doctrine** and the recognition of the **right to water, the principle of subsidiarity** as explicated in the 73rd and 74th Constitutional amendments. Formally defined to be a '*bill based on the emphasis laid by the National Water Policy (2012), adopted by the National Water Resources Council on the need to evolve a National Framework Law it recognizes water as a limited natural resource that has to be protected and preserved for generations*' through '*continuous and cohesive action*', translating into the Act of 2013. It unambiguously lists down the definitions pertaining to water resources sector including terms that are often come across in water resources management literature and specifically in the national water policy documents like -'common pool resources', 'community-based institutions', 'corporatisation', 'livelihood', 'pre-emptive needs', 'participatory management', 'principle of differential pricing', 'privatisation', 'public trust' etc. [2. Definitions.(iv), (v), (vi), (xiii), (xviii), (xix), (xxii), (xxiii), (xxiv), Draft National Water framework Bill, 2013].

Interestingly, on one hand it identifies water as a '**common pool resource of the community and shall be managed, protected and preserved as such by community based institutions**', held by the state as a trustee for the benefit of all '**in public trust for the people**', obliging it to '*protect water resources*' and affirming that this responsibility to the state as public trustee '**shall remain even if some of the functions of the state in relation to water are entrusted to any public or private agency**' [Clauses (4),(5), Chapter II, Basic Principles for Water Management]. On the other, the Act prioritises allocation of water for the drinking water and sanitation, food security, as livelihood-support for the poor, exempting it from the '*principle of differential pricing*' while making sure that for other uses, '*water shall increasingly be subjected to allocation and pricing on economic principles to ensure its development costs, efficient use and reward conservation*' with prior '*consultation with all stakeholders*', through '*independent statutory Water Regulatory Authority, set up by each State*' [Clause(6), Chapter II, Basic Principles for Water Management].

Legitimising the basic rights to water, the Act avers that '*every individual has a right to a minimum quantity of potable water for essential health and hygiene and within easy reach of the household*' which '*shall not be less than 25 litres per capita per day*', complying with the quality standards set by the Government and '**despite corporatisation or privatisation of water services shall remain the State's responsibility to ensure the people's right to water**'. [Clause 4.(1) and (3), Right to Water, Chapter III, Rights to Water, Preservation of Water Quality and Water Pricing, Draft National Water Framework bill, 2013]. The concept of determination of water charges on a '**volumetric basis, reviewed periodically to meet equity, efficiency and economic principles**' based on the '*principle of differential pricing*', compulsion to '*ensure conformance to the Service Level Benchmarks for water supply, sanitation and the practice of regular water audits to sensitize communities for reduction of nonrevenue water*' are also notified in the Act. [Clause (6). Water Pricing,; Clause 13.(1),(2 and (3), Urban Water Management, Chapter III, Rights to Water, Preservation of Water Quality and Water Pricing, Draft National Water Framework bill, 2013].

Draft National Water Framework Bill, 2016

A revision to the earlier 2013 Act, the National Water Framework Act, 2016 adds on to the previous set of directives of 2013, new definitions like 'full cost recovery pricing', 'water footprint', 'water for life' [2. Definitions.(i), (z).(aa), Chapter I. Preliminary, Draft National Water framework Bill, 2016] and the terms of pricing whereby '*water as a part of water for life as defined herein, shall not be denied to anyone on the ground of inability to pay*' [Clause 22.1.(a) Water Pricing and Water Regulators Chapter V. Planning for Water Security, Draft National Water framework Bill, 2016]. Acknowledging its commitment to the United Nations Sustainable Development Goals to be attained by 2030, it conceives the '**Right to Water for Life**' for every person, regardless of, among others, caste, creed, religion, community, class, gender, age, disability, economic status, land ownership and place of residence complying with the standards set by '*The Manual of the Central Public Health and Environmental Engineering Organization, Bureau of Indian Standards specifications or standards adopted by the appropriate government as modified or revised from time to time*' [3. Right to Water for Life, Clause.3.(1), (2). Chapter I. Preliminary, Draft National Water framework Bill, 2016]. Insisting for the **convergence of all**

water sector schemes (14,), it advocates for the preparation of '**Water Security Plans**' at the '*lowest possible administrative level*' that would be '*valid for a period of five years*'. [Clause 14, Chapter III Basic Principles, Clause.15, (2), Chapter V : Planning for Water Security, Draft National Water framework Bill, 2016] and the '**conservation, protection, regulation and management**' of groundwater as per the '**Model Bill for the Conservation, Protection, Regulation and Management of Groundwater, 2016**' [Clause 18, Chapter V : Planning for Water Security, Draft National Water framework Bill, 2016].

2015 marked the initiation of the era of sustainable development as per the UN Agenda for Sustainable Development (2016-2030) held on 25th September 2015, listing out 17 goals to be achieved by 2030. Goal 6 of the 17 SDGs stated that by 2030, universal and equitable access to safe and affordable drinking water for all needs to be achieved. The SDGs, together with the provisions of Paris Climate Change Conference have led to the UN Water GLAAS, 2017 (Global Assessment of Sanitation and Drinking Water) and the UN General Assembly Resolution for the **Proclamation of International Decade for Action, "Water for Sustainable Development (2018-2028)"**, promising further developments in the water sector.

2. CRITICAL POLICY REVIEW: CHANGING ROLE OF THE STATE AND A FEMINIST ANALYTICAL FRAMEWORK

Besides stage-crafting 'water' as an economic good, water reforms through policy reversals have implied an important shift in terms of the rights of control over and access to water, recasting the perspectives of looking at water from a public trust thing to the introduction of water rights and the possibility to trade water entitlements. The novelty introduced by the reforms is that water rights are now created in favour of water users (Cullet, 2007:7) expediting the trading process of the entitlements. Endorsements for decentralisation in decision-making to the lowest level and participation of 'all stakeholders' have been based on the crafted as well as perceived inability of the state to deliver appropriate services, thus proclaiming the role of the state from that of a 'service provider' to that of a 'regulator'. The other attributes added on to water through such characterisation is that its services should be based on the principle of (full) cost-recovery, making water users pay at least for the operation and maintenance charges linked to the 'supply' of water - seen by the Asian Development Bank as the first instrument for conserving water ⁵⁴⁰. Tracing back the role of the state in this entire policy spectrum, it is seen that in the initial years after independence, the state was a dominant entity in rendering the social sector services to the people. Skocpol calls this 'explanatory centrality of the states as potent and autonomous organisational actors', whereby 'impulses shaping the major policies and actions within the state' were thought to be outcomes of what Miliband calls the state's conception of national interest, as a trustee of nation's normative aspirations. Sudipta Kaviraj describes this phase as the ideational revolution within the Indian State that carried with it significant transformatory potential (Kaviraj, 1997) but this was soon punctuated by exogenous shocks in the global water arena, that were harbingers of massive changes to follow. The critical juncture brought about substantial changes in policy ideas within the Indian State conforming to the then significant prescriptions of deregulation and globalisation in the liberalisation phase. The Eighth Five-Year Plan period thus forced the State to admit that 'under-performance of the rural water supply sector is likely to continue unless there is a fundamental reform of the service arrangements' and an explicit warning that the State will not be able to provide necessary expansion of services to a growing population' (GoI, 1997). In the same spirit, Swajaldhara guidelines were announced in December 2002 as 'non-negotiable reform principles, which supersede all earlier guidelines' (GoI, 2003) only to arrive at the Eleventh Plan (2007-2012) where despite acknowledging the basic right to water, approach to pricing water was further highlighted. The emphasis now was on flexible cost sharing arrangements between the Centre, State, and Local Governments, Markets and User Communities. In the years to follow, the Governments at the Centre have taken up the projects like JNNURM, Swachh Bharat Mission that have created backdoor favouring of corporate entities to run business encashing on the country-wide reforms drive. Be it the coalition or right at the Centre, the State slowly has got into the role, similar to Poulantzas's Neo-Marxian view of defining the State as a 'relatively autonomous entity', enjoying its autonomy from the dominant economic class even though it acts on behalf of it, safeguarding its interests.

Table elaborating the changing role of the state by contrasting the policy features of the supply driven approach and the demand- driven approach.

⁵⁴⁰ Section 37 and Section E, Asian Development Bank, Water for All – The Water Policy of the Asian Development Bank (2003).

Criteria	Supply-driven approach	Sector Reform Programme
Central role	Government	People/users/clients
Goal	Coverage	Process, Demand-based
Basis for service	Water a welfare good to be provided free of cost	Water a social and economic good demonstrated by willingness to pay
Role of government	Provider	Promoter
Role for people	Recipient	Manager
Role for women	Low	High
Actors	State monopoly	Users, Panchayats, NGO, state and private sector
Partnership scope	Low	High
Capital contribution	100% Government (50/50 state and Gol)	10% community contribution
O&M	State	Users
Level of management	State	Users – habitation level
Dependence on government	High	Low
Source protection	No clauses	Integral part of programme
Political patronage	High, provides for free riders	Relatively low, because users have to pay
Incentive for officials	High because of their role in decision-making, control of finances	Disincentive, power taken away by users

Source: Prasad (2002)

Source :Joshi, D. (2011)

Feminist analytical Framework

To critically assess the policy trajectory so far, it is essential to not only pinpoint the market dimensions attached to it, but also how the aspects of equity, social justice have been dealt in the policy language. A feminist analysis of water security places politics and power at the centre of its framework, entailing a more 'refined analysis of questions of water allocation and distribution' plus also 'dismantling the conceptual abstractions that reify and reproduce boundaries and binaries such as those between the natural and the human or between the private and the public', accruing to strong linkages between 'local' water struggles to larger historical and economic trends and forces'(Ahlers&Zwarteveen, 2009: 418) ⁵⁴¹.

In the context of empowerment of the backward sections, the changing relational equations under the reforms project, focuses solely on its material underpinning rather than truly building their bargaining power for in its very theoretical essence, the neo-liberal water domain treats all actors as equal or compels them to be treated as equal; rubbing off their differences and setting the rules of the water game they follow, same to everyone.

Strangely, the neoliberal demand-led projects seem to focus more on 'engaging women' compared to their welfare-based supply-driven counterparts primarily on basis of the argument of efficiency. But what they eventually end up doing in its course is portraying them as 'tokens and showpieces' as an attempt to 'mainstream' gender issues in the framework of social sector programmes pivoting on the presumption that prior to this women were not key actors in the development process (Ramachandran, 1998:49 ⁵⁴², Vina Mazumdar⁵⁴³). Assigning roles to women in project implementation, their representation in community decision making platforms like Village Water & Sanitation Committees, as agents in campaigning about the health and hygiene concerns as well as their participation in income generation activities, the opportunity cost of which is the time spent to fetch water – sum up few of the project norms that 'water sector professionals claim to result not only in positive service outcomes but also in positive gender outcomes' (Dayal et. al., 2000 ⁵⁴⁴). This clearly reflects the recent efforts to make development policies more gender aware, essentially based on two types of considerations – one being the integrationist tactics 'to shift the basis of claims on behalf of women, from earlier emphasis on need - to an emphasis on merit' and the other - transformative or agenda setting, more politically ambitious strategies that promise to go beyond the 'trend of just seeking to integrate gender issues into the development agenda, broaden its goals to enable it to address issues of social justice' (Cleaver & Elson, 1995 ⁵⁴⁵; Jahan, 1995 ⁵⁴⁶; Jaquette, 1990 ⁵⁴⁷). 'Inclusion' or 'integration' in formal decision-making bodies and in markets is presumed to be gainful given that it acts as a sort of a 'equalizer' from the developmental perspective on one hand and on the other, supposedly enhances the performance of water institutions. However, these equalizing measures fail to mention about the inequity by caste or the social, cultural and historical dimensions of gendered inequities rooted in 'gendered divisions of labour and in gendered kinship and inheritance structures', by unreservedly denying the policy-level 'need to change the culture

541Ahlers, R., &Zwarteveen, M. (2009). The water question in feminism: water control and gender inequities in a neo-liberal era. *Gender, Place and Culture*, 16(4), 409-426.

542Ramachandran, V. (1998). Engendering Development: Lessons from the Social Sector Programmes in India. *Bulletin (Centre for Women's Development Studies)*, 5(1), 49-63.

543Mazumdar, V. (1979). From research to policy: rural women in India. *Studies in family planning*, 10(11/12), 353-358.

544Dayal, R., van Wijk, C., & Mukherjee, N. (2000). Methodology for participatory assessments–Linking sustainability with demand, gender and poverty. *Water and Sanitation Program*, World Bank, IRC, Washington.

545Cleaver, F., & Elson, D. (1995). Women and water resources: Continued marginalisation and new policies (pp. 1-10). London: International Institute for Environment and Development.

546Jahan, R. (1995). *The elusive agenda: mainstreaming women in development*. Zed Books.

547Jaquette, J. S. (1990). *Gender and justice in economic development*.

of the water institutions and only a cyclic shift of drinking water responsibilities from the community to the state' (Joshi, 2011: 62⁵⁴⁸). So, the policy reforms on caste and gender in India's drinking water sector have been little other than rhetorical changes in policy on paper.

What comes up as a stronger critique to this routine integrationist inclusion is regarding the approach of misinterpreting the theory of gender, and thus identifying 'gender' as a 'homogenised social category- called women', isolating them from the context of social relations (Baden and Goetz, 1998 ;Kabeer and Subrahmanian, 1999⁵⁴⁹). Moreover the casual and liberal use of the terms 'empowerment' and 'participation' in water policy guidelines makes it lose its deep rooted relevance in the context of development and their inherent political connotations. As discussed by Deepa Joshi, the practice of eulogizing the term empowerment, making it equivalent to the meaning – 'to enable a sharing of power' erases out the innate notion of power that the term as a theoretical concept essentially bears for in its truest sense, it expresses the interests of those - long distanced from power and authority, to challenge and define the agenda for development on the basis of their own priorities and interests (Kabeer, 1994⁵⁵⁰). Similarly, 'participation', due to its lackadaisical usage in policy papers becomes a mere synonym for the term 'integration'. This calls for the critical examination of the success of the development projects in mainstreaming gender, caste issues and bringing about the much hyped 'empowerment' of the concerned disadvantaged groups.

Why to use this framework ?

Although there is no single correct framework for 'doing gender' in the most comprehensive way possible, in the policy domain, in relation to the water sector - it is important for the feminist framework to 'explicitly situate its analysis in the structural transformation currently taking place, embedding gender dynamics in the world historical process of privatisation' (Ahlers&Zwarteveen, 2009: 419). The idea is to come up with a different 'window on reality', recognise the multi-layeredness of the entitlements, the cultural and social embeddedness in the discourse of understanding water ownership and security because their relational nature enables them to serve as political and economic vehicles to exploit the hidden power relations. Gender sensitisation instead of being treated as an add-on, has to be premised on the notion of social justice, rather than on a search for formal equality of opportunity, making it integral and central to the programme at its conceptual, design, implementation and monitoring levels (Ramachandran, 1998: 51).The framework raises subtle questions like what has been the underlying causes of gaps in the gendered outcomes in the water sector and whether the welfare oriented policy provisions or the market driven service delivery programs have the skill to weave a gender -just perspective in their approaches. Given the very fluid characteristics of water as a resource, the right over water creates a fuzziness in terms of delineating rights over it. Carrying with it an economic as well as social agency, the right over water envisages not only the right over the resource but right over its distribution, granting a certain authority to the right holders, tagging along other social privileges or obligations linked to it and hence redefining the 'question about access to a resource, not merely its control but the difference it makes to the shifting socio-economic inequalities' (Kabeer, 1999: 45)⁵⁵¹.

3. ANALYSIS

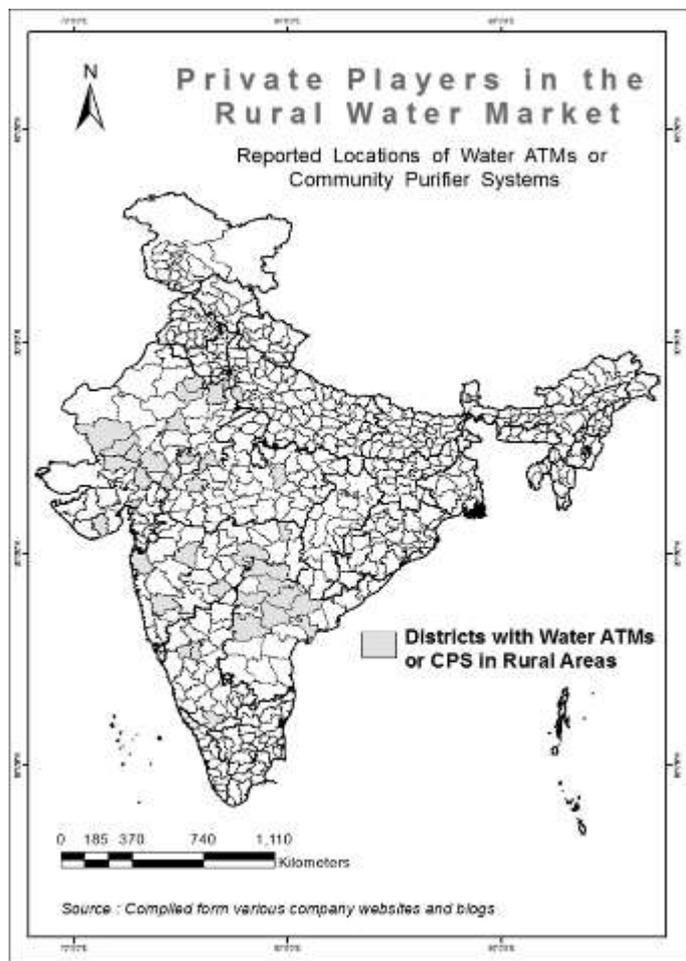
The concept of Water-ATMs - a market based solution packaged in the name of social entrepreneurship is not something new to India and in fact has gained pretty much of popularity and public support over the years, in the pretext of inadequacy of State arrangements to ensure safe water access to all. Given the rising informality in the form of tankers, the proliferation of the local packaged water businesses, these technology based, low-cost water vending machines automatically earn an edge over the other alternate arrangements on grounds of its assured provision of drinking water as per WHO conformed quality standards and the fact that via cloud technology it apparently promises the constant monitoring of quality and operations of the purification system within. Besides, many corporate organisations have sought to install community purification systems in rural areas in India in partnership with local governing bodies or charitable organisations These systems run on a nominal pay- per-use mechanism as preached by donor organisations like ADB, World Bank, IMF accepting coins or prepaid RFID cards to access water from these water stations.

548Joshi, D. (2011). Caste, gender and the rhetoric of reform in India's drinking water sector. *Economic and Political Weekly*, 56-63.

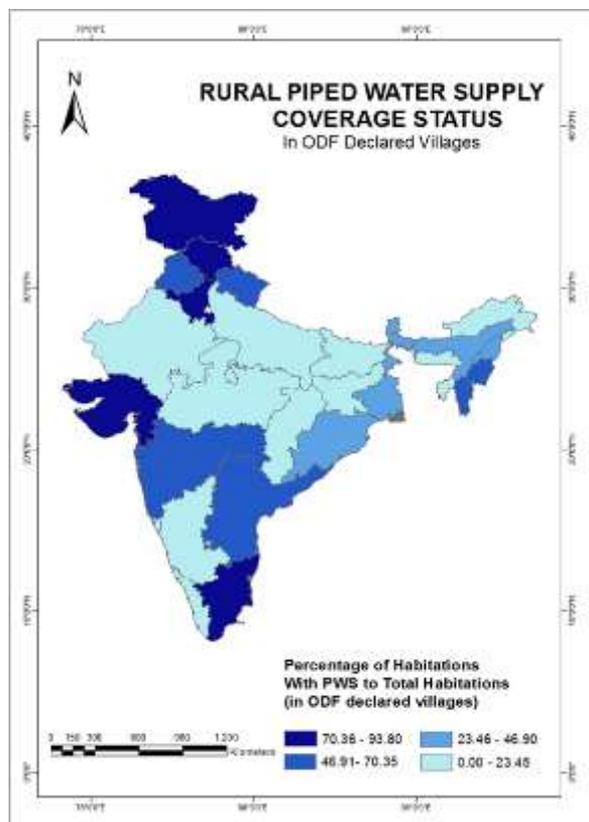
549Kabeer, N., &Subrahmanian, R. (Eds.). (1999). *Institutions, relations, and outcomes: A framework and case studies for gender-aware planning*. Zubaan.

550Kabeer, N. (1994). *Reversed realities: Gender hierarchies in development thought*. Verso.

551Kabeer, N. (1999). *From feminist insights to an analytical framework*. *Institutions, relations and outcomes: a framework and case studies for gender-aware planning*. London: Zed Books, 3-48



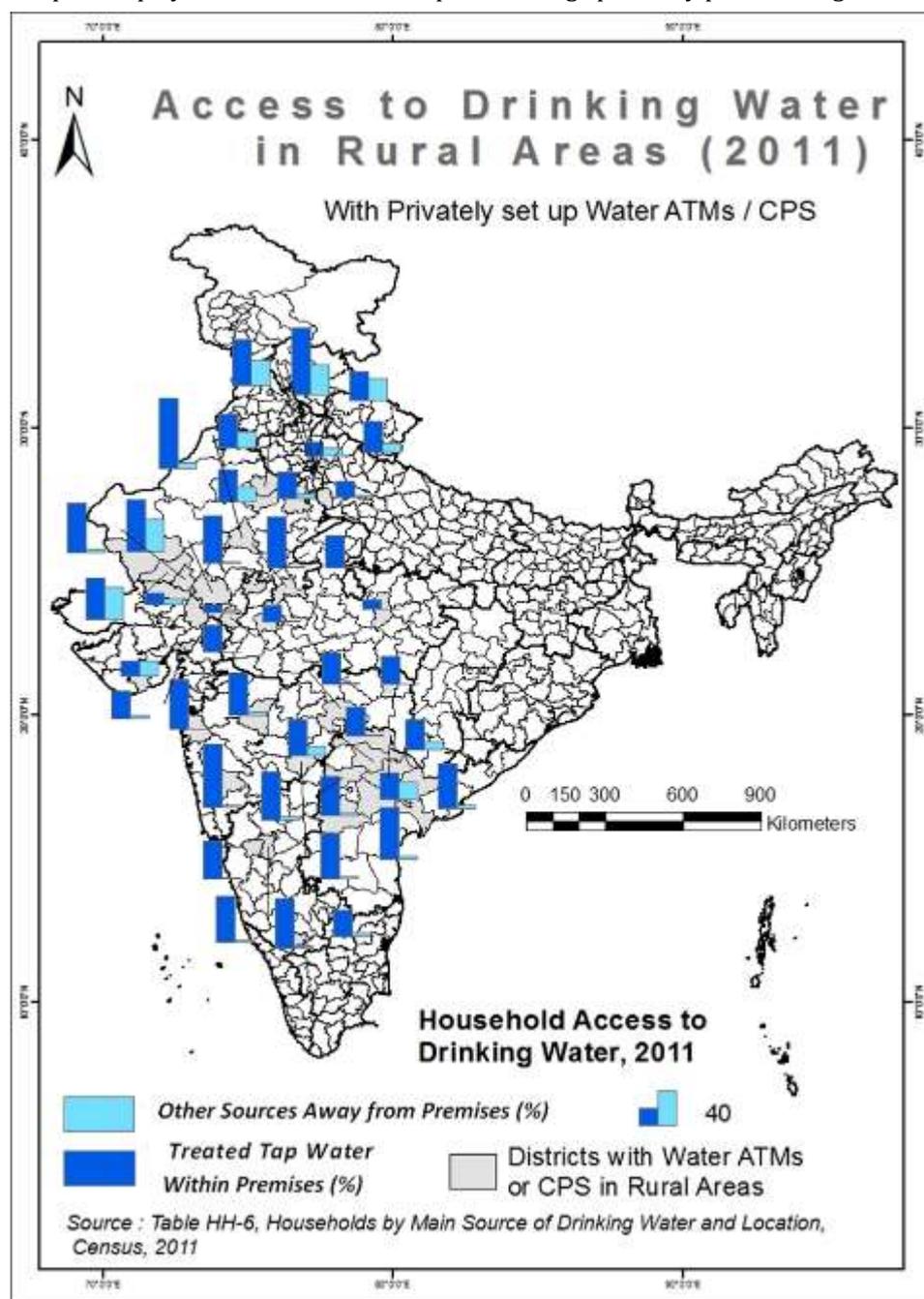
Map 1. Districts reported to have Water ATMs or Community Purifier Systems, installed by renowned or large corporate bodies in rural areas in India.



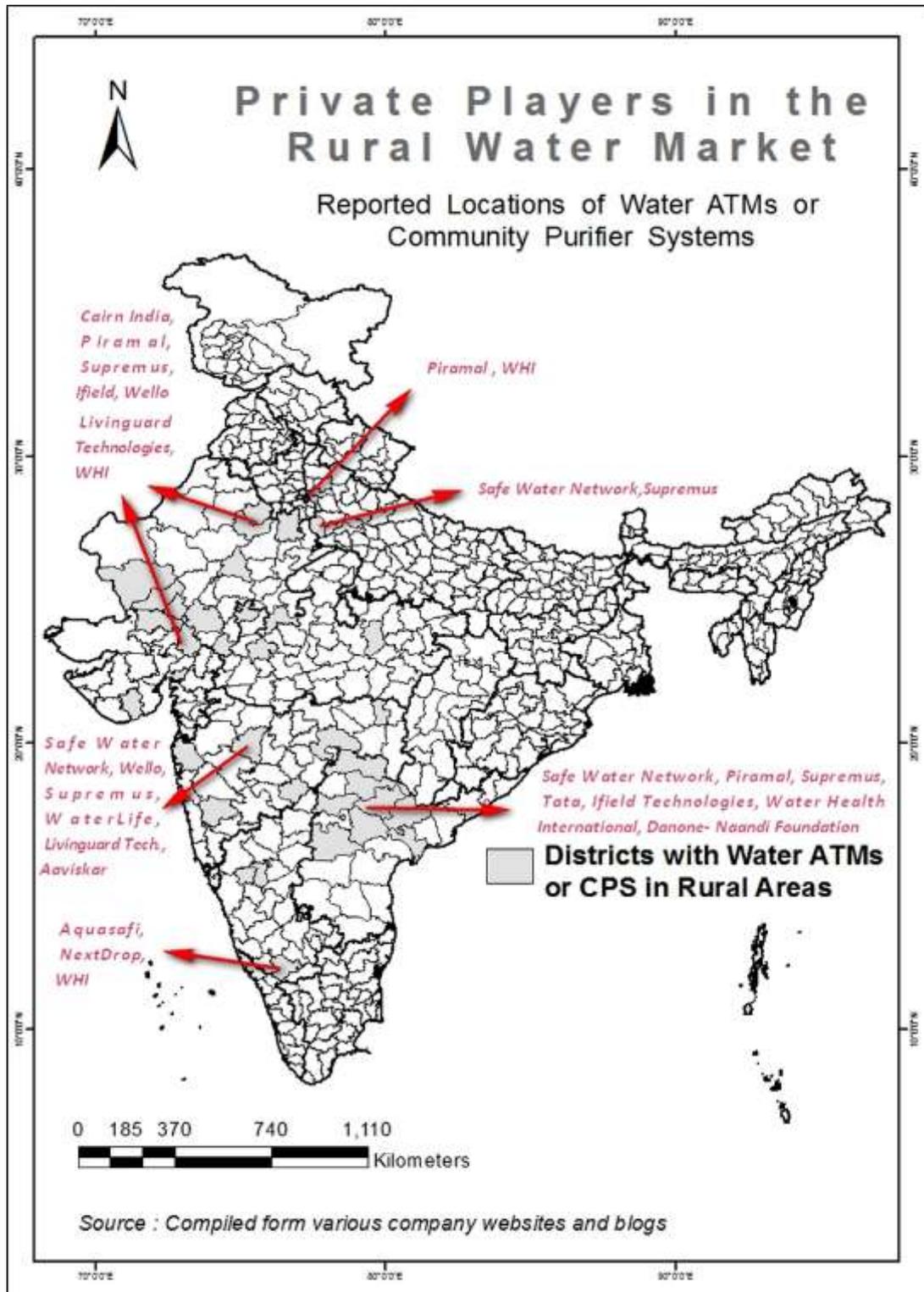
Source : Format H4 (A) RWS coverage of Habitation in ODF Verified Villages, NRDWP, Miscellaneous Reports, 2016-2017

Map 2. (left), shows us the Rural Water Supply Status in case of ODF Declared Villages under the SBM (Gramin) Yojana in 2016.

The Swachh Bharat Mission- Gol's flagship program since 2014 on water and sanitation, formed on the structures of the Nirmal Bharat Abhiyan promised to improve the coverage status in rural areas in terms of both access to safe water and sanitation facilities. In this map, at the state aggregate level, the states of Haryana, Gujarat, Tamil Nadu, Himachal Pradesh, Jammu and Kashmir show very high coverage status compared to the states of Rajasthan, Madhya Pradesh, Uttar Pradesh, Karnataka etc. This however fails to provide the real situation prevalent in the smaller units of districts and how access issues have come up within better performing states also. The map in the next page (Map no.3), essentially shows the district wise access to drinking water among the rural households considering both formal and informal sources of treated tap water within premises as well as informal sources like tankers or any other informal arrangement of household water delivery. These districts are specifically the ones where private players are found to operate their ATMs or CPSs. Interestingly what comes out from this is the fact that these specified districts despite having considerable access to treated tap water sources within premises are fairly dependent on the other sources which constitute the Non-State supply mechanisms including these supplementary water provisioning arrangements in the form of ATMs or Community Purifiers. The district wise household dependence is found to exist on these secondary sources of drinking water despite fulfilling the coverage criteria of 'access to treated tap water' among the rural households. This implies that the quality of water even after State treated mechanisms fail to match with the standards delivered after private treatment processes as available through ATMs or water purifiers. Moreover, the assured supply from these walk-in water vending systems guarantees access more than the irregular piped water supply as provided by the State, making it conducive enough for the private players to work from their profit vantage points by proliferating their market bases in the rural areas.

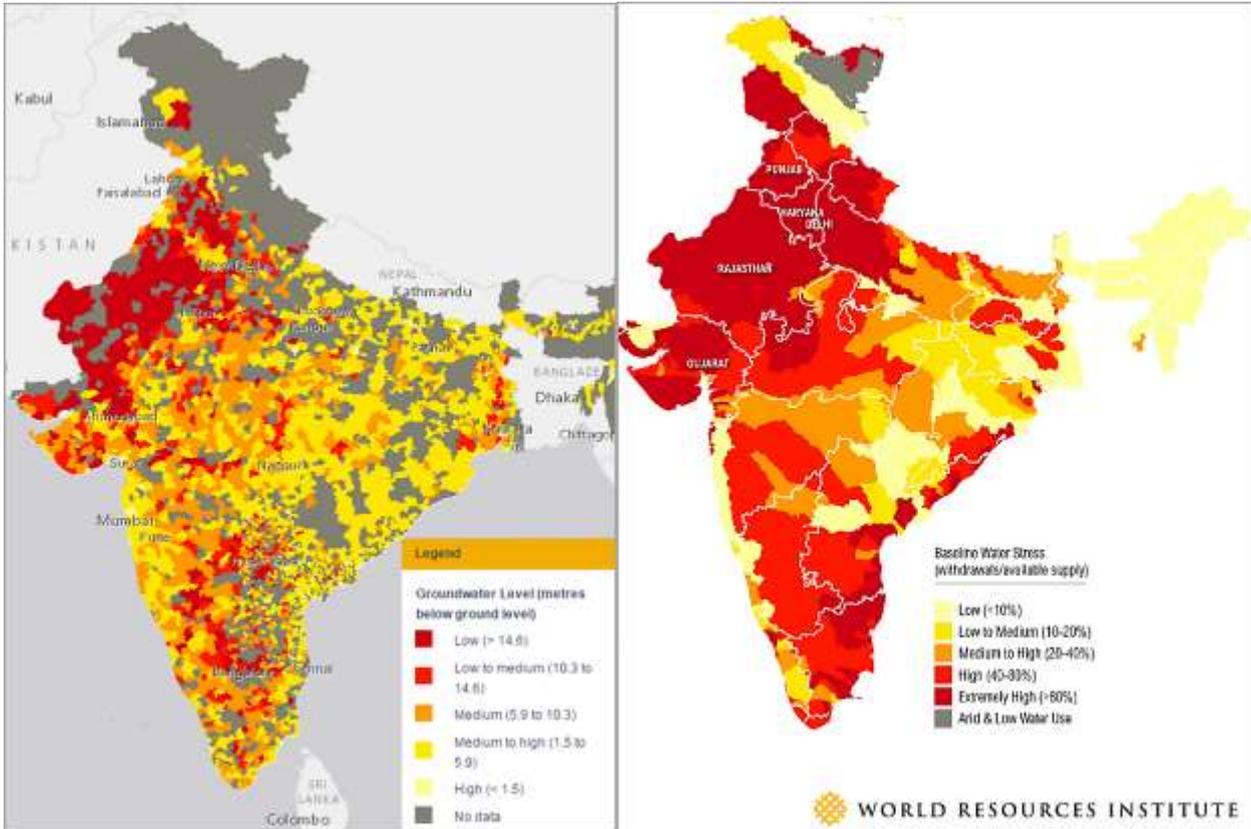


Map 3. Rural household Access to Drinking Water (in terms of treated tap water within premises and dependence on 'other sources' far from premises - in the districts shown before



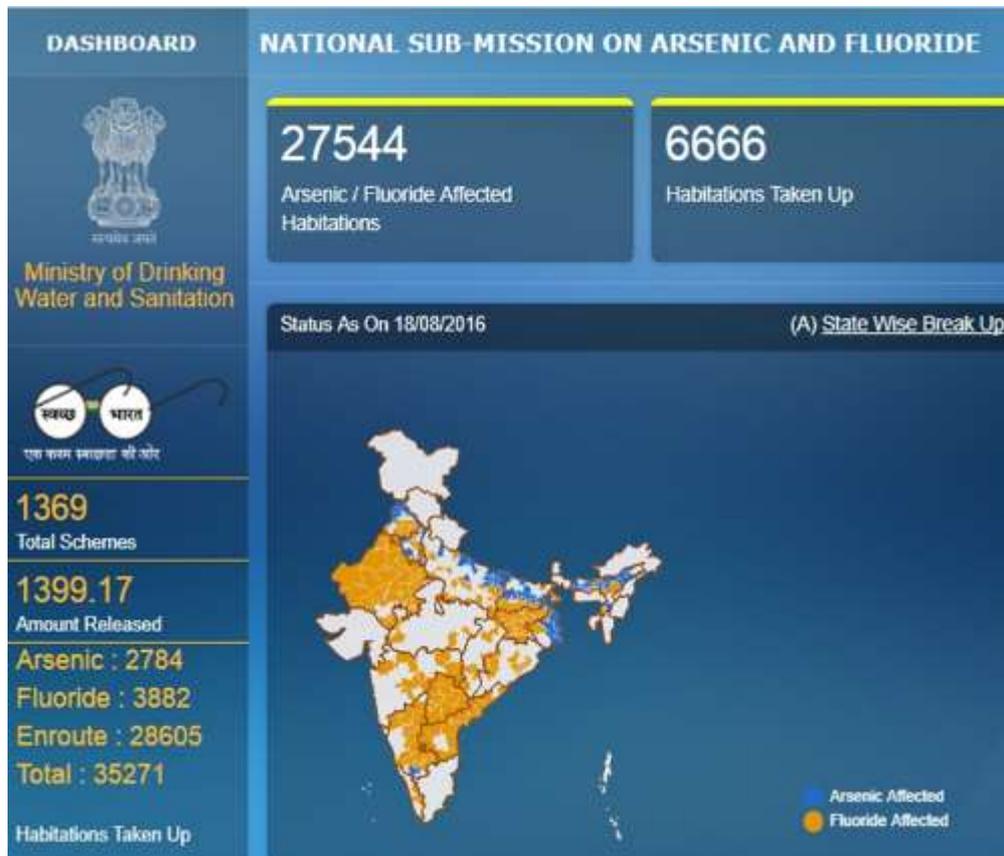
Map 4.

Now, if the same map is reviewed showcasing the distribution of the big corporate players in the rural drinking water market in these districts, there emerges interesting patterns and trends.



Source: Screenshot taken from www.indiawatertool.in

Map 5& Map6 : (left) Occurrence of Ground Water Levels below the ground (m) across India and the baseline Water stressed areas.



Source: Screenshot from www.indiawater.gov.in/submissiondashboard/dashboard.aspx

Encasing on the scarcity and quality issues

The map 5 shows the water stressed areas across India (measured as a ratio of amount of withdrawals to available supply in %) as given by WRI which shows that districts covering Western Rajasthan, North Western Gujarat , Western U.P, Marathwada, Vidarbha regions and parts of Andhra Pradesh and Telangana show high to extremely high water stress conditions which overlap with the districts under discussion. Moreover, the National Sub Mission on Water Quality offers

a map (Map 6) of habitations across India with Fluoride content greater than the permissible limits. These two correspond to the areas where the private players have emerged.

Some of the big names in the Indian industrial and commercial circle can be found to having an involvement in the profit-making efforts, in short making business through backdoor. Depending upon the rural demands and specificities of rural markets, the players have virtually customised their products and reduced the price to very low levels in order to cater to the rural customers. These include both home based solutions and community water solutions set up through partnerships and sponsorship of microfinance groups and NGOs. Interestingly, the state of the role is implicit in such models whereby the state ‘facilitates’ the access to land, water and electricity to the private water purification companies and the user charges come up as revenue in return. Also, in tune with the provisions of the National Water Policy, these business models ensure ‘community participation and engagement’ in the operations and maintenance of the systems.

Table 1 .Rural Water Supply Coverage in 'Open Defecation Free' declared Villages

State	Number of Habitations in ODF Declared Villages	Number of Fully covered Habitations with PWS	% of Fully Covered Habitations with PWS in ODF villages
HARYANA	7619	7147	93.80
TAMIL NADU	5743	5317	92.58
GUJARAT	35162	31372	89.22
HIMACHAL PRADESH	48691	37248	76.50
JAMMU AND KASHMIR	105	74	70.48
ANDHRA PRADESH	11185	7822	69.93
MANIPUR	172	117	68.02
PUNJAB	4451	2846	63.94
MAHARASHTRA	61391	37831	61.62
MIZORAM	177	109	61.58
TELANGANA	2475	1392	56.24
UTTARAKHAND	32584	18157	55.72
NAGALAND	516	228	44.19
SIKKIM	2047	712	34.78
ASSAM	634	200	31.55
ODISHA	7877	1962	24.91
WEST BENGAL	48470	11680	24.10
KARNATAKA	10818	2376	21.96
KERALA	20303	4283	21.10
MADHYA PRADESH	23389	4573	19.55
MEGHALAYA	3805	715	18.79
CHATTISGARH	54271	10052	18.52
RAJASTHAN	47574	8536	17.94
JHARKHAND	10952	1624	14.83
BIHAR	2180	219	10.05
UTTAR PRADESH	8313	688	8.28

Source : Format H4 (A) RWS coverage of Habitation in ODF Verified Villages, NRDWP, Miscellaneous Reports, 2016-2017

The highlighted rows in the table refer to those states having the districts where these water players have reported to be operating their water ATMs or CPS in rural areas.

Home based solutions - water filters

In addition to these community based solutions, the companies have also found the opportunity lucrative enough to encash on this narrative of ‘safe drinking water consumption’ to penetrate the rural markets with their home based solutions in the form of low-priced water filters which are often non electric in nature and come with a decent amount of storage facilities.

Table 2: Major Market players for sale of Non-Electric Storage Filters customised for rural households with low purchasing power and lack of electricity facilities.

Brand Name/ Price	Mother Group	Corporate	Technology Used
Aquasure (rural specific brand) Rs. 1499 to 20,999/-	Eureka Group	Forbes; Shapoorji-Pallonji Group	Particulate, sediment filter, carbon block, UV,UF,RO Technology replaceable cartridge ‘Aquasure Amrit with Kitanu Magnet’ at 449/-
Pureit Rs. 2000/- (variants : 1200/- to 16000/-)	Hindustan Limited	Unilever	Chlorine discharger kit replaceable after 1500L at 365/-
Swach&Swach Smart (Rs. 999 & 749/- introductory prices, now 1349 to 3200/-) Takes off from Sujal	Tata	(Tata Chemicals, TCS, Titan Industries)	Silver Nano technology, Rice husk ash; replaceable cartridge with 3000L shelf life costs 299/-
Sujal (2000-2003) piloted among NGOs, Distributed in Tsunami affected rural districts of South India, 2004	Tata		Basic water filter
Other players include: Voltas Water Solutions, Kent UF Gravity water filters (Kent RO Systems Limited, Ion exchange India Ltd - ‘Srijal Purifier’ with Zero-B resin technology.			

Tables 3 and 4 in the following pages list out the details of some of the biggest names in the rural drinking water sector with their brand specifications and business models. A highly competitive market is mushrooming out there harnessing on this purification business. Combining modern technology with marketing strategies to promote their brands and building up 'water entrepreneurship' initiatives among the rural communities, these players have carved out a niche of their own leveraging on the scarcity and quality issues and paving the way for increased privatisation of the rural drinking water sector.

Mother group	Water ATM /CPS Brand Name	Districts	Technology	Funders/Sponsors	Partnerships	Business Model
Safe Water Network (SWN)	'iJAL Stations'; Rs 5 per 20 litres	Bhandara (Maharashtra), Karimnagar, Adilabad, Warangal Rural, Warangal Urban, Jayashankar, Mahabubabad, Jagtiyal, Peddapalli, Badradri, Mancherial, Suryapet, Khammam, Nalgonda, Medak (Telangana), Gautam Buddha Nagar , Mathura (U.P).	solar energy operated, 6 step water treatment process, RO,UV,UF technology used, access via prepaid RFID cards	Funders: BHEL, CISCO foundation,Honey wellIndia,MacquarieGroup,Merck Foundation, NABARD, Oracle , Pentair Foundation, Paul Newman's Own foundation, PepsiCo Foundation, Sir Ratan Tata Trust, USAID ; Solution partners - Accenture, IBM, IMRB , Tata Strategic Management Group,	with local governments and microfinance/NG Os	---
Cairn India	'Jeevan Amrit Project'; -ATW (Any time water)	Barmer, Jalore (Rajasthan), Banas Kantha, Surendranagr, (Gujarat)	Kiosks with Ro plants, smart cards with initial value-Rs. 220, of which user pays Rs. 70 for registration, card charge + Rs. 150 (One month charge 30x5) for 20 litres of water	---	with local governments and microfinance/NG Os	CSR initiative with PHED, TATA projects; ' Village water community ' setup who would appoint the plant operator and collect user charges to ensure community buy-in and ownership
Piramal Piramal Healthcare Group	'Sarvajal'	Jhunjhunu initially. Now over 16 states	kiosks with UV, RO filtration systems; Sarvajal 'Soochak' - remote monitoring tool for real time monitoring of purity of product water, machine functionality and water output	Funders - Mercedes Benz, Adani, Cairn, DLF, Pratham, Lupin, Nestle, Michael and Susan Dell foundation, L&T Construction, HSBC, DJB, Honda	with local governments and microfinance/NG Os	social Entrepreneurship - Franchise Model/PPP/ Purchase Model
Supremus Group	Janajal -ATMs and 'Water on Wheels'-WOW-initiative ((500 litre tanks on e-rickshaws)	districts not specified but in areas of - Ghaziabad, Maharashtra, Gujarat, Andhra, Telangana, UP, Parts of NE	Areas where TDS < 500 PPM, Janajal relies on eco-friendly, low pressure, UF technology, patented for membrane design - 'SupremusAquaw ater Treatment System'. Payment via prepaid and digital wallets - BHIM app,Bharat QR Code, any UPI interface	---	with local governments and microfinance/NG Os	Cost of installing ATM - 8 lakhs, Franchise Model/PPP/ Purchase Model; keeps a profit margin of 20% at EDITDA level, after taxes 10% margin.

Mother group	Water ATM /CPS Brand Name	Districts	Technology	Funders/Sponsors	Partnerships	Business Model
Eureka Forbes	Aquasure Purifier/'Aquaguard Water	not specified but covers many of	many variants - UV, RO, UF	----	---	Forbes provide hardware,

	Shops' / Community centres ; 10-15p/litre	the Eastern and Western States	technologies			Panchayat - land, state- access to water. Business model : Govt. Subsidises plant cost, companies recover operational expenditure by running plants and selling water, promotes 'water entrepreneurship'
Naandi Community Water services Ltd	---	Bomminampadu Village, Krishna District of Andhra Pradesh	---	Danone Foundation and Water Health International		'social contract drinking water provision formula'
Aquakraft Projects Pvt. Ltd	AQUATM; Re1/ litre, cold drinking water -Rs 1.50/litre	some districts of Maharashtra, Karnataka, Rajasthan	green technology, unlike reverse osmosis, no wastage, 100% treatment of water, connected to a borewell or any other source of water, vends upto 5000l of water per day, card based prepaid system issued to customers	---	technological partnership with US based Aqueous Solutions LLC	local level engagement, SHGs managed by women, social Entrepreneurship Model - Franchise Model/PPP/ Purchase Model, Capital
Livinguard Technologies Pvt.Ltd	Livinguard Gravity filter; 1-6p/litre for community systems	some districts of Maharashtra, Gujarat	uses treated for microbial treatment, proprietary textile coating technology 100litres of water per hour	developed by Sanjeev swamy, as a 100% subsidiary of the Switzerland based investment firm Green Impact Holdings	NGOs like Swades foundation, Maharashtra, Jamnabaitrust , Gujarat , PHC-Jamsarvillage, Thane district	social Entrepreneurship - Franchise Model/PPP/ Purchase Model
Water Health International	Water Health Centres	districts in Rajasthan, Gujarat, Telangana	UV, RO technology; wastewater generated- discharged into the recharge soak pit after treatment - 'zero' wastage of water+ recharges aquifer.	Acumen Fund, International Finance Corporation, Tata Capital, Vital Capital Fund - investment contributors ;Sponsors - USAID, Tata Water Mission, The CocaCola Co.	SAIL Capital, The Dow Chemical Company	Panchayat provides land, water, electricity to set up Water Health Centres (WHCs), community initiatives for locals, Capacity building programs; eventual transfer to the community at the end of concession term.
Others include -Voltas Water Solutions (50:50 joint venture between Voltas Limited and Dow Chemical Pacific (Singapore) Pvt. Ltd. Payment coin/Smart card operated, 10-20 p/litre, 6 stages filtration, RO, 'Voltas Smart Monitoring app'; Aquasafi- started off in Gadag District of Karnataka, Waterlife,						

THE STRUCTURE OF THE MARKET

Types of Purification Models:

- a. Centralised water treatment facilities as the case of urban areas
- b. Point of use water purifiers
- c. Community water systems

Types of Business models

1. Outright Sale: Here the water company sells the water system to the government, NGO or CSR. Often the village panchayat (local government) owns and operates the plant either directly or through a jointly constituted committee. Revenue generated through the sale of purified water (typically at INR 2-5 for 20 litres) is used to fund operations. Often these systems are maintained poorly as the revenue does not cover the necessary operating costs.
2. Sale and Maintenance: This model is similar to the previous one in which the system is sold outright, usually to the government. However, in this case, the water company continues to service and maintain the system for a fee. Generally,

these continue to operate well although the price is higher (e.g. INR 4-7 for 20 litres) because the professional water company is being paid to properly maintain these units.

3. Franchise: Here the water company identifies a local entrepreneur who contributes part of the initial system cost. The entrepreneur operates the system and shares part of the profit with the water company. In this model too water is sold at a higher rate (INR 6-10 for 20 liters) to recover the initial capex cost (most of which is borne by the water company).

Microfinance and Water

- **Water-Credit**, an innovative program launched by Water.org which addresses this issue by providing small loans to households for the purchase of water filtration systems.
- In another such initiative, **Milaap**, a **Unitus Seed Fund** portfolio company has tied up with **Guardian**, a **microfinance institution** and **Yunus Social Business Fund**, to provide micro loans people in Tamil Nadu for building water connections and toilets in their homes.
- **SpandanaSphoorty** Financial Ltd. started off with this model in Neemuch and Ujjain district, MP involving a weekly repayment amount similar in both areas Rs 43 (\$0.95) per week for 25 weeks, Rs 39 (\$0.87) per week for 17 weeks.
- Monthly repayment plan Rs 250 (\$5.60) per month for 6 months, plus upfront payment of Rs 250 started by **Pragati Seva Sanstha under the umbrella org ACCESS in Andhra Pradesh**.

Investment firms in the water sector –

- **Aavishkar** – Mumbai based, equity investments in social enterprises. Investment in Waterlife.
- **Acumen** – Raises Charitable donations for investments, in India has invested in Water Health International, Guardian and Spring Health.
- **Avantage Ventures** – Asia based social investment company with offices in Hongkong and Beijing, invested in Piramal-Sarvajal which franchises their proprietary filtration equipment to local entrepreneurs who then operate the machines and sell water at a minimum cost.
- **Matrix Partners** – Investment in Waterlife.
- **Sandi group** – Washington based company investing in Aquakraft,

Unitus Seed Fund investing in many of the water projects operating in the districts shown in map.

4. CONCLUSION

Policies and international agreements have laid down targets and goals for the water and sanitation sector to achieve by 2030 and some even before that. However, some of the greatest barriers that the States face today are related to financing of development schemes and to bear the capital costs of increasing the coverage status in rural areas to ensure safe drinking water for all. Moreover the donor organisations backing such social sector programs have talked the language of neoliberal policies encouraging private players to take part in the service delivery mechanism and ensure cost recovery of it.

Although this study fails to validate the actual extent of privatization and the current size of the water market with details of its players and structural elements, the paper substantiates the fact that policy documents and the actions taken up by the supra national donor organisations have provided the incentive to the companies for seeking profit in this 'life- saving' business. The riveting fact is that the water business has set its strong footing in the rural drinking water sector taking advantage of the utopian imageries of 'safe water' created by policies so far and that too in areas which are official statistics wise found to be having pretty high treated water supply facilities by the State. The huge business potential given India's unmet demands by the State makes key themes - equipment supply, public private partnerships for water supply and distribution, water treatment plants and water EPC (engineering, procurement and construction) business and integrated water resource management for utilities – the building blocks of establishing increased private control in this sector.

BIBLIOGRAPHY

- Achterhuis, H., Boelens, R., & Zwarteveen, M. (2010). Water property relations and modern policy regimes: neoliberal utopia and the disempowerment of collective action. *Out of the Mainstream: Water Rights, Politics and Identity*, London: Earthscan, 27-56.
- Ahlers, R., & Zwarteveen, M. (2009). The water question in feminism: water control and gender inequities in a neo-liberal era. *Gender, Place and Culture*, 16(4), 409-426.
- Bakker, K. J. (2003). A political ecology of water privatization. *Studies in political economy*, 70(1), 35-58
- Barlow, M., & Clarke, T. (2002). *Blue gold: The fight to stop the corporate theft of the world's water*. The New Press.
- Barlow, M. (2010, August). The global water crisis and the commodification of the world's water supply. In *International Forum on Globalization*.
- Castree, N. (2008). Neoliberalising Nature: The logics of deregulation and reregulation. *Environment and Planning A*, 40(1), 131-152.
- Cleaver, F., & Elson, D. (1995). *Women and water resources: Continued marginalisation and new policies* (pp. 1-10). London: International Institute for Environment and Development.
- Cullet, P. (2007). Water law in India: overview of existing framework and proposed reforms. *Geneva: International Environmental Law Research Centre*.
- Dayal, R., van Wijk, C., & Mukherjee, N. (2000). Methodology for participatory assessments – Linking sustainability with demand, gender

- and poverty. Water and Sanitation Program, World Bank, IRC, Washington.
- Harvey, D. (2007). *A brief history of neoliberalism*. Oxford University Press, USA.
- Jahan, R. (1995). *The elusive agenda: mainstreaming women in development*. Zed Books.
- Jaquette, J. S. (1990). Gender and justice in economic development.
- Joshi, D. (2011). Caste, gender and the rhetoric of reform in India's drinking water sector. *Economic and Political Weekly*
- Kabeer, N. (1994). *Reversed realities: Gender hierarchies in development thought*. Verso.
- Kabeer, N., &Subrahmanian, R. (Eds.). (1999). *Institutions, relations, and outcomes: A framework and case studies for gender-aware planning*. Zubaan.
- Kabeer, N., &Subrahmanian, R. (Eds.). (1999). *Institutions, relations, and outcomes: A framework and case studies for gender-aware planning*. Zubaan.
- Kus, B. (2006). Neoliberalism, institutional change and the welfare state: The case of Britain and France. *International Journal of Comparative Sociology*, 47(6), 488-525.
- Luxemburg, R. (2003). *The accumulation of capital*. Routledge.
- Mazumdar, V. (1979). From research to policy: rural women in India. *Studies in family planning*, 10(11/12), 353-358.
- National Water Policies – 1987, 2002, 2012, *MoWR, GoI*
- Peck, J., & Tickell, A. (1994). Jungle law breaks out: neoliberalism and global-local disorder. *Area*, 317-326.
- Ramachandran, V. (1998). Engendering Development: Lessons from the Social Sector Programmes in India. *Bulletin (Centre for Women's Development Studies)*, 5(1), 49-63.
- Rosegrant, M. W., & Binswanger, H. P. (1994). Markets in tradable water rights: potential for efficiency gains in developing country water resource allocation. *World development*, 22(11), 1613-1625.
- Section 37 and Section E, Asian Development Bank, Water for All – The Water Policy of the Asian Development Bank (2003).
- Swyngedouw, E. (2005). Dispossessing H2O: The contested terrain of water privatization. *Capitalism Nature Socialism*, 16(1), 81-98.
- World Bank, India – Water Resources Management Sector Review – Report on the Irrigation Sector (Report No. 18416 IN, 1998)
- Zwarteveen, M., Roth, D., &Boelens, R. (2005). Water rights and legal Pluralism. *Liquid Relations: Contested water rights and legal complexity*, edited by Dik Roth, RutgerBoelens and MargreetZwarteveen, 254-268.

1603 REDEFINITION OF REGIONAL DEVELOPMENT FACTORS OF THE EUROPEAN UNION IN THE LIGHT OF CONTEMPORARY SOCIO-ECONOMIC CHANGES

ABSTRACT

The contemporary socio-economic development process shows tendencies towards growing divergence. At the same time the limited effectiveness of present activities of regional policy is emphasized as well as the existence of barriers to achieve the differences in the level and standard of life socially accepted. External determinants of the development process, specific in various parts of the world including Western and East-Central Europe, are linked with long-term changes in economic systems (Naisbitt, 1982; Naisbitt, Naisbitt, 2016; Horváth, 2015; Salamin, 2016). The current state of these changes results from the transformation creating postmodern conditions for economic activity, characteristic of the present stage in the development of cognitive capitalism (Harvey, 1990; Boutang, 2012). They are strengthened by globalization manifested increasingly with advancing economic integration (Huwart, Verdier, 2013). In these difficult conditions, shaped by identified megatrends, a real challenge is a successful influence on regional development factors, which effectively tend to optimize the conditions of leading economic processes and consequently to improve the level of life (The Future of Cohesion Policy..., 2015; White Paper..., 2017; Seventh Report..., 2017; Schneider, 2017). This is so because these factors change the range, interpretation and mechanism of the interaction, and significantly differ in space, which leads to their redefinition. The analysis aims to determine the direction and range of the redefinition of development factors of the regions of the EU member states and to identify their current spatial differences. The research involves threestages. The first stage presents the results of the arrangements organizing the direction and range of the influence of contemporary megatrends in socio-economic development on the changes in regional development factors. The second stage involves an analysis and typology of differences in the level and dynamics of the development of the EU member states and their regions. The third stage of the analysis concerns the identification of differences in the factors of regional development in the set of all the investigated regions and in their sub-set representing the development types identified. This research also includes the organization of the obtained pattern of regional development factors in the three categories of cohesion: economic, social and territorial. This analysis seeks to identify the factors which significantly shape changes and the present state of regional socio-economic differences in Europe and their specific features in the pattern of regions: more developed – transitory – less developed. The study in question is implemented under the research project FORSED (<http://www.forsed.amu.edu.pl>) financed by the National Science Centre as part of the competition OPUS 10 - 2015/19/B/HS5/00012: New challenges of regional policy in shaping socio-economic development factors the less-developed regions.

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1671 GROWING UP IN DIVERSITY: THE EFFECTS OF ENJIKAMPTHNIC DIVERSITY ON EDUCATIONAL OUTCOMES?⁵⁵²**Moh Agung Widodo, Budy P. Resosudarmo****(Work in progress)****ABSTRACT**

This paper examines empirically the effects of the exposure to ethnic diversity during school-age period on human capital outcome, measured mainly as year of schooling achievement. Combining three different data sets from Indonesia in 2000 and 2010, we link children's neighbourhood-ethnic diversity and the cohorts' average educational outcome at local level ten years later. The diversity is measured by the Herfindahl-based index constructed at sub district level from the full count 2000 Population Census. In addition, to net out the effect of diversity we control for neighbourhood characteristics that may be correlated with population density. Our OLS estimates tend to support the popular idea that diversity is harmful. More diverse communities are associated with lower mean year of schooling. However, when we employ instrumental variables to mitigate potential endogeneity issue in the neighbourhood ethnic mixture, the diversity effects become significantly positive. More diverse neighbourhoods tend to provide favourable educational environment for children so they are able to accumulate more year of schooling. The mechanism behind this is likely through an exposure to greater pool of talents.

Keywords: ethnic diversity, ethnic fractionalization, educational outcomes

JEL classification: C26, O15, Z13

1 INTRODUCTION

Interests on ethnic diversity has been increasing in the last decade for two reasons. Firstly, ethnic diversity is often associated with backwardness and one of the impediments of economic progresses in cross countries literature. Many developing countries with higher level of ethnic fractionalization, such as those in Sub-Saharan Africa, are predicted to have limited opportunity to catch up with more advanced economies (see Alesina & Ferrara 2005 for example). Secondly, population mix has been intensifying in many advanced countries because of international and internal migration, and this social heterogeneity is expected to become a common norm in the future (Putnam 2007). Policy responses to this change are also mixed, from immigration ban to affirmative programs for incoming migrants to help cultural assimilation. Scholars, therefore, are motivated to evaluate the benefits and costs of ethnic mixture on varied dimensions of economic development, as well as understand the underlying mechanisms behind it.

Findings on the net effect of ethnic diversity is still not conclusive. There are two competing hypotheses in the literature. On most cross-country analyses, diversity is generally seen as harmful (Alesina & Ferrara 2005, Collier 2000, Easterly 1997), a phenomenon that refers to a 'diversity debit' (Gerring et al. 2015). Ethnic fractionalization erodes trust and social capital (Putnam 2007), reduces investment and increases the probability of civil conflict (Montalvo & Reynal-Querol 2005). On the other hand, findings at sub-national and micro level have been a mixed, suggesting there exist the potential advantages of diversity. Firm-level analyses usually find positive impacts of workers' ethnic/racial mixture on firm's productivity and innovation. The mechanisms behind these benefits span from talent complementarity to greater product variation and better market understanding (Ozman & Erdil 2013, Ramasamy & Yeung 2016). Recent studies using class-level analyses also find evidence that students benefit from class' ethnic composition that help raise their educational performance (Hoogendorn and Van Praag 2012, Braster and Dronkers 2013).

Despite a large body of literature in the relationship between ethnic fractionalization and social economic development, the link between the former and the accumulation of human capital is still understudied, especially in two subtopics. Most of research are undertaken at national or state aggregate level, with only few use community or individual level analyses. Such macro-aggregate analyses are potentially omitting potential confounders, such as heterogeneous ability. Furthermore, most studies treat and assume ethnic diversity as exogenous, while in fact ethnic diversity and population mix are closely related with migration, which involves self-selection process. We attempt to contribute to the current literature by addressing these issues.

In this paper we focus our analysis on the potential effects of neighbourhood's ethnic diversity on children educational outcomes. Particularly, we observe whether there is an effect of ethnic composition during childhood to adolescence to children performance at formal education, tracked at primary, junior and high school, and finally at the accumulated year of schooling. We bring together two branches of the literature. Firstly, the literature on the determinants of human capital formation that includes theories on children development. Secondly, the literature on ethnic diversity and social formation. Our research question departs from the insights that if children social environment is influential to their subsequent development, then we would like to know the possible effects of diverse environment on children education outcomes.

We mainly use three datasets from Indonesia. Using the full count of the 2000 Population Census we construct ethnic diversity index as well as segregation index at subdistrict level (*kecamatan*), a level that we argue better reflect people interaction in most daily life. We then match the 2000 subdistricts with the corresponding subdistricts in the 2010

⁵⁵² Preliminary draft, not for citation.

Census. From the later we calculate average educational outcome for cohorts 16-22, 22-25, and 25-28 years. These cohort groups correspond to children and teenagers in the age group of 6-12, 12-15, and 15-18 respectively in the 2000 Census. The age groups represent common school age for primary, junior, and high school level in Indonesia. The main outcome that we analyse will be the subdistrict's mean year of schooling. We also use information from the 2000 Village Census (*Podes*) to control for region's characteristics. Instrumenting subdistricts' ethnic diversity, we find that ethnic diversity is significantly beneficial for educational attainment. Regions characterised with higher degree of ethnic mixture are associated with more year of schooling, as well as with higher rate of school completion. We propose the channels for this benefit are through greater pool of talent and complementarity which facilitate knowledge and skills spill over across ethnic groups.

The paper will proceed as follows. In the next section we discuss the theoretical framework on the importance of children social environment on their development. The following section elaborates data, research setting, and the empirical strategy. Finally we discuss results and offer possible mechanisms, and conclude.

2 WHY MAY ETHNIC DIVERSITY AFFECT EDUCATIONAL OUTCOMES?

We bring together insights from two different branches in the literature. The first branch is the literature on human capital formation, especially during the initial period of life. Including in this strand is the theory of child development. The second branch comprises literature on ethnic diversity, its origin and determinants, and its potential costs as well as benefits for human development.

Human capital formation at early life

Recent years witness the convergence of view among economists, education and health experts on the determinants of human capital. In general, human capital accumulation is a function of initial endowment including in-utero conditions, family background and investments on education and health, and environmental conditions which include natural, physical, and social environment (Barker 1990, Conti et al. 2010, Grossman 1972, Heckman et al. 2013). While the empirical evidence of the importance of health condition in early life on adult outcomes is well documented (Almond & Currie 2011, Currie & Vogl 2012, Glewee et al. 2001, Glewee & Miguel 2008, Hoddinott et al. 2011), evidence on the effect of social environment is still sparse and is dominated by class or school characteristics analysis. Children are exposed to social interaction not limited at school, but also at home and their neighbourhood.

Coleman (1988) conceptualizes the role of social capital in human capital formation. He combines two different perspectives, sociologists and economists views, on the actions made by individuals. While the former see the actor is dictated by her environment: social norms, rules and obligations, the latter see the actor as an independent agent with her self-interest. He then proposed the middle way, acknowledging rational action and use it in the analysis of social system. With respect to human capital formation, he sees two-way interaction: social capital as a kind of resources available to individual on the one hand, and on the other hand the functioning of social capital depends on social structure and social relation that may different from one place to another. Social capital here includes social capital in the family and the one in the community, both are important for children educational outcomes. Social capital in the family, in the form of interaction between children and parents, will enable family's financial capital and human capital (parents' education) to affect children learning process. Social capital outside family, in the form of mutual relationship, will facilitate children to reap benefit from the community.

Related to human capital framework is the theory of child development. There are many theoretical frameworks on this field, however we focus on theories that relevant to our studies. Jean Piaget's psychosocial theory divide children development into four stages: sensory-motor stage (up to 2 years), pre-operational stage when children are illogical thinkers (2-7 years), concrete operation stage when children develop their logical thinking (7-12), and the final stage of formal operation (12 years-over) when children develop abstract and complex thinking (NSW Office of Childcare 2002). The early adolescence (11-14 years old) is an important period when children cognitive development is occurring, and is characterised by strong peer effects (Stang and Story 2005). In addition, Ecological Theory of Bronfenbrenner proposes the balance between nature and nurture, suggesting heredity and environmental stimulation are both important for children development. In this framework, children are surrounded by four concentric circles that influence their development: family, preschool or school, wider network such as parents' network, and macro-system that includes values, customs and attitudes of the wider cultural group in which the children belong to.

Ethnic Diversity and Its Potential costs and Benefits

Ahlerup and Olsson (2012) suggest that ethnic diversity originate date back since prehistoric era, with geographic, diversity in vegetation, topography or the roughness of the earth surface, diseases, and the duration of human settlements determine the level of diversity in a country. More specifically, heterogeneity in land endowments has facilitated specific human capital to develop locally and coupled with mobility constraints have produced specific ethnicities and languages (Michalopoulos 2008). Later, in modern day ethnic diversity is affected by the duration of the modern state and human migration which has been intensifying in the last three centuries. This new development implies that ethnic diversity becomes more complex and challenging phenomena, and its exogeneity assumption becomes more difficult to hold in the contemporary analyses.

The negative effects of ethnic diversity on countries' performance identified in cross-country analyses (Alesina and Ferrara 2005, Allesina and Zuravskaya 2008, Collier 2000, Easterly 1997). Summarizing from these research, there are three mechanisms through which ethnic fractionalization produces detrimental effects. Firstly, ethnic diversity erodes

trust between group, thus country with high diversity will have thin social capital. This could increase the probability of civil conflict or at a lesser extent hampering common action and collaboration. Lower trust could also deviate budget spending away from public goods provision toward security spending. Secondly, community with higher level of diversity will find it difficult to agree with common public goods to be provided, since each group has strong aspiration for their own preferences. The worst is when the society failed to achieve consensus on important public goods to be provided, given private sectors will have no incentives to do so. Lack of public goods in turn hinder economic development and human capital formation. Thirdly, ethnic diversity is usually associated with diverse local languages used in the country. This could increase communication costs and slow down the diffusion of knowledge. At macro level, higher level of ethnic fractionalization could lead to lower level of investment and slower growth rate due to increased risks.

However, literature also provides another evidence suggesting the benefit of ethnic diversity. Analysis at sub national level in the US and Europe find that cities with higher level of ethnic mixture generally have higher level of innovation, productivity, and cultural capital. Similar results also found in firm-level analysis. Firms with greater variation in workers' cultural background are generally more productive. Economists suggest that diversity could have greater probability of talent complementarity. People from different cultural background bring with them specific skills that enrich stock of skills in their working place. People may also learn from other to equip them with new skills. Evidence on this mechanism is found by Hoogendorn and Van Praag (2012) who employ a randomized field experiment to 550 business students in the Netherlands and find that groups with high ethnic diversity perform better than those with homogeneous features. Similar positive effects also found in school/class level analyses, when diversity not only benefit the minority group and underperforming students but the high-achievers students also improve their understanding on the subjects they provide help to others.

Table 1 Summary of research and findings on the effects of ethnic diversity

Author/s	Methods and data	Main findings
Easterly and Levine (1997)	Cross-country analysis, OLS	Ethnic diversity explains cross-country differences in the quality of public policies, stability, and economic performance High ethnic fractionalization in Sub-Saharan Africa is associated with low economic growth, low schooling, political instability, underdeveloped financial systems, distorted foreign exchange markets, high government deficits, and inefficient infrastructure
Alesina et al (2003)	Cross country analysis, OLS, 190 countries Employs new measures of ethnic, linguistic and religious fractionalization Introducing ethnic polarization index	Ethnic fragmentation negatively affects economic growth Cross-correlation between ethnic fractionalization and legal origin, and its link with institutional quality Religious fractionalization has no association with economic outcomes
Lee et al (2016)	Panel data analysis of 600 municipalities and 1,286 school districts in the United States Time period: 2001, 2006, 2011 Pooled-OLS, Pooled-2SLS, Random effect 2SLS	Ethnic heterogeneity does not necessarily reduce local public spending (per capita) Low substitution between public goods in response to changes in ethnic diversity Ethnic diversity increases public spending on education, police, and fire
Sparber (2010)	Fixed effect analysis of US regions 1980-2000 Employ instrumental variable: a racial fractionalization index, predicted by shift-share approach	Diversity enhances productivity of cities Evidence is ambiguous at state level, find positive effect using Random Effect approach
Hoogendorn and Van Praag (2012)	Randomized field experiment involving 550 business students in Netherland, with 53 country origins Distribute students randomly into small groups, approximately consist of 10-12 persons, as part of a compulsory entrepreneurship program	Positive effects of larger minorities' share (implying more diverse) in group on business performance, higher sales and greater profits, when the share of minorities exceeds 55% More homogeneous team tend to experience less conflict Members of heterogeneous teams tend to learn more, suggesting greater variation of skills in groups
Parrotta et al. (2012)	Structural estimation of the firms' production function Firms data in Denmark	Diversity in education enhances firms' value added Diversity in ethnicity and demographics tend to harm firm productivity Communication and integration costs outweigh benefits from creativity and knowledge spillover
Braster and Dronkers (2013)	Classroom-level analysis of 905 students in	Ethnic diversity in the classrooms increases

	41 classes in 11 schools	educational performances of migrant pupils, but the effect is not significant for native students
Ramasamy and Yeung (2016)	Cross country analysis Evaluate the links between values diversity, ethnic diversity, and innovation Values diversity index is constructed based on 4 dimensions: self-enhancement, self-transcendence, openness to change, and conservatism	Ethnic diversity has a negative effect on innovation, while values diversity is beneficial The best innovators are countries with low diversity ethnically but heterogeneous in values orientation (eg. South Korea, Sweden)

3 DATA AND EMPIRICAL STRATEGY

The setting of this study is Indonesia. Our main variable in this analysis is ethnic diversity. We use Herfindahls based ethnic fractionalization index to represent the degree of ethnic composition in a neighbourhood as suggested by Alesina et al. (2003). The index ranges from 0, meaning an ethnically homogeneous society, to a maximum of 1 when everyone is different from another. Sometimes, the index is interpreted as the probability of randomly picking from the population two people who belong to different ethnic background. Mathematically the index is calculated using the following formula:

$$EF = 1 - \sum_1^N s_i^2$$

Where EF is ethnic fractionalization index, s is the share of ethnic group i in a unit of population, and N is the number of ethnic group. We calculate ethnic diversity index at subdistrict level. We argue that this administrative boundary better represents neighbourhood level in which people, particularly children, involve in daily interaction with others more intensively than in higher administrative unit. Based on the 2000 census we find the average population of subdistrict is 51,575⁵⁵³ with the average area is 379 kilometer square⁵⁵⁴.

We use the information on ethnicity in the 2000 Indonesian Population Census. Indonesia Statistics Office (BPS) collected information of ethnicity for the first time in the 2000 Census and continued in the subsequent census in 2010. Prior to 2000, ethnicity is considered as taboo in social and political discourse because of government concern on national unity. Government strongly encouraged a national identity and saw ethnicity, together with religion, race, and group identity (*Indonesian: Suku, Agama, Ras dan Antar-golongan*) as a threat to national harmony (Hugo in Ananta et al. 2015). Following the change in political regime, perception on ethnicity has also change and BPS collected ethnic identity using self-identification approach. By this approach, respondents are free to identify themselves to belong to particular ethnic groups, and these ethnic names would be added to the BPS lists if they were not identified beforehand. The result is 1030 ethnic identities identified throughout the country. It should be noted that some parts of Aceh Province were under identified due to security reasons and census officials found it difficult to collect information from the whole population.

In this paper we reclassify the ethnic group from 1300 into 31 bigger ethnic classification for the calculation of ethnic fractionalization index. The 31-group classification is used by BPS in its official report. There are two reasons to choose the 31-group classification. Firstly, the original ethnic classification does not necessarily provide equal classification because of self-identification process. Therefore, there is a mix between ethnic and sub-ethnic or even sub-sub-ethnic classification (Ananta et al 2015). Generally, among sub-ethnic groups under the same group share many similarities, thus less variation, and this will make the analysis less meaningful. The idea of estimating the effect of ethnic diversity is to identify the potential costs and benefits of the interaction between people from different culture, way of thinking, and importantly specific skills associated with ethnicity. Using the original classification is likely to overstate the actual diversity in the neighbourhoods. The other reason is practicality. The big classification is better matched with island and provincial unit, making it easier to improve the analysis with migration pattern.

Our calculation indicates that the level of ethnic diversity varies across country. On average, the ethnic diversity index of subdistrict is 0.23 with the minimum value is virtually zero 0.00011 (almost homogen) and the maximum one is 0.843. We use 31-group classification and exclude Aceh Province. One may ask whether the result will be different if we use the original ethnic classification or 630 classification proposed by Ananta et al. (2015). Our calculation indicates the correlation between indices calculated using 31 classification and original classification (1030) is 0.927, while the correlation between indices from 31classification and Ananta's 630 classification is 0.956.

⁵⁵³ We exclude Aceh Province from the calculation of national average due to incomplete census data collection.

⁵⁵⁴ Based on the 2000 Village Census (Podes)

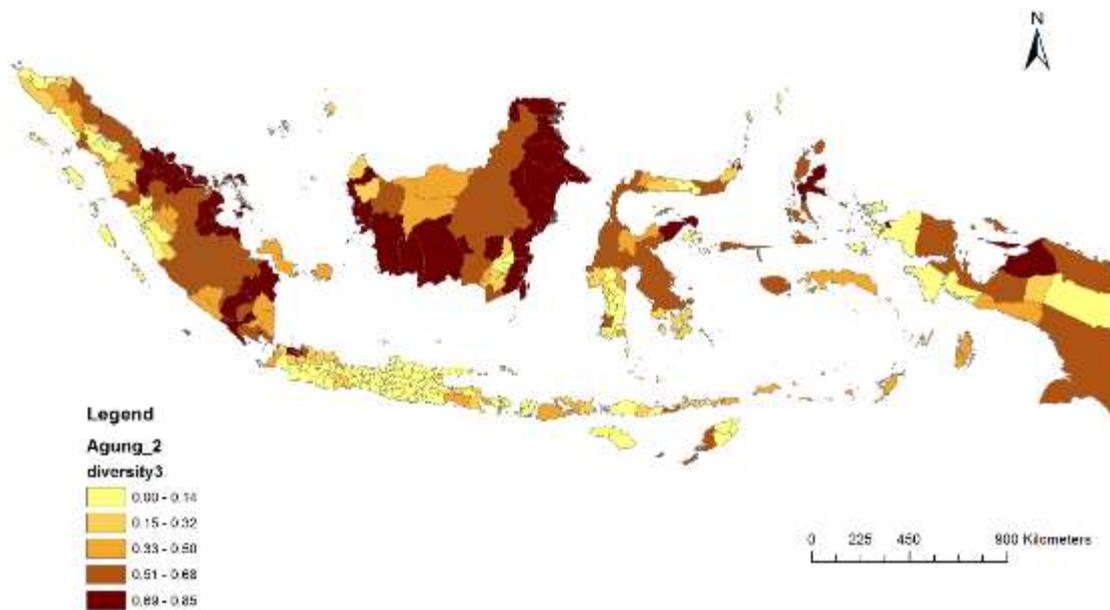


Figure 1 Ethnic Diversity Index by Province in Indonesia (2000)

In addition to ethnic diversity index, we also construct an alternative measure in the form of polarization index, as suggested by Reynal-Queroll (2005). The use of this measure is motivated mostly in social and political analyses, when ethnic diversity tends to be a less convincing predictor for social conflict and civil war. While ethnic fractionalization is increasing with the number of ethnic group, the maximum value of ethnic polarization is reached when there are two ethnic group with equal size in the community. The idea is the more the society is polarized, the greater the probability of diametric conflicts will be. The formula used to calculate ethnic polarization index is as follow:

$$RQ = 1 - \sum_{i=1}^N \left(\frac{1/2 - s_i}{1/2} \right)^2 s_i$$

Where RQ is Reynal-Queroll polarization index, N is total number of ethnic groups in a subdistrict, s is the population share of particular ethnic group in the society. As in ethnic diversity, the value of ethnic polarization ranges from 0 when there is only single ethnic group in the population to a maximum 1.

The origin of ethnic diversity in Indonesia

The cohabitation between different ethnic groups in the same place in Indonesia can be traced back from pre-modern era. There are three different waves of people mobility that affect ethnic composition across place in Indonesia. The marks of ethnic mix in Indonesia have been found far before the Dutch colonial era through interisland trades and slavery (Cribb 2000). The evidence is some similarities among traditional languages and the continuum of the physical appearance of Indonesian people. Through trade, people moved to look for more attractive resources and opportunities in more developed regions. People migration was also motivated by monopolistic trade imposed by local kingdoms or sultanates. As for slavery, the main victims were usually the population of small islands who lack of protection. Cribb (2000) also suggest the possibility that in the prehistoric era initially the people who first invaded the region spoke in the same language. Later, they spread to different places, settled and developed their own specific languages deviating or evolving from the original one.

The second wave was people migration during the Dutch Colonial. The Dutch Colonial Government launched transmigration policy for two purposes. First, along with the expansion of plantation in outer islands, especially Sumatera, the Colonial Government mobilised famers from populous Java island to outside islands. Up to 1930, around 443,000 people were moved from Java to North Sumatera (Cribb 2000). Furthermore, in the beginning of 20th Century the Colonial Government believed that Java had been over-populated, and they introduced a transmigration program supplemented with attractive incentives to resettle Javanese to the outer islands. The 1930 Population Census recorded that around 11.5 per cents of indigenous population lived outside their districts of birth (Volkstelling 1930 in van Lottum and Marks 2012).

The third wave of internal migration is post-independence modern era. The Government of Indonesia replicates the Dutch's transmigration program in an increasing scale. The main destination of transmigration from Java and Madura was initially southern parts of Sumatera in the 1970, and then shifted to Kalimantan and Irian Jaya in the 1980s and 1990s (Cribb 2000). While after 1990s the flow of government-led transmigration has been decreasing, the movement

of people attracted by economic opportunities has continued to increased since 1970, mostly towards developing metropolitan area in Java (van Lottum and Marks 2012). The share of population whose provincial birthplace are different from current residence increased from only 5 per cents in 1970 to 10 per cents in 2000.

Population of ethnic group in Indonesia

Statistic Office of Indonesia (BPS 2010) reports the result of the 2010 Census for the population of ethnic group. The largest ethnic group is Java with more than 95 million population or accounted for 40.2 per cent of total population. The geographic origin of Javanese are in three provinces: Central Java, Yogyakarta, and East Java. Following in the second place is Sunda which is concentrated in West Java province with almost 37 million population (15.5 per cents). In the third place is Batak, originated from North Sumatera province, with 8.5 million people (3.6 per cents). Another ethnic group with size slightly above 3 per cents is Madura, whose origin is in Madura island in East Java province. The rest twenty-seven ethnic groups altogether constitute less than 40 per cent with Nias being the smallest group of 0.4 per cents of total population. Table 1 reports the population size of the 31 ethnic groups and its share to national population, as well as their historical geographic origin.

Table 1 Population of Ethnic Groups and Geographic Origin

Ethnic group	Population	Share (%)	Geographic origin
Aceh	4,091,451	1.73	Aceh province
Batak	8,466,969	3.58	North Sumatera
Nias	1,041,925	0.44	Nias island
Melayu	5,365,399	2.77	Riau, Riau Islands, Jambi
Minangkabau	6,462,713	2.73	West Sumatera
Ethnic groups from Jambi	1,415,547	0.60	Jambi province
Ethnic groups from South Sumatera	5,119,581	2.16	South Sumatera province
Ethnic groups from Lampung	1,381,660	0.58	Lampung province
Other ethnic groups in Sumatera	2,204,472	0.93	Sumatera island
Betawi	6,807,968	2.88	DKI Jakarta
Ethnic groups from Banten	4,657,784	1.97	Banten province
Sunda	36,701,670	15.50	West Java
Jawa	95,217,022	40.22	Central Java, Yogyakarta, East Java
Cirebon	1,877,514	0.79	Eastern part of West Java province
Madura	7,179,356	3.03	Madura island
Bali	3,946,416	1.67	Bali province
Sasak	3,173,127	1.34	Lombok island of NTB province
Other ethnic groups from NTB	1,280,094	0.54	Other islands in NTB province
Ethnic groups from East Nusa Tenggara	4,184,923	1.77	NTT province
Dayak	3,009,494	1.27	Kalimantan island
Banjar	4,127,124	1.74	South Kalimantan province
Other ethnic groups from Kalimantan	1,968,620	0.83	Kalimantan island
Makassar	2,672,590	1.13	South Sulawesi province
Bugis	6,359,700	2.69	South Sulawesi province
Minahasa	1,237,177	0.52	North Sulawesi province
Gorontalo	1,251,494	0.53	Gorontalo province
Other ethnic groups from Sulawesi	7,634,262	3.22	Sulawesi island
Ethnic groups from Maluku	2,203,415	0.93	Maluku islands
Ethnic groups from Papua	2,693,630	1.14	Papua island
Chinese	2,832,510	1.20	-
Foreigners	162,772	0.07	-

Source: BPS 2010

Outcome variables and other covariates

Our second dataset is the 2010 Population Census. We calculate mean year of schooling at subdistrict as the main outcome indicators of knowledge accumulation for cohort groups 16-22, 22-25, and 25-28 year old. These groups correspond to children aged 6-12, 12-15, and 15-18 respectively ten years before, or in 2000. Basically we want to analyse the accumulation of knowledge for these cohort in year 2000 as a result of their exposure to ethnic mixture during their childhood. In addition we also analyse the completion rate of schooling at primary, junior, and high school levels.

We choose subdistrict (*kecamatan*) as unit of analysis instead of district or province levels. We argue that population and area size at subdistrict level will be better in representing people interaction in daily life. The provision of public school, health center, and local market is usually made at this level. The average population in subdistrict is 51,575 in 2000, with the average size of area is 379 km square. In 2010 the average population per subdistrict falls to 47,213 because some subdistricts have split into smaller ones. As we want to match the 2000 subdistricts with the corresponding one in 2010, we have to deal with the region proliferation issue. Our data shows that between 2000 and 2010, 1,336 out of 3,826 subdistricts (35 per cents) split into smaller size new subdistricts. For this analysis we merge the 2010 subdistricts based on the 2000 subdistrict boundaries.

In Indonesia's government system, subdistrict is the third tier of subnational administration after province and district (*kabupaten*). Each subdistrict consists of several villages (*desa* or *kelurahan*). As an administrative unit subdistrict is

unique in the sense that it does not have autonomous power. While the head of province, district, and village is directly elected, the subdistrict head is appointed by the district government. In short, the subdistrict is more of district representative at local level. This unique feature help us in controlling for potential unobserved confounders in the analysis of ethnic diversity and educational outcomes.

Finally, we use information from the 2000 Village Census (*Podes*) to extract regions' characteristics, such as geographic location, topographic features, and school availability at subdistrict level. Information in *Podes* is presented at village level, so we have to aggregate the data into subdistrict level. Furthermore, *Podes* also provides estimates of village population which we can sum up to get subdistrict population. However, for the analysis we use subdistrict population from the 2000 Census.

Empirical Strategy

We start our analysis by estimating the following equation:

$$EDU_i = \alpha + \beta EF_i + REG_i' \varphi + INFRA_i' \delta + SES_i' \rho + ADULT_YOS_i' \vartheta' + \partial_p + u_i \quad (1)$$

Where *EDU* represents educational outcomes of subdistrict *i*. *EF* is ethnic diversity index of subdistrict *i*. *INFRA* is a set of infrastructure indicators in subdistrict *i*, including the ratio of household electricity connection, school density at primary, junior and high school, and distance to nearest health center. *SES* represent a set of social-economic indicators of subdistrict *i*, comprises the share of households classified as poor (*pra-sejahtera*) and the year of schooling of the village head. *ADULT_YOS* represents average year of schooling for people aged 25 and above, which serve as a proxy for average parents' education and the stock of human capital in the subdistrict. We fix provincial effects by putting a set of provincial dummies ∂_p to control for potential unobservable at provincial level.

We adjust the standard errors by clustering at provincial level. The idea is to control for heteroscedasticity due to systemic correlation in the error term among regions within the same province.

Correlations

Estimating equation (1) by OLS we get the correlational relationship as depicted in Table 2. In column 1 gross correlation between ethnic diversity and year of schooling for cohort 16-22 year in 2010 (corresponds to cohort 6-12 in 2000) shows a positive value, suggesting that subdistrict with high diversity tends to have more year of schooling. The correlation becomes stronger if we fixed provincial effects. However, after controlling for regional characteristics, infrastructure, and education of village head the correlation becomes insignificant with the magnitude shrinking. Finally, when we add adults' year of schooling the direction of the correlation changes to negative, although remains insignificant, suggesting a harmful effect of ethnic diversity on educational attainment. In the column 7 and 8, the outcomes are mean year of schooling for cohort 22-25 and 25-28 respectively.

Table 2. OLS estimate of the relationship between ethnic diversity and year of schooling

VARIABLES	Outcome: Mean year of schooling							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ef31_00	0.4572*** (0.0787)	1.3369*** (0.3242)	0.4249 (0.3620)	0.2218 (0.3003)	0.0747 (0.2882)	-0.2843 (0.1832)	-0.4490* (0.2566)	-0.4265 (0.2674)
lsdpop_00			0.0890 (0.0803)	0.1122** (0.0515)	0.0491 (0.0429)	0.0072 (0.0380)	-0.0488 (0.0438)	-0.0701* (0.0407)
areakm2			-0.0000* (0.0000)	-0.0000*** (0.0000)	-0.0000 (0.0000)	-0.0000* (0.0000)	-0.0000* (0.0000)	-0.0000* (0.0000)
coastal			-0.0144 (0.3056)	-0.1131 (0.1968)	-0.1117 (0.1685)	0.0060 (0.1530)	0.0158 (0.1718)	0.0122 (0.1789)
ldistokab			-0.4126*** (0.0293)	-0.1537*** (0.0242)	-0.0751** (0.0273)	0.0236 (0.0226)	0.0255 (0.0278)	0.0372 (0.0277)
ldiskabprov			-0.1371*** (0.0225)	-0.0758*** (0.0158)	-0.0625*** (0.0157)	0.0049 (0.0207)	0.0324 (0.0248)	0.0402 (0.0240)
electricityhh				0.0177*** (0.0022)	0.0144*** (0.0017)	0.0110*** (0.0016)	0.0134*** (0.0019)	0.0135*** (0.0022)
prdensity				0.0645 (0.1620)	0.1127 (0.1271)	0.0664 (0.1052)	0.1483 (0.1196)	0.1681 (0.1225)
jsdensity				1.7799*** (0.3143)	1.5532*** (0.2614)	1.3586*** (0.2044)	1.7117*** (0.3415)	1.7151*** (0.3619)
hsdensity				2.4527*** (0.3692)	1.8629*** (0.3016)	0.2147 (0.4153)	0.5487 (0.3960)	0.6001 (0.4297)
healthctr				-0.0236*** (0.0048)	-0.0188*** (0.0045)	-0.0234*** (0.0025)	-0.0271*** (0.0048)	-0.0278*** (0.0055)
vhschooling					0.1543*** (0.0309)	0.0935** (0.0382)	0.1170** (0.0458)	0.1151** (0.0464)
prasjhh					-0.0067*** (0.0011)	-0.0014 (0.0010)	-0.0024* (0.0014)	-0.0026* (0.0014)
yos25_00						0.4239*** (0.0515)	0.6419*** (0.0744)	0.7331*** (0.0805)
Constant	8.6122***	8.4098***	9.6423***	6.7882***	6.0543***	4.0222***	2.9574***	2.3990***

	(0.0271)	(0.0746)	(0.8309)	(0.7381)	(0.8143)	(0.5518)	(0.4896)	(0.4384)
Observations	3,826	3,826	3,826	3,826	3,826	3,826	3,826	3,826
R-squared	0.008	0.384	0.555	0.694	0.728	0.795	0.813	0.826

Robust standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Causal Inference

We suspect that our OLS estimates in Table 2 biased because of two issues. Firstly, there may be a reverse causality between ethnic diversity and education. Regions that are relatively educated tend to be more favourable for ethnic mixture. Another issue is self-selection process, when family can choose where they live based on their preference on the neighbourhood characteristics, including the level of ethnic diversity and education level. There may be families who are convenient to live in diverse neighbourhoods, but other families may not. If their preference on ethnic diversity is correlated with unobservable characteristics of the family, which likely to be transmitted to their children, which also correlated with educational attainment, then the estimates in Table 2 will be biased.

We need instrumental variables for neighbourhood ethnic diversity to purge its correlation with unobservable confounders. Such instruments must meet two criteria. First, the instruments must be relevant, meaning they are good predictor for ethnic diversity index. The potential threat for this is if we get a weak instrument, which results in inefficient estimates. Technically, these instruments must be significant in the first stage estimation. The rule of thumb is the F-statistics from the first stage regression must not be less than 10. The second criterion is more challenging. The instruments must not have direct effect on the main outcome, educational attainment. In other words, the instrument should be excluded from the structural equation. Unfortunately, this criterion is not testable formally when we only have single instrument. If we can find more than one instruments and employ over-identified model, Hansen J-statistics and the p-value provide indication on the validity of our instruments under the null hypothesis that all instruments are valid. However, the results of the over-identification test must be evaluated with caution if all available instruments affect the endogenous variable by the same rationale (Murray 2006).

We propose topographic feature, in this case the share of village with flat topography, to instrument subdistricts’ ethnic diversity. We argue that flatness fits both criteria. Flat is expected to be positively correlated with ethnic diversity since this topographic feature can accommodate a wide range of skills and livelihoods. On the contrary, rugged surface and elevated topography may only be suitable for particular life skills embedded in fewer ethnic groups. There is also little to think that flat is correlated with unobserved characteristics, ability for example. More educated and skilled people may be expected to better able to locate near urban centres and main infrastructure. Once we control for infrastructure density and distance to district capital, flat will be virtually exogenous. In addition, our flat variable is expressed as the share of village within subdistrict with flat surface. Even if people with high ability prefer flat sites for their residence, they may not care with the rest of the villages in their subdistrict.

An alternative instrument for subdistrict ethnic diversity would be mean rainfall intensity, measured at district level, for the period 1978-1996. As part of tropical zones, Indonesia has a relatively wet climate. Our data shows the average district annual year is 2,336 mms, with the minimum and maximum values are 966.9 and 3575.9 mms respectively. The gross correlation between rainfall and ethnic diversity shows a relatively small positive value. However, when we control for the province dummies the correlation becomes negative, although the magnitude remains small, suggesting that lower rainfall associated with higher diversity within province. Given the high value of average rainfall, the correlation should be interpreted carefully as the less intensive rainfall provide more favourable environment for ethnic diversity. We argue that rainfall meets exclusion restriction criteria, meaning that regions with less intensive rainfall facilitate greater variation of skills and culture, but not necessarily correlated with unobservable confounders of education such as ability. In other words, controlling for infrastructure, distance to district capital, and other district’s characteristics, rainfall intensity affects educational outcomes only through ethnic diversity in the region.

4 RESULTS

Main findings

We start by estimating equation (1) by just identified 2SLS approach and later with over-identified model. In Table 3 we report the results of IV estimates in column 2-4, and column 1 provides OLS estimates as comparison. As in OLS model, we control for region’s characteristics (population, area size, share of village in coastal area), distance to district capital and distance from district to province capital, infrastructure (ratio of household with electricity connection, school density, distance to closest health center), and subdistrict social economic status (share of poor household and average education of village heads). We also fixed provincial effect to mitigate potential correlation between ethnic diversity and unobservable provincial characteristics. In the first stage estimations the value of F-statistics are above the rule of thumb 10 as well as Stock-Yogo critical value of 10% maximal IV size, suggesting our instruments are not weak. Compared to OLS, the IV estimates are significantly beneficial for educational outcomes. Using flat topography as an instrument, an increase in subdistrict ethnic diversity by 0.1 point leads to an increase in mean year of schooling by 0.6-0.7 years for three different cohorts. When we use rainfall to instrument ethnic diversity, the effect is between 0.4-0.5 years for the same increase in ethnic diversity. Employing all available instruments into an over-identified model, we find the effect of a 0.1 point increase in the index of ethnic diversity ranges from around 0.5 to 0.6 years more in the average schooling.

Table 3 The effect of ethnic diversity on year of schooling

VARIABLES	OLS	IV/2SLS		
	(1)	(2)	(3)	(4)
Cohort 16-22				
Coef. Of Ethnic Diversity	-0.2843 (0.1832)	5.7956*** (1.1228)	3.6169*** (0.6983)	4.4731*** (0.6367)
Endogeneity test stat.		93.24	65.26	139.30
Endogeneity P-value		0.00	0.00	0.00
Hansen's J test stat.				3.12
Hansen's J P-value				0.08
Cohort 22-25				
Coef. Of Ethnic Diversity	-0.4490* (0.2566)	7.1167*** (1.3839)	4.6576*** (0.8871)	5.6409*** (0.7895)
Endogeneity test stat.		100.33	76.00	160.44
Endogeneity P-value		0.00	0.00	0.00
Hansen's J test stat.				2.50
Hansen's J P-value				0.11
Cohort 25-28				
Coef. Of Ethnic Diversity	-0.4265 (0.2674)	6.9990*** (1.3785)	4.5056*** (0.8797)	5.5005*** (0.7809)
Endogeneity test stat.		93.11	68.26	149.14
Endogeneity P-value		0.00	0.00	0.00
Hansen's J test stat.				2.57
Hansen's J P-value				0.11
Instrument		Flat	Rainfall	Flat, rainfall
First-stage F-value		44.02	60.27	48.90
Stock-Yogo critical value (10%)		16.38	16.38	19.93
Observations		3826	3826	3826

Robust standard errors in parentheses, clustered at province level

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

In over-identified model, Hansen's J statistics are below the critical value at 5% confidence level, suggesting that we failed to reject the null hypothesis that all instruments are valid. However, for cohort 16-22 the J statistics is bigger than the critical value at 10% level, casting a doubt about the validity of one of our instruments, although it is still unable to reject the null hypothesis at 5% level. This may be related with the fact that the mean year of schooling in younger cohort has less variation. Our data indicates that the average of subdistricts' mean year of schooling for younger cohort (16-22) is 8.7 years with standard deviation around 1.3, while the mean figures for older cohorts are 9.1 years (22-25) and 8.9 years (25-28) with standard deviation of 1.6 and 1.7.

Another indicator for educational outcomes is school-level completion. So we re-estimate the equation (1) with school-level completion as a dependent variable. We calculate the share of population who completed education at primary, junior, and high school level for the same cohorts as we have in the estimation of mean year of schooling. The report is in Table 4. Most of the estimates by IV/2SLS are significantly different from OLS estimates. However in the estimation of the effect of ethnic diversity on primary-school completion, the coefficients of IV are not significantly different from OLS when we use rainfall as the instrument. We suspect this because two things or a combination of the two. First is the low variation in the primary-school completion across subdistricts. It should be noted that primary education has been made compulsory by the Government of Indonesia since 1984 and in 2010 Census the figure of primary school completion has been relatively high. Our data indicates that the average percentage of subdistrict population who at least graduated from primary school are 93.3 per cent, 92.9, and 92.4 for cohort 16-22, 22-25, and 25-28 respectively. Second is the construction of the rainfall instrument at district level, meaning that all subdistricts within similar district are assigned with the same intensity of rainfall.

Table 4 The effect of ethnic diversity on school-level completion

	OLS	IV/2SLS		
	(1)	(2)	(3)	(4)
<i>Outcome: completed primary</i>				
Cohort 16-22	-0.0053 (0.0106)	0.3135*** (0.0767)	0.0514 (0.0391)	0.1340*** (0.0376)
Endogeneity test stat.		27.49	2.23	16.31
Endogeneity P-value		0.00	0.14	0.00
Hansen's J test stat.				10.90
Hansen's J P-value				0.00
Cohort 22-25	0.0004 (0.0155)	0.3963*** (0.0903)	0.0455 (0.0461)	0.1625*** (0.0443)
Endogeneity test stat.		33.16	1.01	15.46
Endogeneity P-value		0.00	0.31	0.00
Hansen's J test stat.				14.70
Hansen's J P-value				0.00

Cohort 25-28	0.0004 (0.0175)	0.4206*** (0.0962)	0.0385 (0.0495)	0.1675*** (0.0471)
Endogeneity test stat.		33.04	0.63	14.49
Endogeneity P-value		0.00	0.00	0.00
Hansen's J test stat.				15.28
Hansen's J P-value				0.00
<i>Outcome: completed junior school</i>				
Cohort 16-22	-0.0863** (0.0404)	0.6781*** (0.1547)	0.5965*** (0.1220)	0.6296*** (0.1003)
Endogeneity test stat.		59.95	65.37	110.51
Endogeneity P-value		0.00	0.00	0.00
Hansen's J test stat.				0.19
Hansen's J P-value				0.66
Cohort 22-25	-0.0891* (0.0518)	0.7777*** (0.1707)	0.6744*** (0.1347)	0.7169*** (0.1103)
Endogeneity test stat.		67.59	68.96	119.51
Endogeneity P-value		0.00	0.00	0.00
Hansen's J test stat.				0.25
Hansen's J P-value				0.62
Cohort 25-28	-0.0916* (0.0538)	0.7647*** (0.1683)	0.6550*** (0.1327)	0.7004*** (0.1087)
Endogeneity test stat.		68.28	66.77	118.60
Endogeneity P-value		0.00	0.00	0.00
Hansen's J test stat.				0.29
Hansen's J P-value				0.59
<i>Outcome: completed high school</i>				
Cohort 22-25	-0.0660 (0.0393)	0.7049*** (0.1477)	0.7036*** (0.1260)	0.7041*** (0.0986)
Endogeneity test stat.		81.24	98.46	160.45
Endogeneity P-value		0.00	0.00	0.00
Hansen's J test stat.				0.00
Hansen's J P-value				0.99
Cohort 25-28	-0.0563 (0.0390)	0.6315*** (0.1348)	0.6551*** (0.1184)	0.6451*** (0.0911)
Endogeneity test stat.		72.09	90.51	146.81
Endogeneity P-value		0.00	0.00	0.00
Hansen's J test stat.				0.02
Hansen's J P-value				0.89
Instrument		Flat	Rainfall	Flat, rainfall
First-stage F-value		44.02	60.27	48.90
Stock-Yogo critical value (10%)		16.38	16.38	19.93
Observations		3826	3826	3826

Robust standard errors in parentheses, clustered at province level

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

5 DISCUSSIONS

Specification test

We check whether using different ethnic measures will affect our results. First, we re-estimate our model with ethnic diversity calculated using 630 group classification. Then we also try ethnic diversity in logarithmic form. And finally, we estimate the model with polarization index substituting for diversity index.

Table 5 The Effect of Ethnic Diversity on Student Outcomes, using 630 group classifications

VARIABLES	IV/2SLS		
	(2)	(3)	(4)
<i>Cohort 16-22</i>			
Coef. Of Ethnic Diversity	5.599*** (1.120)	3.256*** (0.621)	4.077*** (0.592)
Endogeneity test stat.	90.80	62.70	132.37
Endogeneity P-value	0.00	0.00	0.00
Hansen's J test stat.			4.18
Hansen's J P-value			0.04
<i>Cohort 22-25</i>			
Coef. Of Ethnic Diversity	6.903*** (1.383)	4.261*** (0.792)	5.205*** (0.737)
Endogeneity test stat.	98.46	75.50	156.19
Endogeneity P-value	0.00	0.00	0.00
Hansen's J test stat.			3.31
Hansen's J P-value			0.07

<i>Cohort 25-28</i>			
Coef. Of Ethnic Diversity	6.804*** (1.377)	4.137*** (0.787)	5.089*** (0.730)
Endogeneity test stat.	91.68	68.06	145.61
Endogeneity P-value	0.00	0.00	0.00
Hansen's J test stat.			3.38
Hansen's J P-value			0.06
Instrument	Flat	Rainfall	Flat, rainfall
First-stage F-value	39.97	68.24	49.70
Stock-Yogo critical value (10%)	16.38	16.38	19.93
Observations	3826	3826	3826

Robust standard errors in parentheses, clustered at province level

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 5 reports the results when ethnic diversity index is measured using 630 group classification, instead of 31 group. The gross correlation between the 630 and 31 indices is 0.96. Given this high correlation, we would expect that the main results are maintained. The coefficients of ethnic diversity across cohorts and instruments in the 630 group model have the same direction and significance as those in the 31 group model. In term of magnitude, the effect of ethnic diversity when topographic feature is used ranges from 0.6 to 0.7 more years of schooling for every 0.1 point increase. If the average rainfall is used the corresponding effect is between 0.3 and 0.4 more years. When both instruments are used, the effect is between 0.4 and 0.5 more years. The results of the endogeneity test suggest that the IV estimates are significantly different from OLS for all cohorts and instruments used. The first-stage F values are well above the critical values, so we confident enough that our instruments are not weak. However, the overidentified specification does not pass Hansen’s overidentification test for cohort 16-22, suggesting one of the instrument is not valid.

Table 6 The Effect of Ethnic Diversity on Student Outcomes, with Ethnic Diversity in logarithmic form

VARIABLES	IV/2SLS		
	(1)	(2)	(3)
<i>Cohort 16-22</i>			
Coef. Of Ethnic Diversity	0.681*** (0.121)	0.795*** (0.200)	0.716*** (0.104)
Endogeneity test stat.	106.73	66.51	159.11
Endogeneity P-value	0.00	0.00	0.00
Hansen's J test stat.			0.27
Hansen's J P-value			0.61
<i>Cohort 22-25</i>			
Coef. Of Ethnic Diversity	0.840*** (0.148)	1.040*** (0.257)	0.900*** (0.128)
Endogeneity test stat.	113.24	77.40	178.33
Endogeneity P-value	0.00	0.00	0.00
Hansen's J test stat.			0.53
Hansen's J P-value			0.47
<i>Cohort 25-28</i>			
Coef. Of Ethnic Diversity	0.828*** (0.147)	1.010*** (0.253)	0.883*** (0.127)
Endogeneity test stat.	104.63	69.71	166.21
Endogeneity P-value	0.00	0.00	0.00
Hansen's J test stat.			0.44
Hansen's J P-value			0.51
Instrument	Flat	Rainfall	Flat, rainfall
First-stage F-value	65.35	26.97	44.89
Stock-Yogo critical value (10%)	16.38	16.38	19.93
Observations	3826	3826	3826

Robust standard errors in parentheses, clustered at province level

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

In table 6, we reports the result of the model with ethnic diversity, calculated by 31 group classification, is transformed into logarithmic form. The interpretation of the coefficient will be the effect on the year of schooling as a result of a percentage change in the ethnic mix in the subdistrict. In other word, the marginal effect will not be linear with the effect will diminish as the diversity keeps increasing. The direction and the significance of the main coefficient are maintained. For every 10 per cents increase in the level of ethnic diversity in the subdistrict will lead to an increase by 0.07-0.08, 0.08-0.10, and 0.07-0.09 when flat, rainfall, and both instruments are used, respectively. Interestingly, the log form model pass all the statistical tests.

Table 7 The Effect of Ethnic Diversity on Year of Schooling, with Ethnic Diversity is expressed as polarization index

VARIABLES	IV/2SLS		
	(1)	(2)	(3)
<i>Cohort 16-22</i>			

Coef. Of Ethnic Diversity	3.409*** (0.594)	3.557*** (0.824)	3.461*** (0.489)
Endogeneity test stat.	95.76	61.21	145.45
Endogeneity P-value	0.00	0.00	0.00
Hansen's J test stat.			0.02
Hansen's J P-value			0.88
<i>Cohort 22-25</i>			
Coef. Of Ethnic Diversity	4.203*** (0.728)	4.656*** (1.061)	4.359*** (0.602)
Endogeneity test stat.	103.67	72.46	166.07
Endogeneity P-value	0.00	0.00	0.00
Hansen's J test stat.			0.13
Hansen's J P-value			0.72
<i>Cohort 25-28</i>			
Coef. Of Ethnic Diversity	4.143*** (0.728)	4.520*** (1.047)	4.274*** (0.598)
Endogeneity test stat.	96.78	65.67	155.70
Endogeneity P-value	0.00	0.00	0.00
Hansen's J test stat.			0.09
Hansen's J P-value			0.76
Instrument	Flat	Rainfall	Flat, rainfall
First-stage F-value	65.53	32.41	46.51
Stock-Yogo critical value (10%)	16.38	16.38	19.93
Observations	3826	3826	3826

Robust standard errors in parentheses, clustered at province level

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

When the polarization index is used instead of the diversity index, the inference is maintained, as shown in Table 7. The correlation between two index is high, around 0.93. However graphically the polarization index is a hump-shaped curve with the maximum is reached when the number of ethnic diversity is two, with both have equal group size, and the values get lower in either sides. This suggest an optimum level of diversity, with the extreme values of homogeneous and very fragmented society as detrimental to knowledge accumulation. Using different instruments, the schooling effect of ethnic polarization is positive with point estimates ranging between 0.34 and 0.47 more years of schooling for every 0.1 increase in ethnic polarization index. In terms of statistical tests, the first stage F values suggest that our instruments are not weak. The results of the endogeneity test also suggest that ethnic polarization should not be treated as exogenous. Furthermore, in the overidentification test, we cannot reject the null hypothesis that all instruments are valid.

Heterogenous effect

One may wonder if the ethnic diversity affects differently between migrants and residents. In this section we test this by estimating the model only for the stayers or those stay in their birth place. We identify this group in the census data as subpopulation whose birth place and current place are the same.

Table 8 The Effect of Ethnic Diversity on Year of Schooling, for Stayers Only

VARIABLES	OLS	IV/2SLS		
	(1)	(2)	(3)	(4)
<i>Cohort 16-22</i>				
Coef. Of Ethnic Diversity	-0.330* (0.186)	5.337*** (1.054)	3.168*** (0.648)	4.014*** (0.595)
Endogeneity test stat.		85.13	56.75	123.92
Endogeneity P-value		0.00	0.00	0.00
Hansen's J test stat.				3.55
Hansen's J P-value				0.06
<i>Cohort 22-25</i>				
Coef. Of Ethnic Diversity	-0.548** (0.252)	6.296*** (1.274)	3.823*** (0.808)	4.811*** (0.726)
Endogeneity test stat.		86.99	59.94	131.27
Endogeneity P-value		0.00	0.00	0.00
Hansen's J test stat.				3.04
Hansen's J P-value				0.08
<i>Cohort 25-28</i>				
Coef. Of Ethnic Diversity	-0.573** (0.252)	5.981*** (1.250)	3.345*** (0.777)	4.396*** (0.702)
Endogeneity test stat.		77.78	47.09	112.35
Endogeneity P-value		0.00	0.00	0.00
Hansen's J test stat.				3.62
Hansen's J P-value				0.06
Instrument		Flat	Rainfall	Flat, rainfall
First-stage F-value		45.21	61.36	50.01
Stock-Yogo critical value (10%)		16.38	16.38	19.93

Observations	3826	3826	3826
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Robust standard errors in parentheses, clustered at province level

*** p<0.01, ** p<0.05, * p<0.1

As reported in Table 8, the sign and the statistical significance of the coefficients of ethnic diversity for stayers subpopulation confirm our main results. However, compared to the main results, the magnitude of OLS coefficients are bigger while that of IV/2SLS one are smaller in the stayers estimation than the corresponding coefficients in the whole population. For causal inference we focus on the IV estimates. The analysis for stayers subpopulation suggests that the schooling effect of an increase in ethnic diversity by 0.1 point is between 0.3 and 0.6 more years of schooling for three different cohorts and across instruments. This results also suggest the effect in the main results (0.4-0.7) is magnified by the performance of the migrants.

Possible channels

We speculate that there might be two competing effects in play in the relationship between ethnic diversity and educational outcomes. As suggested in the literature, ethnic diversity may facilitate progressiveness through the assimilation process. Children learn from their peer and adults in their communities and families may have higher expectation because they are exposed to better and varied example than they would have in the homogeneous communities. It is likely that in diverse society the standard of achievement becomes higher due to competition among individuals with different talents. To see this, we regress the correlation between ethnic diversity and various indicators as proxies for talent diversity. Firstly, we use employment diversity and the availability of different life-skills training in the society to proxy talent variation among population. For employment diversity, we use information in the 2000 census on employment, classified in 9 industries. While for constructing training variation variable we use information in the 2000 Podes (Village Census) on the availability of the following training activities in the village: mechanics, electronics, typewriting, language, bookkeeping, culinary, sewing, agriculture, computer, carpentry, handicraft, and fashion. We expect these variables, after controlling for regions’ social economic conditions represent the pool of talents available in the communities. Simply put, comparing regions with the same level of social economic development, regions with more variation in employment and life-skills training would have greater pool of talents.

Secondly, we also check the correlation between subdistrict ethnic diversity and community’s facilities build in the village for hobbies or sport activities. In this case we use information on the availability of soccer and volley courts in subdistricts from the 2000 Podes.

As for the potential negative effects that commonly associated with ethnic diversity, we check its correlation with some indicators as proxies for cooperation and trust among subdistrict residents. We use information on the existence of *gotong-royong* (community-based self-help activities) and *karang-taruna* (youth organization) to represent cooperation. In addition, we use the incidence of fighting to represent trust. In most literature, ethnic diversity is expected to reduce the willingness to cooperate and erode trust among villagers.

Table 9 Ethnic diversity and regions’ characteristics

VARIABLES	(1) employment	(2) training	(3) soccer	(4) volley	(5) gotongroyong	(6) karangtaruna	(7) fighting
ef31_00	0.137** (0.0615)	0.460 (0.326)	0.125* (0.0635)	0.114 (0.0701)	0.0260 (0.0324)	0.0969* (0.0512)	0.0331* (0.0179)
coastal	0.109*** (0.0187)	0.507** (0.206)	-0.00566 (0.0265)	0.0230 (0.0227)	-0.0324 (0.0211)	-0.0117 (0.0386)	0.0188 (0.0140)
lpop15_00	0.0141 (0.00973)	1.119*** (0.144)	0.0481** (0.0177)	0.0178 (0.0147)	0.0159* (0.00867)	0.00223 (0.0109)	0.00964** (0.00434)
electricityhh	0.00127*** (0.000205)	-0.00617** (0.00299)	0.00102* (0.000514)	0.000997** (0.000411)	0.000662*** (0.000203)	0.00128*** (0.000418)	0.000199** (8.39e-05)
prasjhh	-0.000434 (0.000425)	-0.00703*** (0.00237)	-0.00125** (0.000511)	-0.000852*** (0.000282)	-0.000163 (0.000332)	-0.000552 (0.000375)	0.000267** (0.000114)
ldistokab	-0.0189** (0.00846)	-0.581*** (0.0612)	0.0850*** (0.00929)	0.0354*** (0.00745)	0.000126 (0.00313)	-0.0215** (0.00819)	-0.0105*** (0.00360)
ldiskabprov	0.00597 (0.00421)	0.0587 (0.0588)	0.0352*** (0.00852)	0.0181** (0.00866)	0.00139 (0.00396)	-0.00534 (0.00559)	0.000909 (0.00315)
lgrdp_00	0.0207** (0.00837)	0.213** (0.0958)	0.0286** (0.0119)	0.00347 (0.00895)	-0.00634 (0.00905)	-0.0137 (0.0141)	0.00989** (0.00396)
vhschooling	-0.00861* (0.00444)	0.0594* (0.0327)	0.0183*** (0.00504)	0.0137*** (0.00485)	0.00853* (0.00452)	0.0173*** (0.00601)	0.00258 (0.00225)
yos25_00	0.0131 (0.0161)	0.817*** (0.121)	-0.00957 (0.0142)	0.000664 (0.0114)	-0.0105 (0.00761)	-0.000874 (0.00998)	-0.00417 (0.00489)
Constant	0.145 (0.132)	-15.57*** (1.975)	-0.864** (0.413)	0.211 (0.253)	0.805*** (0.149)	0.830*** (0.299)	-0.204*** (0.0722)
Observations	3,780	3,780	3,780	3,780	3,780	3,780	3,780
R-squared	0.410	0.445	0.312	0.249	0.203	0.449	0.088

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The results are reported in Table 9. The coefficients of ethnic diversity are as expected for employment variation and soccer court. Subdistricts with higher degree of ethnic mixture tend to have greater variation in employment, controlling for infrastructure, adults' education and other regions' characteristics. This support the idea of talent complementarity. More heterogenous communities also tend to have facilities for hobby. Again this support our speculation about greater pool of talent. Interestingly, popular concerns about the erosion of the willingness to cooperate is not supported by our data. There is no correlation between ethnic diversity and the existence of community-based activities, and even more surprisingly more heterogenous subdistricts tend to have more village with active youth organization. On the other hand, the association between ethnic diversity and the incidence of fighting tend to support diversity debit hypothesis. The probability of fighting incidence increases with ethnic diversity.

Overall, the results in Table 9 suggest that the mechanism by which ethnic diversity benefits educational outcomes works through the availability of greater talent pool in the society. By exposing to many different types of skills children learn from other and help them in accumulating knowledge. Furthermore, the concern on lack of cooperation in diverse society is also not proved.

Regional features

Finally, we want to know whether the results are consistent if we limit the observation only for Outer Islands. It is reasonable to think that the results are driven by Java, given the size of the population and the level of development. Although Java only makes up around 6 per cent to total land area, the number of subdistrict in Java is 1,872, or about 49 per cent of total subdistrict (including Madura). As a results, our sample drop almost by half, from 3,826 to 1,954 subdistrict. This smaller sample size may affect the credibility of our estimate because of IV finite sample property. The biasness of IV estimate may also increase if our instruments are weak.

The results of Outer-Islands estimation in general maintain our main results, as shown in Table 10. The sign of the coefficients are consistent, but with the magnitude of the effect falls by around half of the magnitude in the main results. Attention should be given to the IV estimates using rainfall as instrument, which do not pass the endogeneity test. This is likely caused by weak instrument, as indicated by the low F value in the first stage estimation. Consequently, the standard errors become larger so the IV estimate is biased toward OLS. This is salient in the estimate of 16-22 cohort. On the other hand, the statistical tests for model with flat as instrument and overidentified model suggest that IV estimates are consistent. Overall, the results of subpopulation analysis confirm the main results that ethnic diversity, on average, is beneficial for subdistrict human capital formation.

Table 9 The Effect of Ethnic Diversity on Year of Schooling, Outer Islands only

VARIABLES	OLS	IV/2SLS		
	(1)	(2)	(3)	(4)
<i>Cohort 16-22</i>				
Coef. Of Ethnic Diversity	-0.1979 (0.1193)	2.6801*** (0.8805)	1.4990 (1.4403)	2.4367*** (0.7718)
Endogeneity test stat.		16.65	1.84	17.54
Endogeneity P-value		0.00	0.18	0.00
Hansen's J test stat.				0.40
Hansen's J P-value				0.53
<i>Cohort 22-25</i>				
Coef. Of Ethnic Diversity	-0.2814 (0.1710)	2.9840*** (1.0403)	3.8682* (2.2971)	3.1671*** (0.9337)
Endogeneity test stat.		14.87	7.03	21.76
Endogeneity P-value		0.00	0.01	0.00
Hansen's J test stat.				0.14
Hansen's J P-value				0.71
<i>Cohort 25-28</i>				
Coef. Of Ethnic Diversity	-0.2441 (0.1876)	3.1026*** (1.0803)	4.1711* (2.4289)	3.3243*** (0.9704)
Endogeneity test stat.		14.51	7.23	21.79
Endogeneity P-value		0.00	0.01	0.00
Hansen's J test stat.				0.19
Hansen's J P-value				0.67
Instrument		Flat	Rainfall	Flat, rainfall
First-stage F-value		30.83	6.78	19.16
Stock-Yogo Critical value (10%)		16.38	16.38	19.93
Stock-Yogo Critical value (15%)		8.96	8.96	11.59
Observations		3826	3826	3826

Robust standard errors in parentheses, clustered at province level

*** p<0.01, ** p<0.05, * p<0.1

6 CONCLUSION

Our analysis finds that ethnic diversity is beneficial for human capital accumulation. Using full-count data from two waves of Population Census and employing instrumental variable approach we correct the downward bias on the relationship between ethnic diversity and average year of schooling at subdistrict level. The results suggest that exposure to ethnic diversity during primary to high school age leads to more years of formal education in the subsequent stage, 10 years later.

The benefits are not only accrued to migrants, who are generally associated with more ability and agility, but also to stayers. The mechanism behind ethnic diversity benefit is likely through a greater pool of talent which in turn facilitate a spill over effects from the talented persons or groups to the rest of society. The concern that this process will be offset by eroded trust and willingness to cooperate among member of society is also not proved. In our research context, children in ethnically diverse communities are likely to reap more benefit through peer effects and their interaction with adults than children in homogeneous society. The results of our analysis provide supports for policies promoting multiculturalism and assimilation, especially in educational sector.

REFERENCES

- Ahlerup, P. and Olsson, O. (2012) 'The roots of ethnic diversity', *Journal of Economic Growth*. doi: 10.1007/s10887-011-9075-0.
- Alesina, A. and Ferrara, E. La (2005) 'Ethnic Diversity and Economic Performance', *Journal of Economic Literature*, XLIII, pp. 762–800.
- Alesina, A. and Zhuravskaya, E. (2008) 'Segregation and the quality of government in a cross-section of countries', *American Economic Review*, 101(5), pp. 1872–1911. doi: 10.1257/aer.101.5.1872.
- Alesina, A. et al. (2003) 'Fractionalization', *Journal of Economic Growth*. doi: 10.1023/A:1024471506938.
- Almond, D. and Currie, J. (2011) 'Killing Me Softly: The Fetal Origins Hypothesis', *Journal of Economic Perspectives*, 25(3), pp. 153–172. doi: 10.1257/jep.25.3.153.
- Arifin, E. N. et al. (2015) 'Quantifying Indonesia's Ethnic Diversity: Statistics at National, Provincial, and District levels', *Asian Population Studies*. doi: 10.1080/17441730.2015.1090692.
- Badan Pusat Statistik (2010) *Kewarganegaraan, Suku Bangsa, Agama, dan Bahasa Sehari-hari Penduduk Indonesia: Hasil Sensus Penduduk Indonesia 2010* (Citizenship, Ethnicity, Religion, and Daily Language of Indonesian: Results of the 2010 Population Census).
- Barker, D.J.P. (1990) 'The Fetal and Infant Origin of Adult Disease', *BMJ* 301 (6761): 1111.
- Braster, S. and Dronkers, J. (2013) 'The positive effects of ethnic diversity in class on the educational performance of pupils in a multi-ethnic European metropole', Discussion Paper Series CDP No 18/13, Centre for Research and Analysis of Migration, Department of Economics, University College London.
- Coleman, J.S. (1988) 'Social Capital in the Creation of Human Capital', *American Journal of Sociology*, 94, pp. S95-S120.
- Collier, P. (2000) 'Ethnicity, Politics, and Economic Performance', *Economics and Politics*, 12 (3), pp. 225-245.
- Conti, G., Heckman, J. and Urzua, S. (2010) 'The education-health gradient', in *American Economic Review*. doi: 10.1257/aer.100.2.234.
- Cribb, R. (2000) *Historical Atlas of Indonesia*, Curzon Press.
- Currie, J. and Vogl, T. (2013) 'Early-Life Health and Adult Circumstance in Developing Countries', *Annual Review of Economics*, 5(1), pp. 1–36. doi: 10.1146/annurev-economics-081412-103704.
- Easterly, W. et al. (1997) 'AFRICA'S GROWTH TRAGEDY: Policies and Ethnic Divisions*'. Available at: <http://www.worldbank.org/html/prdmg/grthweb/growth.t.htm>.
- Gerring, J. et al. (2015) 'Does diversity impair human development? A multi-level test of the diversity debit hypothesis', *World Development*. doi: 10.1016/j.worlddev.2014.07.019.
- Gisselquist, R. M., Leiderer, S. and Niño-Zarazúa, M. (2016) 'Ethnic Heterogeneity and Public Goods Provision in Zambia: Evidence of a Subnational "Diversity Dividend"', *World Development*, 78, pp. 308–323. doi: 10.1016/j.worlddev.2015.10.018.
- Glewee, P. and Miguel, E.A. (2008) 'The Impact of Child Health and Nutrition on Education in Less Developed Countries', *Chapter 56 of Handbook of Development Economics*, Vol. 4, Elsevier B.V. doi: 10.1016/S1573-4471(07)04056-9.
- Glewwe, P., Jacoby, H. G. and King, E. M. (2001) 'Early childhood nutrition and academic achievement: A longitudinal analysis', *Journal of Public Economics*, 81(3), pp. 345–368. doi: 10.1016/S0047-2727(00)00118-3.
- Grossman, M. (1972) 'On the Concept of Health Capital and the Demand for Health', *The Journal of Political Economy*, 80 (2), pp. 223-255.
- Heckman, J., Pinto, R. and Savelyev, P. (2013) 'Understanding the mechanisms through which an influential early childhood program boosted adult outcomes', *American Economic Review*. doi: 10.1257/aer.103.6.2052.
- Hoddinott, J. et al. (2011) 'The Consequences of Early Childhood Growth Failure over the Life Course', IFPRI (International Food Policy Research Institute) Discussion Paper 01073, Poverty, Health, and Nutrition Division.
- Lee, N. (no date) 'Migrant and ethnic diversity, cities and innovation: Firm effects or city effects?' doi: 10.1093/jeg/lbu032.
- Michalopoulos, S. (2008) *The Origins of Ethnolinguistic Diversity: Theory and Evidence*. Department of Economics, Tufts University.
- Montalvo, J.G. and Reynal-Querol, M. (2005) 'Ethnic diversity and economic development', *Journal of Development Economics*, 76, pp. 293-323. doi: 10.1016/j.jedevo.2004.01.002.
- Murray, M.P. (2006) 'Avoiding Invalid Instruments and Coping with Weak Instruments', *Journal of Economic Perspectives*, Volume 20 (4), pp. 111–132.
- Nunn, N. and Puga, D. (2012) 'Ruggedness: The Blessing of Bad Geography in Africa', *Review of Economics and Statistics*, 94(1), pp. 20–36. doi: 10.1162/REST_a_00161.
- Ozman, M. and Erdil, E. (2013) 'Cultural Diversity, Knowledge Diversity'.
- Parrotta, P., Pozzoli, D., and Pytlikova, M. (2011) 'Does Labor Diversity affect Firm Productivity?', NORFACE Migration Discussion Paper No. 2011-22.
- Putnam, R.D. (2007) 'E Pluribus Unum: Diversity and Community in the Twenty-first Century, The 2006 Johan Skytte Prize Lecture', *Scandinavian Political Studies*, 30 (2), pp. 137-174.
- Ramasamy, B. and Yeung, M. C. H. (2016) 'Diversity and innovation', *Applied Economics Letters*. doi: 10.1080/13504851.2015.1130785.
- stang
- Van Lottum, J and Marks, D. (2012) 'The Determinant of Internal Migration in a Developing Country: Quantitative Evidence for Indonesia, 1930-2000', *Applied Economics*, 44:34, 4485-4495, DOI: 10.1080/00036846.2011.591735

SS20.1. Gender and Social Justice

1089 REPRODUCTIVE LABOR AND COMMERCIAL SURROGACY: A CASE STUDY IN NEW DELHI, INDIA

ABSTRACT

Under the globally stratified biopolitical economy, the development of reproductive technologies and “outsourcing” of reproductive materials have led to the rise of reproductive industries in third world countries like India, and the involvement of women from the socio-economically disadvantaged background in the production process has been analyzed and critiqued in myriads of ways. This study aims to establish commercial surrogacy as a form of gendered labor practice in the Indian context. It examines how commercial surrogates are able to exercise their rights and agency in India’s surrogacy industry as reproductive laborers. Contemporary theoretical and empirical evidence clearly suggests that commercial surrogacy, empowering or not, provides employment for women from difficult backgrounds, and can be associated with the process of economic production in a market economy. The methodology primarily involves participant observation, including in-depth semi-structured interviews with the participants of commercial surrogacy, as well as workplace observations to gain insight of the surrogate’s day- to- day lives. The issues addressed here are empirically substantiated by field observation and case studies. The study involves a multiple case study set in the National Capital Region of Delhi (NCR) between October of 2016 and April of 2017. Given the present political scenario in India, with a proposed ban on commercial surrogacy; the economic activity today operates as undetected as possible. Due to the ethical aspects of the issue and the difficulty to locate informants for the study, snowball sampling method was adopted for the study. Surrogate mothers, fertility specialists, surrogacy agency owners, and surrogacy agents were interviewed in order to observe and understand the complexities of work and labor in surrogacy industry in India. This paper will present an illustration of the network through which surrogacy industry operates in India by identifying and mapping the segments of commercial surrogacy as an intertwining web of people and technology. The argument is based on the evidence derived from workplace and participant observations in the field and interviews with different stakeholders of surrogacy services, in order to understand the processes through which individuals operate and form a network within which power imbalances fuel the economic production. Further, the disposable nature of the labor in this highly commercialised process is alarming. Also, the disadvantaged socio-economic background that limits the surrogate’s decision-making capacity and their ability to exercise their agency as laborers in a production process reiterates the issue of commodification and exploitation. Commercial surrogacy in India has always been approached with a critical stance, owing to the traditional gender relations prevailing in Indian Society. As a result, surrogacy as a form of a labor practice is grossly undermined, something this paper attempts to address. The government’s abolitionist stance on surrogacy needs to be reconsidered and policies on surrogacy should be framed from a more pragmatic approach.

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1295 GENDERED LANDSCAPE OF FEAR IN PUBLIC SPACE IN KOLKATA, INDIA

ABSTRACT

Existing research on fear of victimization in public spaces substantially pointed out its negative impact on women’s mobility, and corresponding restriction on their freedom and right to city space. Eminent scholars have argued that, albeit the apparent visibility of women in urban landscape, they do not possess equal access to public space with that of men. This produces gendered space, which increases and also gets reinforced through fear of violent crime, shaping geographies of spatial intervention by women. This paper focuses on fear induced production of gendered public spaces in otherwise acclaimed, one of the safest city scope for women in India - Kolkata. The city, has always been considered to be safe for women compared to other metropolis of the country. The robust social cohesion, neighbourhood appendage and its rich cultural heritage provided its women with secure social environment and (comparatively) fair command over public space. Nonetheless with the recent increase in the reporting of violent incidences in and around the city, the ‘being safe for its women’ image stands challenged and is questioned. The escalating rates of violent crime is perceived to have increased fear of victimization and reduced spatial confidence among the women of the city; restricting and reshaping their mobility and thus creating gendered spaces. Therefore an attempt is made to examine the real situation against the perceived notion; study the degree of change in the social environment of the city; the factors resulting in production of fear; and to what extent gendered spaces are being produced and (re)produced. The study is largely based on personal interviews nonetheless information from National Crime Records Bureau, Kolkata Police Station and newspaper reports are also used. The subjects for the study includes both men and women of various age cohort, however the lower range is kept at 16 years. It will therefore capture different perspectives and the varied gendered nuances that influence and also get influenced through the social process. The questionnaire used is extensively qualitative in nature along with necessary quantitative aspects. The choice of extensive usage of qualitative method is deliberately done as quantifying fear would reduce the importance of the study. A preliminary survey was conducted to get larger perspective of the people regarding their perception about the places unsafe in Kolkata and the rationale behind that. On the basis of that the sites are chosen to examine the real scenario. Having said that the study reveals (provisional) that the larger perception of people about a certain area being unsafe depends on the built area characteristics, social cohesion and feeling of “otherness”. Nonetheless the fear of victimization is very much present among women which modifies their mobility and accessibility of public spaces. Moreover, the slow alteration in the social dynamics from a cohesive society to one that is more egocentric and less empathetic towards the victim proves to be a major obstacle in creation of safer space for women. Key words: gendered space, urban landscape, social cohesion, fear, crime, restricting mobility, spatial confidence, otherness.

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1381 CULTURE INDUSTRY AND GENDERED SPACES' STEREOTYPING IN HINDI CINEMA IN SELECT FILMS POST 1990

ABSTRACT

“Gender Bias Without Borders” (2014) reported of a high sexualisation of women in films made in India. The report identified media as an important tool shaping the development of nations and included ‘Women and Media’ as a section stating its objective as “Increase the participation and access of women to expression and decision- making in and through the media and new technologies of communication”. India’s report on implementation of the above gave a very vague description of the methods, intending practice particularly through media without any particular reference to women. Constant upheavals against various portrayals and the association with identity has cast serious doubts about any improvement in the continuing scenario. An attempt has been made to decipher the elements of ‘Bollywood’ that reinforce the application of the term ‘culture industry’, particularly the way commodified culture converts depictions of reality and appropriates, while defining and producing gendered spaces and stereotyping them in the process. Cinema thus as a form of entertainment based on fusion of amusement and knowledge, the way it combines the workings of pleasure and reality to form the industry producing meaning for the imagination of the viewers possesses great potential of bringing social change. Moreover, the cinema has the potential where identities are constructed and deconstructed with respect to the space by the manufacturers of the products of culture industry. The contents of Hindi cinema are examined in relation to the representations of identities as products of social and cultural interactions. The content analysed is of both mainstream and parallel cinema in select films post 1990 analysing the influence of the changes encountered under the Structural Adjustment in India post liberalisation, the major factor being increased influence of Global interaction through capital flow and culture flow, especially through the medium of mass media. The reach of cinema in India in terms of its effects is immense and thereby is looked at as an important tool of shaping the nation’s imagination. The movies selected are on the basis of their gross earnings and felicitation of awards of National recognition for both popular and critic appreciation. The parallel are also selected through an additional filter of being women centred. The movies are analysed on the basis of the portrayals of the male and female protagonists primarily, and the other lead roles as per the individual narratives. The perceptions are described and analysed as elaborated by the characters or as relatable to the referred literature. The main grounds identified for the production of commodified culture are i. The Regional / Location, ii. The Religion, and iii. The Gender. The gendered spaces are identified on the basis of the portrayals in the context of i. The Home, ii. The Workplace, and iii. The Marketplace / Street. The research overall succeeds in bringing out the properties of Hindi cinema as a mass producer of stereotyped images and spaces, serving its purpose as an industry aimed at profit maximisation by following the established “formulas”.

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SS20.2. Gender and Social Justice

1412 WOMEN'S ACCESS TO HIGHER EDUCATION IN INDIA: AN ANALYSIS OF DISTRIBUTION AND QUALITY

ABSTRACT

In the post-economic reform period, there has been an unprecedented increase in growth of higher education system (HEIs) and enrolment in India. However, the presence of HEIs fails to guarantee equal access to all, especially in a society where gender is an important determinant of exclusion. The institutional- structural constraints regarding distribution and quality of HEIs are major factors to women’s participation in HE in India. This necessitates examining how much equitable and inclusive higher education system has become for women in the post-economic reform era. The study analyses the level of participation of women through GER and Eligible enrolment ratio in higher education at graduate and above level. Sopher’s disparity index measures the extent of gender disparity in enrolment among different social groups and rural-urban populations. The study tries to enquire how the distribution of HEIs affects the women’s accessibility to HE in India through an association between women’s access and college population density, the average size of enrolment per college across states and the nature of concentration of HEIs in a state. The rampant increase of private- aided HEIs has given rise to various levels of educational infrastructure which interfere with the affordability of HEIs and choices made. In the recent observations, we recognize an increase in women’s participation in HE, though the scheduled women suffer discrimination in access. The gender disparity is wider for rural women; however, in recent years, convergence is observing in its rural-urban differential. The study suggested that enrolment in local private colleges compromises the quality of education though offer better accessibility. At the same time, better quality of educational infrastructure in urban centers acts as motivation to women’s participation in HE through better access to hostels, common rooms, etc.

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1504 FEMALE STREET VENDORS: A CASE STUDY FROM WEST BENGAL

ABSTRACT

At present a sizeable proportion of socio-economically poor women both from rural and urban areas are engaged in street vending in the urban areas. In the study areas these women mainly consists of Scheduled castes and 'Atraf' Muslim. Separated, widow and divorced women are forced to take part in such work due to absence of adult income able male persons in the family. Along with them very scanty income of some married women's husbands drove them in doing street vending. These women can easily engaged in such work, as these economic activities need nearly no education, very low skill and very small financial inputs. For these reasons illiterate or very low educated poor women from far off rural areas come to the road side areas of the city for selling mainly non- standardized and low priced raw vegetables and flowers. These women start to work nearly mid-night and go back home in the afternoon. These women could not have proper food during their long working period. Very few of them manage to arrange overhead shade to protect them from heavy rains and scorching sunrays. Even after doing very hard work these women earn very little amount of money that they used for family maintenance and can't save anything . They also could not look after their children properly, as a sizeable proportion of these women left their children abundantly at home. These women are forced to donate money for different local festivals and ceremonies. Though these women work for the whole life they do not have any old age financial security. The study area of this research work located on both side of Dum Dum station along Dum Dum Road. This study area is situated both in Kolkata and North Twenty-four Parganas districts of West Bengal. For this research work percentage and correlation matrix are used. Key Words : Street Vendors, socio-economically poor women, low priced selling objects, rural women, illiterate low skilled women.

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SS20.3. Gender and Social Justice

1674 XENOPHOBIC VIOLENCE, TRAUMA, DISPLACEMENT AND REINTEGRATION: A CASE STUDY OF FEMALE MIGRANTS IN ISIPINGO, DURBAN, SOUTH AFRICA

ABSTRACT

Xenophobia has become a serious problem in South Africa since the dawn of democracy. South Africans have been accused of being “Afro-phobic”, as their xenophobia is mostly aimed at other African nationals in the country. Socio-economic conditions, relative deprivation and apartheid’s legacy foster xenophobia amongst South Africans. Female migrants have not been spared, and are especially vulnerable to xenophobic attacks due to their political status, and are exposed to human rights abuses, and experience of different forms of violence – physical, emotional, sexual, psychological and institutional. This paper focuses on the injustices that are inflicted on female refugees and undocumented migrants in South Africa. More specifically, this paper adopts a qualitative approach to investigate the trauma, displacement and reintegration of female migrants with reference to the 2015 xenophobic attacks in Isipingo, Durban, South Africa. A major concern was the health and safety conditions in displacement camps, and the challenges encountered by female migrants. The study revealed that prior to the xenophobic violence, the migrant women had received verbal threats to evacuate the area before they were attacked. However, the magnitude of the xenophobic attacks was unexpected. The displacement camps that were situated along the Isipingo Beach and the Chatsworth areas, had housed a massive population that deprived women of privacy and separate sanitation facilities. The purpose of the displacement camps was to provide a safe zone for migrants until the xenophobic violence had subsided. However, strategies to prevent violence and crime from occurring inside the confined camps were not considered. As the camp population increased, resource provisioning was inadequate. Re-integration of displaced women to their domiciles in Isipingo was a difficult process. Migrant women in Isipingo have been experiencing more insidious forms of xenophobic violence such as rape, ethnic discrimination and emotional abuse. Conceptually, this study was influenced by feminism and gendered migration perspectives. Women in Isipingo faced a ‘double jeopardy’ - being foreign and female. They encountered gender specific challenges during displacement and reintegration in specific localities. Females were more vulnerable to human rights abuses, making them one of the most helpless groups during xenophobic violence. Migrant women suffered the most injustices and trauma in displacement camps, and returning to their homes in Isipingo was deemed unsafe and risky. The hostility of local citizens poses a larger problem for the peaceful reintegration of migrant women back into their society in their original localities. Keywords: Female migration, displacement, xenophobia, trauma, violence, Isipingo, Durban, South Africa

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1695 ROLE OF TRADITIONAL KNOWLEDGE-BASED INDUSTRIES FOR INCLUSIVE DEVELOPMENT OF REGION: CASE OF WEST MITHILA REGION, BIHAR, INDIA

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ABSTRACT

The inclusive regional development can be based on the integration of marginalized stakeholders of the development process. In the marginalized section, major shares belong to women which constitutes half of the population. According to SDG 2030 of United Nations, gender and social justice are one of the 17 goals for achieving the target of sustainable development of any place or region. In most of the development programs for gender equality, women are treated as the target group which leads to the continuation of their subordinate role in socio-economic dimensions. It has been observed from the employment scenario of women in India, 53% of the working women are involved in the traditional knowledge-based industries followed by the 33% of the casual wage workers. Hence by tapping the potential of traditional knowledge-based industries can be resulted in the active inclusion of women in the development process of the region which is way more sustainable and inclusive in nature. In this paper, the role of traditional knowledge-based industries will be discussed as the potential tool for inclusive development of the region and as well achieving gender equality and social justice.

Keywords: Inclusive development, marginalized, sustainable, gender equality, social justice

1 INTRODUCTION

India is emerging as one of the fastest growing economies across the globe. With this growing economy, India has to ensure that its development path should be sustainable and inclusive. The inclusion of marginalized section based on gender, ethnicity, caste, etc. in the sustainable development process is need of the time. According to Sustainable Development Goal 2030 of United Nations, gender and social justice are one of the 17 goals for achieving the target of sustainable development of any place or region. The gender issue is one the major concern of sustainable or inclusive development of any place or region and inclusion of women in the development process will help in solving the gender issues. In the present scenario, most of the development program exclusively focussed on the women which resulted in the subordinate role of them in socio-economic dimensions.

It has been observed from the employment scenario of women in India, 53% of the working women are involved in the traditional knowledge-based industries followed by the 33% of the casual wage workers. Hence by tapping the potential of traditional knowledge-based industries can be resulted in the active inclusion of women in the development process of the region which is way more sustainable and inclusive in nature.

1.1 Role of Traditional knowledge-based industries

Traditional knowledge-based industries are living heritage of us. It is part of the cultural and ethnic identity of the region transferred from generations. The World Intellectual Property Office (WIPO) defines *traditional knowledge as indigenous knowledge related to categories such as agricultural knowledge, medicinal knowledge, biodiversity-related knowledge, and expressions of folklore in the form of music, dance, song, handicraft, designs, stories and artwork*. It contributes to the manufacturing sector of the micro and small industries of the economy. It is the labor-intensive sector and with the development of this sector, it can provide employment.

This paper discusses the role of the traditional knowledge-based industries in the inclusive development of the region by studying the case of West Mithila region, Bihar.

2 METHODOLOGY

The study was done majorly in two steps to understand the ecosystem of Traditional knowledge-based industries: (i.) assessment of the significance of traditional knowledge-based industries and scenario of women employment (ii.) Nesting of the Traditional knowledge-based industries in the region, and discussions on policy guidelines.

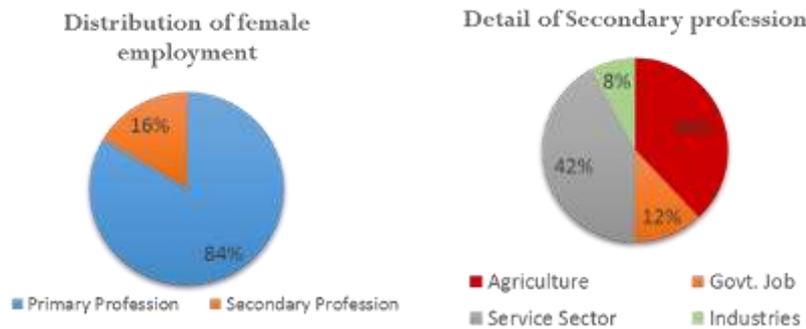
3 THE CASE OF WEST MITHILA REGION

3.1 Study area

Bihar has a variety of art & crafts like Mithila paintings, Patna Kalam, Tikuli art, Sikki grass Craft, Stone carving work, lac work, Khatwa work, Sujini work, etc. but the highest concentration of Traditional knowledge-based industries are in West Mithila region of the state. Basically, Mathili is a language of Bihar and Maithili speaking areas are known as Mithila region and western part of this region comprises of 7 districts- Sitamarhi, Madhubani, Sheohar, Darbhanga, Muzaffarpur, E. Champaran & W. Champaran. West Mithila is very rich in a variety of Art & Craft and about 20% of the total concentration of Art & Craft industries of the state is in these 7 districts of the region.

3.2 Assessment of Traditional knowledge-based industries

About 91% of the manufacturing in the region comprises of MSME industries (DCMSME). MSMEs have a large share of micro industries which is about 96% and in the micro industry sector, traditional knowledge-based industries have a share of 74%. It shows the clear domination of Traditional knowledge base industries in the region.



Source: DCMSME 2011, DC (Handicrafts & Weaving)

Figure 140 Nature of employment

84% of workers are solely dependent on the Traditional knowledge-based industries and other 16% are serving more as their secondary source of income. The maximum number of artisans which are serving traditional art & craft industry more as the secondary profession are involved in the service sector, than agriculture.

The spatial concentration of artisans is highest in Madhubani & Darbhanga districts. In West & East Champaran spatial concentration of craft is least.

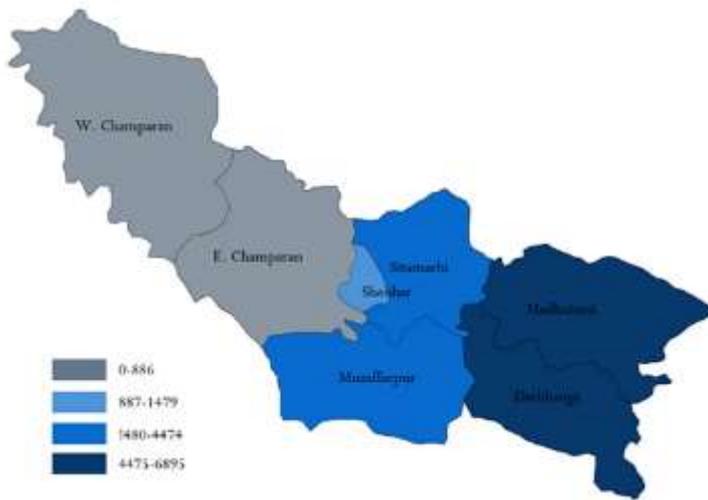
3.3 Nesting Analysis

For nesting analysis, location quotient of female workers in traditional knowledge-based industries is determined. Basically, location quotient of a district is the ratio of a number of female workers to the working population. Madhubani has the highest nesting of artisans in the whole region, preceded with Muzzafarpur and Darbhanga.



Source: Author

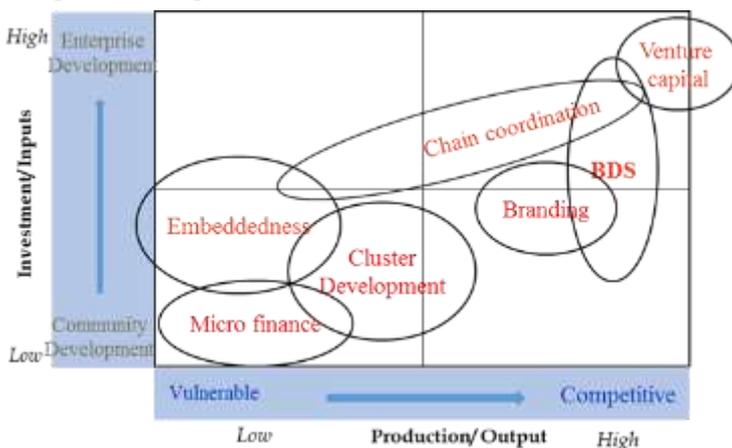
Figure 141 Spatial concentration of artisans in the region



Source: Author
Figure 142 Spatial Distribution of Location Quotient

3.4 Discussions

The West Mithila region is rich in traditional knowledge-based industries but on the other hand, it is one of the economically backward regions of India. The study of the ecosystem of Traditional Knowledge-based Industries is showing the dependency and involvement of female workers on it. In this region despite a high number of female employment, investment/ inputs, as well as production/ output, is very low. This situation is giving rise to the vulnerable condition of Traditional knowledge-based industries. Women-owned firms face multiple challenges. Although evidence shows they are as effective as men owner/managers, women often use their firms as part of household survival strategy and opt not to grow (Nichter, S. Goldmark, L.) and the strategy of community development is more suitable than the enterprise development.



(Source: Understanding micro and small enterprise growth, S Nichter, L Goldmark - Micro Report, 2005)
Figure 143 Investment Production Scenario

Hence tapping the potential of Traditional knowledge-based industries can play an important role in inclusive development by including women of West Mithila Region broadly by the following crucial factors: (i.) community development (ii.) social embeddedness (iii.) micro finance and (iv.) cluster development. Apart from the general business factors of micro- finance, capital, marketing, etc. this inclusive development path needs the more specific intervention of the community development, social embeddedness, and cluster development as women are the stakeholder.

4 CONCLUSIONS

The discussion on the role of Traditional knowledge-based industries for inclusive development of region presented in this paper may raise more questions than it answers. It is evident from the study that female employment is higher in the Traditional knowledge-based industries and they often use their firms as part of a household survival strategy. Accordingly, policy should be framed for specific interventions in community development, social embeddedness and cluster development as women are the stakeholder of this inclusive regional development. Hence by tapping the potential of traditional knowledge-based industries can be resulted in the active inclusion of women in the development process of the region which is way more sustainable and inclusive in nature as well help in achieving gender equality and social justice.

REFERENCES

Glasson, J. 1978. An introduction to Regional Planning. Hutchinson & Co.(Publishers) Ltd. London.
Knudsen, Daniel C. 2000. Shift-share analysis: further examination of models for the description of economic change. Socio-Economic

Planning Sciences

Havell, Ernest Binfield. *The Basis for Artistic and Industrial Revival in India*. Madras, India: The Theosophist Office, 1912.

CUNNINGHAM, S. (2001) 'From cultural to creative industries: theory, industry and policy implications' *Culturelink*, Special Issue, pp. 9-32.

CUNNINGHAM, S. (2004) 'The creative industries after cultural policy' *International Journal of Cultural Studies*, 7: 105-15

HIGGS, P, CUNNINGHAM, S, PAGAN, J. (2007a) *Australia's creative economy: Basic evidence on size, growth, income and employment*. Technical Report, Faculty Research Office, CCI.

CUNNINGHAM, S. (2006) 'What price a creative economy?' Platform papers. Currency House: Sydney

HESMONDHALGH, D. (2002) *The cultural industries*. Sage: London.

HESMONDHALGH, D., PRATT, A. (2005) 'Cultural Industries and Cultural Policy', *International Journal of Cultural Policy*, 11:1-13.

HIGGS, P., CUNNINGHAM, S. (2007) *Australia's Creative Economy: Mapping Methodologies*.

FREY, B (2003) "Arts and economics: Analysis and cultural policy" Düsseldorf: Springer

DCMS (1998) *Creative Industries Mapping Document*, DCMS, London.

DCMS (2001) *Creative Industries Mapping Document*, DCMS, London.

POTTS, J., ORMEROD, P., CUNNINGHAM, S, HARTLEY, J. (2007) 'Social network markets: A new definition of the creative industries' CCI working paper, QUT.

PRATT, A. (2005) 'Cultural industries and cultural policy: an oxymoron?' *International Journal of Cultural Policy*, 11(1): 31-44

TOWSE, R. (ed) (1997) *Cultural Economics*. Edward Elgar: Cheltenham.

SS21.1. Innovation and Entrepreneurship

1140 IS THERE A LONG-RUN RELATIONSHIP AMONG ENTREPRENEURSHIP, INNOVATION, AND ECONOMIC GROWTH IN EUROZONE COUNTRIES?

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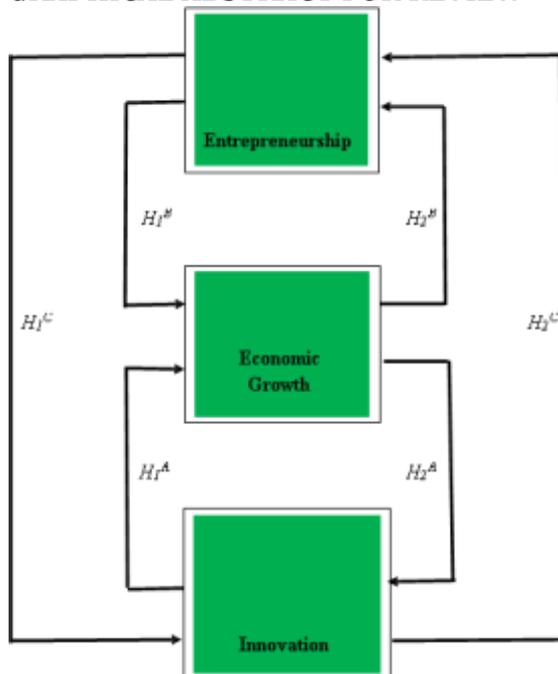
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RESEARCH HIGHLIGHTS

- This study examines the interaction among the entrepreneurship, innovation, and economic growth.
- The focus is on a sample of Eurozone countries over 2001-2016.
- A panel vector autoregressive model is used for the empirical investigation.
- The study demonstrates the existence of Granger causality, both short run and long run, among the variables.

GRAPHICAL ABSTRACT FOR REVIEW



Note:

H1A: Innovation Granger-causes economic growth.

H1B: Entrepreneurship Granger-causes economic growth.

H1C: Entrepreneurship Granger-causes innovation.

Subscript 2 (in place of 1) signifies Granger causality in reverse order.

ABSTRACT

Economic growth in the Eurozone has been lacklustre over the last two decades due to increased global competition from other economic players in other regions, economic and financial crisis, and political uncertainties within the Eurozone. To increase the global competitiveness of the region, the European Union launched the *Europe 2020 Strategy* to raise the level of entrepreneurship and innovation as key drivers of economic growth. This paper investigates the causal relationships among entrepreneurship development, innovation, and economic growth for a sample of Eurozone countries over 2001-2016. Using a vector error-correction model (VECM), the study finds that in the long run, both entrepreneurship and innovation stimulate economic growth. In the short run, however, the causal links are not always uniform and depend on the specific proxies that are used for innovation and entrepreneurship. The results provide valuable insights on the types of policies and strategies that would sustain economic growth in Eurozone countries.

Keywords: Entrepreneurship, innovation, economic growth, VECM, Eurozone countries

JEL Classification: O43, O16, E44, E31

1 INTRODUCTION

A vibrant entrepreneurial culture and a strong national innovation ecosystem are seen as key catalysts for enhancing global economic competitiveness. There is an extensive literature that has examined the inter-relationships between entrepreneurship, innovation and economic growth. While there is a strong understanding of the theoretical foundations on the relationships between these three variables, it is clear from the literature that the causal relationships among them

are rather complex and are underpinned by forces that simultaneously impact all three. The literature on micro-foundations (entrepreneurial activities) of the macro-economy (innovation and economic growth) is still evolving, and the forces that define the underlying structure of the economy are still sources of debate and research among policy-makers, researchers, and industry analysts.

It is widely accepted in the literature that economic growth is determined by factors of production and entrepreneurial activities which spur innovation; by innovation which spurs entrepreneurial activities; and by entrepreneurship and innovation in efficiently allocating resources to deepen the impact of traditional factors of production on economic growth (Schumpeter, 1934; von Hayek, 1945; and Baumol, 1968, 1990). These studies and others have shown that entrepreneurs contribute to the economy via several channels, including: investing resources to produce products and services that meet the needs of the markets; creating new employment; reinvigorating industrial clusters, innovation accelerators and special economic regions; nurturing and sustaining regional trade and cooperation; investing in research and development activities; introducing new innovations to the markets; undertaking social and philanthropic activities; increasing competition in the market that lead to better service quality and cost structures; and continuously undertaking product and process improvements (Romer, 1986 and 1990; Porter, 2008 and Warsh, 2006).

Due to the positive spill-over benefits of entrepreneurial activities, governments across the globe have invested significant resources to nurture entrepreneurial activities and enhance the innovation ecosystems in their respective countries. For example, the European Union introduced a 10-year plan called the *Europe Strategy 2020* in 2010 to foster smart, sustainable and inclusive economic growth in the Eurozone (World Economic Forum, 2014). Smart growth is defined as “developing an economy based on knowledge and innovation”; sustainable growth is defined as “promoting a more resource efficient, greener and more competitive economy”; and inclusive growth is defined as “fostering a high-employment economy delivering social and territorial cohesion” (European Commission, 2010). Under this plan, entrepreneurship and innovation are key drivers for ensuring sustainable economic development, job creation and improvement of the quality of life in Europe. This plan was put in place to help countries in Europe slow economic growth due to the following reasons: financial crisis the plague some countries and its contagion effect on other Eurozone countries; increasing government debts; gloomy economic prediction due to potential fragmentation of the European Union; increasing wealth gap between member countries; and loss of competitiveness to countries from North America and Asia (World Economic Forum, 2014).

Key targets were set under *Europe Strategy 2020* for employment, R&D, increasing green energy and reducing emissions, improving education rates, and reducing poverty. The European Commission recognized that the targets are interrelated and critical to overall success. As such, each initiative has both an EU-level action plan and a national level (member state) action plan (European Commission, 2010). As of 2015, key outcomes achieved under this plan include the following: employment increased from a low of 68.4% to 70.1% from 2012 to 2015; R&D increased from 1.85% of GDP in 2008 to 2.03% in 2014; greenhouse gas emission reduced from 90.3 in 2008 to 77.1 in 2014 (index 1990 = 100); early leavers (population aged 18 years to 24 years) from education and training fell from 14.7% in 2008 to 11% in 2015; tertiary enrolments increased from 31.1% in 2008 to 38.7% in 2015; and people at risk of poverty or social exclusion reduced from a peak of 122.5 million in 2012 to 120.9 million in 2014 (Eurostat, 2016).

The primary objectives of this paper are to shed additional light on the roles that innovation and entrepreneurs play in nurturing and sustaining a vibrant economy in Eurozone countries. This paper is structured as follows. In Section 2, a brief background of the literature and theoretical underpinning of the paper are provided. In Section 3, the methodology used to capture the complex relationship between entrepreneurship, innovation and economic growth is outlined. In Section 4, the empirical results are presented. In Section 5, a discussion of the results, including policy implications is provided.

2 LITERATURE REVIEW

The literature demonstrates that there is a wide range of definitions for “innovation” and “entrepreneurship”. Schumpeter characterized five different types of innovation: introducing new products and services; incorporating new methods that lead to process improvements; expanding to new and diverse markets; acquiring new sources of inputs for the production of goods and services; and introducing new business models and industrial systems that hinder monopolistic market structures (Schumpeter, 1934). While the characterization by Schumpeter covers a number of types of innovation, the definition of innovation has not changed much over time. Consider Du Plessis (2007) who describes innovation as “the creation of new knowledge and ideas to facilitate new business outcomes aimed at improving internal business processes and structures and to create market-driven products and services”. Thus, while specific innovations change over time due to the very nature of innovation, the idea of innovation has not necessarily changed. There is also a wide range of definitions and descriptions of entrepreneurs in the literature. Schumpeter (1934) describes an entrepreneur as someone who undertakes production processes by using different possible combinations that gives them a strategic market advantage and acquire a decent entrepreneurial profit. Knight (1921) describes an entrepreneur as someone who takes ‘calculated risks’ and transforms uncertain endeavors into productive outcomes. Liebenstein (1968) characterize entrepreneurs as creating a vibrant firm culture that reduces organizational entropy and inefficiencies. According to Liebenstein, there are two classes of entrepreneurs that enhance the competitiveness of a firm by 1) allocating resources to enhance the efficiency of the production process and 2) identifying opportunities in the current market and introducing new products that meet the needs of the market.

There have also been several studies that have linked the micro-foundations (entrepreneurial activity) to the state of the macro-economy. For example, studies by Baumol (1990) and Holcombe (1998) argue that entrepreneurs promote an innovation-driven economy by investing in both incremental and radical innovation that spawn new products, services and industries. The entrepreneurial acumen needed to create value for the economy is due to the unique abilities of entrepreneurs to identify profitable arbitrage from uncertain endeavors (Kirzner, 1973 and 1997). These studies show that entrepreneurial activities are key drivers for continuously moving the economy to a new and higher equilibrium by enhancing the richness and reach of the factors of production. There have been numerous empirical studies that have examined the role of innovation in economic growth as well as the role of entrepreneurship in economic growth. Given that there are strong links between entrepreneurship and innovation, this study will examine the trivariate relationship between innovation, entrepreneurship and economic growth. This section addresses three strands of literature pertaining to the possible causal relationship between entrepreneurship, innovation, and economic growth.

2.1 Links between innovation and economic growth

The relationship between innovation and economic growth has received considerable attention in the literature, as discussed above. The relationship between innovation and economic growth can be captured by four different schools of thought. The first school of thought supports a *supply-leading hypothesis* (SLHA), which suggests that innovation Granger causes economic growth. Proponents of this school argue that research and development (R&D) and other new innovations contribute to new products, services, processes, product improvements, and new business models, all of which have the potential to increase economic growth (Kirchhoff et al. (2007), Guloglu and Tekin (2012), and Pradhan et al. (2016)).

The second school of thought promotes a *demand-following hypothesis* (DFHA); which argues that economic growth Granger causes innovation. Proponents of DFHA argue that as economies become more affluent, they invest in innovation to strengthen their economic growth strategies so as to ensure that they remain globally competitive (Sinha (2008), Sadraoui et al. (2014), and Pradhan et al. (2016)).

The third school of thought posits a *feedback hypothesis* (FBHA), which suggests that innovation and economic growth Granger cause and reinforce each other (Hasan and Tucci (2010), Galindo and Mendez (2014), and Pradhan et al. (2016)). Interestingly, some studies such as Pradhan et al. (2017) and Pradhan et al. (2016) support the validity of all three hypotheses, depending on the choice of variables and samples that are used.

Finally, the fourth school of thought presents a *neutrality hypothesis* (NEHA) and argues that innovation and economic growth do not Granger cause each other (Cetin, 2013 and Maradana et al., 2017). The economic rationale is that innovation may be at an infant stage in many of these economies and therefore has a negligible impact on economic growth. Economic growth in many of these economies is due to traditional factors of production.

Hence, the following hypotheses are tested in this study:

H1A: Innovation Granger-causes economic growth H2A: Economic growth Granger-causes innovation

2.2 Links between entrepreneurship and economic growth

The second strand of literature examines the relationship between entrepreneurship and economic growth. Similar to the link between innovation and economic growth, the Granger causality between entrepreneurship and growth can be presented by four different schools of thought. First, a *supply-leading hypothesis* (SLHB) claims that entrepreneurship Granger causes economic growth. The economic rationale for the proponents of SLHB is that entrepreneurs play a key role in investing in R&D and other resources that will lead to new products, services, processes, product improvements, and new business models, all of which will contribute to economic growth. Studies that support SLHB are Urbano and Aparicio (2016), and Li et al. (2012).

Second, are the proponents of a *demand-following hypothesis* (DFHB) who argue that economic growth Granger causes entrepreneurship. The rationale for this line of argument is that as an economy grows, governments have adequate resources to create a vibrant entrepreneurial ecosystem by introducing and establishing new institutions, sophisticated regulatory architecture, and both iscal and non-fiscal incentives to foster entrepreneurship. Improving business support systems should enhance entrepreneurial activities and innovations. Studies that support DFHB are Castano et al. (2015) and Fuentelsaz et al. (2015).

Third, are the proponents of a *feedback hypothesis* (FBHB) who claim both entrepreneurship and economic growth Granger cause and reinforce one another. For example, improving the entrepreneurial culture will stimulate economic growth and a buoyant economy will further encourage higher entrepreneurial investment and activities. The studies that support the FBHB are Huggins and Thompson (2015) and Wennekers and Thurik (1999).

The fourth school of thought supports a *neutrality hypothesis* (NEHB) which argues that entrepreneurship and economic growth do not Granger cause each other. The rationale for this line of argument is that weak entrepreneurial ecosystems, plagued by overregulation, bureaucracy and rent-seeking behaviour, tend to hinder productive endeavours and economic growth. Further, unclear business rules of engagement and opaque regulations may lead entrepreneurs to veer towards unproductive activities, resulting in high failure rates of firms (Bowen, and De Clercq, 2008 and Helmers and Rogers, 2010). All of these factors, including migration of successful entrepreneurs to other business-friendly countries support the NEH hypothesis.

Therefore, the following hypotheses are tested in the study:

H1B: Entrepreneurship Granger-causes economic growth H2B: Economic growth Granger-causes entrepreneurship

2.3 Links between entrepreneurship and innovation

The third strand of literature considers the link between entrepreneurship and innovation where the possible Granger causality between entrepreneurship and innovation can be summarized in four different ways. The proponents of a *supply-leading hypothesis* (SLHC) argue that entrepreneurship Granger causes innovation. The economic rationale for SLHC is that entrepreneurs take calculated risks to invest in R&D and innovation to create value for their portfolio of investments. These entrepreneurs are savvy at identifying firms that have the potential to enhance their return on investment. In many of the developed economies, much of the venture capital industry is led by entrepreneurs who promote both incremental and radical innovations. For example, studies by Popov and Roosenboom (2012) and Kortum and Learner (2000) show that VC funding led by entrepreneurs are a major contributor to industrial innovation in 21 EU economies and US.

The proponents of a *demand-following hypothesis* (DFHC) argue that innovation Granger causes entrepreneurship. Their rationale is that new innovations, especially many of the technology innovations, have resulted in the development of new business models. These new innovations have reduced the entry cost into various market segments and spawned new 'open innovation' platforms. The latter has further reinforced greater access to information, knowledge, market intelligence and other resources – all of which have intensified entrepreneurial activities. For example, Uber's investment in an online user- friendly platform to connect taxi drivers has opened opportunities for every driver to be an entrepreneur. Hall and Kruegger (2016) show that the number of active Uber driver- partners has increased exponentially from the middle of 2012 to December 2015 (from zero to more than 450,000 active Uber Driver-Partners). Other studies such as Audretsch et al. (2002) shows that U.S. government programs such as the *Small Business Innovation Research (SBIR)* program, produce several spillover benefits. The SBIR program provides small businesses access to R&D and innovation support; and, has encouraged new startup firms and commercialization activities among these firms.

There are other studies that support a *feedback hypothesis* (FBHC) of entrepreneurship-innovation nexus, where both entrepreneurship and innovation diffusion Granger cause each other. The economic rationale for FBHC is that, as entrepreneurs invest in new innovations, these new innovations increase the reach and richness of existing products and services, and in some instances, reduce barriers to entry. These lead to more new entrepreneurs entering the market. Studies that focus on the relationship between entrepreneurship and innovation include Capello and Lenzi (2016) and Galindo and Mendez-Picazo (2013).

The fourth school of thought is the proponents of a *neutrality hypothesis* (NEHC); who argue that entrepreneurship and innovation do not Granger-cause one another. The economic rationale for proponents of NEHC is that in some countries, the entrepreneurial and the innovation ecosystems are weak or dysfunctional. This is primarily evident in countries that are plagued by over-regulation, unfriendly business practices, rent-seeking behaviour, low investments in R&D, and lengthy time to register patents and business licences/permits – all of which can stifle innovation and entrepreneurial activities (Kritikos, 2014).

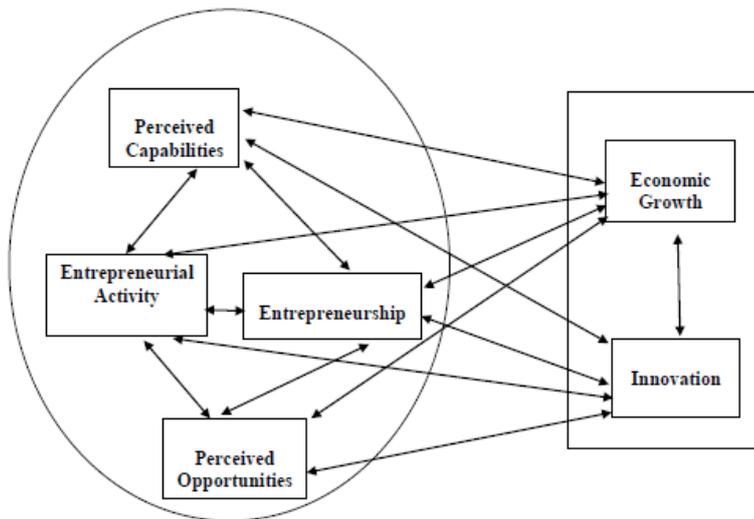
Based on the four schools of thought, the following hypotheses are tested in the study:

H1C: Entrepreneurship Granger-causes innovation H2C: Innovation Granger-causes entrepreneurship

3 DATA, VARIABLES, AND ESTIMATION PROCEDURES

As noted above, while the relationships between economic growth, innovation, and entrepreneurship have been studied, there is no real consensus on the causal direction of these relationships. Additionally, empirical studies on these relationships typically use a bivariate framework and therefore consider only two of these variables at any given time.

Figure 1 provides the possible set of links between economic growth, innovation, and entrepreneurship, based on the discussion in Huggins and Thompson (2015) and Wennekers and Thurik (1999).



Note 1: As will become clear in the text, entrepreneurship can be defined in terms of perceived capabilities and opportunities, as well as entrepreneurial activity.
 Note 2: The figure is developed using Huggins and Thompson (2015) and Wennekers and Thurik (1999).

Figure 1: The Conceptual Framework on the Possible Causal Relations between Entrepreneurship, Innovation, and Economic Growth

Extending the bivariate empirical literature on this subject, the present study uses a Granger causality approach to understand the dynamics among all *three* variables, namely innovation, entrepreneurship, and economic growth. Our study is on a broad scale for 19 Eurozone countries⁵⁵⁵ during the period 2001-2016. We use annual time series data obtained from *World Development Indicators* and the *Global Entrepreneurship Monitor* (see below).⁵⁵⁶

We deploy real per capita economic growth (PEG) and seven different indicators for innovation (INO): the number of patents by both residents and non-residents measured per thousand of population (PAT); trademark applications measured per thousand of population (TRA), researchers in research and development activities measured per thousand of population (RRD); scientific and technical journal articles measured per thousand of population (STJ); research and development expenditure measured as a percentage of gross domestic product (RDE); high-technology exports measured as a percentage of gross domestic product (HTX); and a composite index of innovation (INN), which is weighted average of all six innovation indicators (PAT, TRA, RRD, STJ, RDE and HTX).

It should be noted that we have no direct variables that can represent the status of innovation in a country at a particular period of time. The inclusion of these seven indicators can give a representative approximation for innovation status, particularly with reference to examining the Granger-causal relationship between entrepreneurship and per capita economic growth. However, the importance of a particular innovation indicator varies from study to study. For example, the study by Guloglu and Tekin (2012) places high value on both patents (an output-type innovation) and R & D expenditure (an input-type innovation) for regulating the long-run economic growth in high-income OECD countries, while the study by Kaneva and Untura (2016) looks to both R & D expenditure and R & D staff (an input-type innovation) for regulating long-run economic growth in the Russian Federation. Brenner (2014) places more emphasis on both scientific and technical publications (an output-type innovation) and R&D expenditure for regulating the long-run economic growth in a group of developed and developing countries.

This study uses three indicators as proxies for entrepreneurship. The data was accessed through the World Bank TCdata 360 which obtains the data from the *Global Entrepreneurship Monitor* (an adult population survey). All three indicators are expressed as the percentage of the population between 18–64. Total early-stage entrepreneurial activity (TEA) considers the percentage of the population who are either nascent entrepreneurs or owner-managers of a new business. Perceived capabilities (PEC) considers the percentage of the population who believe that they have the required skills and knowledge to start a business. Finally, perceived opportunities (PEO) considers the percentage of the population who believe that there are good opportunities to start a business in the area where they live.

The present study considers three samples and seven cases on the basis of the three entrepreneurship indicators and the seven innovation indicators.⁵⁵⁷ All the monetary variables are measured in constant US dollars. The variables are converted into their natural logarithms for our estimation in order to normalize the data.

555 The countries are Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia, and Spain.

556 We have an unbalanced panel since data on the variables is not uniformly available for all the countries and for all the years over the period of our investigation.

557 The subset of countries and the years covered under each of these set ups and cases are on the basis of data availability for the selected variables; we have an unbalanced panel.

We estimate a set of dynamic panel regressions, as given by the following equations:

$$\Delta PEG_{it} = \eta_{1j} + \sum_{k=1}^p \beta_{1ik} \Delta PEG_{it-k} + \sum_{k=1}^q \lambda_{1ik} \Delta INO_{it-k} + \sum_{k=1}^r \mu_{1ik} \Delta ENT_{it-k} + \delta_{1i} ECT_{it-1} + \varepsilon_{1it} \quad (1)$$

$$H_0^A: \beta_{1ik} = 0; \lambda_{1ik} = 0; \mu_{1ik} = 0; \delta_{1ik} = 0 \quad \text{for } k = 1, \dots, p, q \text{ and } r$$

$$H_1^A: \beta_{1ik} \neq 0; \lambda_{1ik} \neq 0; \mu_{1ik} \neq 0; \delta_{1ik} \neq 0 \quad \text{for at least one } k$$

$$\Delta INO_{it} = \eta_{2j} + \sum_{k=1}^p \beta_{2ik} \Delta INO_{it-k} + \sum_{k=1}^q \lambda_{2ik} \Delta PEG_{it-k} + \sum_{k=1}^r \mu_{2ik} \Delta ENT_{it-k} + \delta_{2i} ECT_{it-1} + \varepsilon_{2it} \quad (2)$$

$$H_0^B: \beta_{2ik} = 0; \lambda_{2ik} = 0; \mu_{2ik} = 0; \delta_{2ik} = 0 \quad \text{for } k = 1, \dots, p, q \text{ and } r$$

$$H_1^B: \beta_{2ik} \neq 0; \lambda_{2ik} \neq 0; \mu_{2ik} \neq 0; \delta_{2ik} \neq 0 \quad \text{for at least one } k$$

$$\Delta ENT_{it} = \eta_{3j} + \sum_{k=1}^p \beta_{3ik} \Delta ENT_{it-k} + \sum_{k=1}^q \lambda_{3ik} \Delta INO_{it-k} + \sum_{k=1}^r \mu_{3ik} \Delta PEG_{it-k} + \delta_{3i} ECT_{it-1} + \varepsilon_{3it} \quad (3)$$

$$H_0^C: \beta_{3ik} = 0; \lambda_{3ik} = 0; \mu_{3ik} = 0; \delta_{3ik} = 0 \quad \text{for } k = 1, \dots, p, q \text{ and } r$$

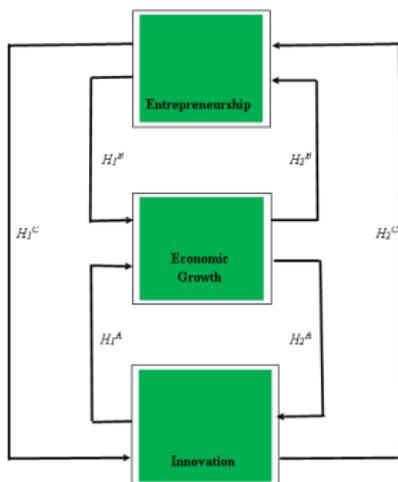
$$H_1^C: \beta_{3ik} \neq 0; \lambda_{3ik} \neq 0; \mu_{3ik} \neq 0; \delta_{3ik} \neq 0 \quad \text{for at least one } k$$

where Δ is the first difference operator, i is country and t is year in the panel, and ε is the error term. *Innovation (INO)* is defined as PAT, TRA, RRD, STJ, RDE, HTX or INN; and *entrepreneurship (ENT)* is defined as TEA, PEC, or PEO.

Additionally, p, q and r are the lag lengths for the differenced variables of the respective equations and can be determined by the Engle-Granger approach. The lagged error-correction terms (ECT-1) are derived from the long-run equilibrium properties inherent in equations (1) to (3). The ECTs represent long-run dynamics, while differenced variables represent short-run dynamics between the variables.

For short-run causal relationships, if the null hypothesis $\lambda_{1ik} = 0$ (or $\lambda_{2ik} = 0$) is rejected, there is Granger causality running from INO to PEG (or PEG to INO). If the joint null hypothesis $\mu_{1ik} = 0$ (or $\mu_{2ik} = 0$) is rejected, there is Granger causality from ENT to PEG (or ENT to PEG). For long-run causal relationships, the null hypothesis ($\delta_{1i} = 0, \delta_{2i} = 0,$ and $\delta_{3i} = 0$) needs to be rejected. The above tests are performed through a Wald test.

Figure 2 presents a synopsis of the hypotheses that are tested in this empirical investigation.



Note:

H1A: Innovation Granger-causes economic growth.

H1B: Entrepreneurship Granger-causes economic growth.

H1C: Entrepreneurship Granger-causes innovation.

Subscript 2 (in place of 1) signifies Granger causality in reverse order.

Figure 2: A Summary of the Possible Causal Links among the Three Sets of Variables

4 ESTIMATION RESULTS

The vector error-correction model (VECM) is used to examine the possible Granger causal relationships among innovation, entrepreneurship, and per capita economic growth. The first step of this framework is to determine the order of integration and presence/absence of cointegration⁵⁵⁸ among the three sets of variables.

We use three panel unit root tests, namely the Levin-Lin-Chu (LLC) test, the Augmented Dickey-Fuller (ADF) test, and the Philipps-Perron (PP) test to identify the order of integration of the variables in our panel setting. The tests establish that all the variables are integrated of order one (see Table 1). These results suggest the likelihood of cointegration among innovation, entrepreneurship, and per capita economic growth. The Johansen panel cointegration test (see Larsson et al., 2001) is then used to test the hypothesis that there is a long-run relationship among these three sets of variables. The results from this test validate the existence of a long-run equilibrium relationship among innovation, entrepreneurship, and per capita economic growth in our three samples and seven cases under each sample (see Table 2).

Table 1. Empirical Results of Panel Unit Root Test

Variable	Test Statics					
	Level Data			First Difference data		
	LLC	ADF	PP	LLC	ADF	PP
TEA	0.611	10.8	20.3	-12.9*	140.4*	217.5*
PEC	-0.49	13.9	16.3	-14.2*	142.9*	209.9*
PEO	0.68	11.97	12.99	-10.4*	106.5*	154.1*
PAT	0.889	24.3	24.9	-10.3*	125.7*	191.3*
TRA	-0.80	16.3	86.9	-8.00*	116.1*	168.1*
RRD	-0.38	19.2	137.8	-6.21*	84.90*	148.8*
STJ	-0.86	10.6	127.6	-3.98*	48.70*	83.88*
RDE	1.28	16.9	46.2	-6.68*	85.80*	147.9*
HTX	0.54	16.6	60.2	-9.32*	133.7*	181.3*
INN	1.17	15.8	10.7	-4.91*	72.50*	43.31*
PEG	0.73	20.6	28.1	-18.4*	278.7*	383.4*

Note 1: TEA is total early-stage entrepreneurial activity, PEC is perceived capabilities, PEO perceived opportunities, PAT is patents filled by both residents and non-residents, TRM is trademark applications, STJ is scientific and technical articles, RDE is research and development expenditure, RRD is researchers in research and development activities, HTX is high-technology exports, INN is composite index of innovation, and PEG is per capita economic growth.

Note 2: INN is the weighted average of PAT, TRA, RRD, STJ, RDE, and HTX.

Note 3: LLC is Levin-Lin-Chu statistics, ADF is Augmented Dickey-Fuller Test statistics, and PP is Philipps-Perron statistics.

Note 4: * indicate that parameter estimates are significant at the 1% level.

558 Cointegration entails a long-run equilibrium relationship that ties the three-time series variables even though short-term departures from equilibrium may exist (Engle and Granger, 1987).

Table 2. Empirical Results of the Panel Cointegration Test

Sample 1: PEG, TEA, INO

	Case 1 (PAT)		Case 2 (TRA)		Case 3 (RRD)		Case 4 (STJ)	
	Tra	Max	Tra	Max	Tra	Max	Tra	Max
None	146.3*	126.6*	113.1*	107.6*	126.9*	112.9*	156.6*	127.7*
At most 1	47.11*	40.54*	26.14**	22.82**	69.79*	58.81*	87.59*	64.81*
At most 2	27.96**	27.96**	21.41	21.41	42.63*	42.63*	56.22*	56.22*
NOC	2		2		2		2	
Inferences	Cointegrated		Cointegrated		Cointegrated		Cointegrated	

	Case 5 (RDE)		Case 6 (HTX)		Case 7 (INN)	
	Tra	Max	Tra	Max	Tra	Max
None	100.6*	90.03*	177.2*	156.1*	136.6*	115.4*
At most 1	64.39*	56.39*	51.17*	49.94*	47.35*	45.63*
At most 2	37.88	37.88	24.4*	24.41*	45.11*	45.11*
NOC	2		2		2	
Inferences	Cointegrated		Cointegrated		Cointegrated	

Sample 2: PEG, PEC, INO

	Case 1 (PAT)		Case 2 (TRA)		Case 3 (RRD)		Case 4 (STJ)	
	Tra	Max	Tra	Max	Tra	Max	Tra	Max
None	133.4*	114.5*	114.0*	103.5*	125.2*	101.3*	92.59*	78.72*
At most 1	27.42*	23.59*	79.11*	60.58*	61.81*	50.05*	31.56*	33.88*
At most 2	22.67	22.67	49.9*	49.93*	39.11*	39.11*	8.39	8.39
NOC	2		3		3		2	
Inferences	Cointegrated		Cointegrated		Cointegrated		Cointegrated	

	Case 5 (RDE)		Case 6 (HTX)		Case 7 (INN)	
	Tra	Max	Tra	Max	Tra	Max
None	115.4*	99.52*	182.3*	153.3*	143.5*	112.5*
At most 1	51.73*	42.88*	65.28*	52.24*	50.54*	58.21*
At most 2	39.47*	39.47*	44.91*	44.91*	48.77*	48.77*
NOC	3		3		3	
Inferences	Cointegrated		Cointegrated		Cointegrated	

Sample 3: PEG, PEO, INO

	Case 1 (PAT)		Case 2 (TRA)		Case 3 (RRD)		Case 4 (STJ)	
	Tra	Max	Tra	Max	Tra	Max	Tra	Max
None	37.95*	33.6*	135.1*	114.4*	108.8*	89.71*	110.7*	93.61*
At most 1	20.72	19.8	49.09*	44.96*	69.28*	55.95*	71.25*	68.11*
At most 2	12.42	12.42	29.53*	29.53*	42.85*	42.85*	58.74*	58.74*
NOC	1		3		3		3	
Inferences	Cointegrated		Cointegrated		Cointegrated		Cointegrated	

	Case 5 (RDE)		Case 6 (HTX)		Case 7 (INN)	
	Tra	Max	Tra	Max	Tra	Max
None	97.82*	79.15*	158.0*	130.5*	116.6*	87.21*
At most 1	62.44*	58.51*	66.24*	57.91*	59.41*	48.11*
At most 2	35.41*	35.41*	35.59*	35.59*	44.25*	44.25*
NOC	3		3		3	
Inferences	Cointegrated		Cointegrated		Cointegrated	

Note 1: PEG is per capita economic growth; INO denotes innovation. TEA is total early-stage entrepreneurial activity, PEC is perceived capabilities, and PEO is perceived opportunities. There are seven measures of INO: PAT is patents filled by both residents and non-residents, TRM is trademark applications, STJ is scientific and technical articles, RDE is research and development expenditure, RRD is researchers in research and development activities, HTX is high-technology exports, and INN is composite index of innovation.

Note 2: NOC is number of cointegrating vectors (1/2/3).

Note 3: Tra is trace statistics; Max is maximum Eigenvalue statistics; and NOC is number of cointegrating vectors.

Note 4: * and ** indicate that parameter estimates are significant at the 1% and 5% levels, respectively.

The above findings justify the use of the VECM approach to determine possible Granger causal relationships among innovation, entrepreneurship, and per capita economic growth. The results are presented in Tables 3 and 4.

We first report the long-run Granger causality results, which are established by examining the statistical significance of the ECT-1 coefficients. We find that when Δ PEG is the dependent variable, the coefficients for lagged ECT terms are statistically significant at the 1% level. This implies that per capita economic growth converges to its long-run equilibrium path in response to changes in both innovation and entrepreneurship.

This is true for all of the cases that we considered (see Table 3). Subsequently, we conclude that per capita economic growth in Eurozone countries is significantly influenced by both innovation and entrepreneurship. The implication of this finding is that, in order to stimulate long-run economic growth, it is imperative to facilitate both innovation and entrepreneurship in the Eurozone countries.

Table 3. Empirical Results of Panel Granger Causality Test

Dependent Variable	Independent variables and ECT-1											
Setup 1: Links between TEA, innovation, and economic growth												
	Case 1 (PAT)				Case 2 (TRA)				Case 3 (RRD)			
	Δ PEG	Δ TEA	Δ PAT	ECT-1	Δ PEG	Δ TEA	Δ TRA	ECT-1	Δ PEG	Δ TEA	Δ RRD	ECT-1
Δ PEG	----	8.23*	8.13*	-0.89*	----	8.28*	3.86***	-0.14*	----	8.42*	11.1*	-0.14*
Δ TEA	0.78	----	8.77*	-0.10	1.31	----	9.30*	-0.07	3.17	----	1.03	-0.01
Δ INO	1.65	3.46***	----	-0.13	1.08	1.27	----	-0.14	13.0*	4.94**	----	-0.09
	Case 4 (STJ)				Case 5 (RDE)				Case 6 (HTX)			
	Δ PEG	Δ TEA	Δ STJ	ECT-1	Δ PEG	Δ TEA	Δ RDE	ECT-1	Δ PEG	Δ TEA	Δ HTX	ECT-1
Δ PEG	----	7.46*	37.7*	-0.14*	----	3.95***	29.2*	-0.11*	----	6.35*	7.13*	-0.14*
Δ TEA	1.36	----	1.17	-0.12	2.68	----	4.39**	-0.06	2.15	----	4.94**	-0.11
Δ INO	75.9*	4.95**	----	-0.09	10.8*	1.59	----	-0.01	4.94**	3.42***	----	-0.18
	Case 7 (INN)											
	Δ PEG	Δ TEA	Δ INN	ECT-1								
Δ PEG	----	4.59**	9.16*	-0.12*								
Δ TEA	0.34	----	6.28*	-0.12								
Δ INO	7.34*	6.34*	----	-0.21								
Setup 2: Links between PEC, innovation, and economic growth												
	Case 1 (PAT)				Case 2 (TRA)				Case 3 (RRD)			
	Δ PEG	Δ PEC	Δ PAT	ECT-1	Δ PEG	Δ PEC	Δ TRA	ECT-1	Δ PEG	Δ PEC	Δ RRD	ECT-1
Δ PEG	----	13.7*	17.2*	-0.13*	----	8.71*	2.32	-0.15*	----	3.95***	5.76**	-0.14*
Δ PEC	3.39***	----	2.25	-0.05	2.92	----	0.43	-0.08	2.20	----	4.78**	-0.04
Δ INO	6.37*	7.54*	----	-0.25	2.63	0.49	----	-0.28	7.52*	3.99***	----	-0.09
	Case 4 (STJ)				Case 5 (RDE)				Case 6 (HTX)			
	Δ PEG	Δ PEC	Δ STJ	ECT-1	Δ PEG	Δ PEC	Δ RDE	ECT-1	Δ PEG	Δ PEC	Δ HTX	ECT-1
Δ PEG	----	4.36**	48.4*	-0.21*	----	6.84*	7.11*	-0.12*	----	13.4*	10.5*	-0.13*
Δ PEC	1.74	----	3.48***	-0.04	8.32*	----	0.89	-0.17	8.53*	----	2.84	-0.18
Δ INO	53.1*	7.24*	----	-0.13	26.5*	5.66*	----	-0.11	6.12*	3.39***	----	-0.09
	Case 7 (INN)											
	Δ PEG	Δ PEC	Δ INN	ECT-1								
Δ PEG	----	6.63*	15.3*	-0.11*								
Δ PEC	4.75**	----	2.88	-0.13								
Δ INO	38.7*	4.28**	----	-0.71								

Setup 3: Links between PEO, innovation, and economic growth

	Case 1 (PAT)				Case 2 (TRA)				Case 3 (RRD)			
	Δ PEG	Δ PEO	Δ PAT	ECT ₋₁	Δ PEG	Δ PEO	Δ TRA	ECT ₋₁	Δ PEG	Δ PEO	Δ RRD	ECT ₋₁
Δ PEG	-----	2.69	12.8*	-0.12*	-----	2.39	3.99***	-0.15*	-----	0.46	7.01*	-0.14*
Δ PEO	3.96***	-----	1.81	-0.37	5.94*	-----	4.20***	-0.47	3.74***	-----	1.29	-0.48
Δ INO	8.16*	5.21**	-----	-0.22	1.55	1.08	-----	-0.17	11.5*	3.54***	-----	-0.08

	Case 4 (STJ)				Case 5 (RDE)				Case 6 (HTX)			
	Δ PEG	Δ PEO	Δ STJ	ECT ₋₁	Δ PEG	Δ PEO	Δ RDE	ECT ₋₁	Δ PEG	Δ PEO	Δ HTX	ECT ₋₁
Δ PEG	-----	3.59***	44.6*	-0.15*	-----	2.68	8.16*	-0.11*	-----	2.71	5.91*	-0.12*
Δ PEO	2.06	-----	8.01*	-0.08	5.93**	-----	4.25***	-0.39	4.27**	-----	1.80	-0.37
Δ INO	82.2*	1.72	-----	-0.22	30.6*	2.90	-----	-0.11	2.78	1.61	-----	-0.13

	Case 7 (INN)			
	Δ PEG	Δ PEO	Δ INN	ECT ₋₁
Δ PEG	-----	1.36	13.4*	-0.11*
Δ PEO	6.32*	-----	5.60**	-0.21
Δ INO	44.3*	1.37	-----	-0.73

Note 1: PEG is per capita economic growth. TEA is total early-stage entrepreneurial activity, PEC is perceived capabilities, and PEO is perceived opportunities. PAT is patents filled by both residents and non-residents, TRM is trademark applications, STJ is scientific and technical articles, RDE is research and development expenditure, RRD is researchers in research and development activities, HTX is high-technology exports, and INN is composite index of innovation.

Note 2: INO denotes innovation and is used for PAT, TRA, RRD, STJ, RDE, HTX, and INN.

Note 3: ECT₋₁ is the lagged error-correction term.

Note 4: *, **, and *** indicate that parameter estimates are significant at the 1%, 5%, and 10% levels, respectively.

The short-run results, however, are mostly non-uniform. A summary of the non-uniform short-run Granger causality results is provided in Table 4 and demonstrates that the short-run adjustment dynamics vary across the three samples and seven cases.

Table 4. Summary of Short-run Granger Causality Results

Setups	Cases	Possible Causalities		
		PEG and ENT	PEG and INO	ENT and INO
1	1	PEG \Leftrightarrow TEA	PEG \Leftrightarrow PAT	TEA \Leftrightarrow PAT
	2	PEG \Leftrightarrow TEA	PEG \Leftrightarrow TRA	TEA \Leftrightarrow TRA
	3	PEG \Leftrightarrow TEA	PEG \Leftrightarrow RRD	TEA \Rightarrow RRD
	4	PEG \Leftrightarrow TEA	PEG \Leftrightarrow STJ	TEA \Rightarrow STJ
	5	PEG \Leftrightarrow TEA	PEG \Leftrightarrow RDE	TEA \Leftrightarrow RDE
	6	PEG \Leftrightarrow TEA	PEG \Leftrightarrow HTX	TEA \Leftrightarrow HTX
	7	PEG \Leftrightarrow TEA	PEG \Leftrightarrow INN	TEA \Leftrightarrow INN
2	1	PEG \Leftrightarrow PEC	PEG \Leftrightarrow PAT	PEC \Rightarrow PAT
	2	PEG \Leftrightarrow PEC	PEG \nleftrightarrow TRA	PEC \nleftrightarrow TRA
	3	PEG \Leftrightarrow PEC	PEG \Leftrightarrow RRD	PEC \Leftrightarrow RRD
	4	PEG \Leftrightarrow PEC	PEG \Leftrightarrow STJ	PEC \Leftrightarrow STJ
	5	PEG \Leftrightarrow PEC	PEG \Leftrightarrow RDE	PEC \Rightarrow RDE
	6	PEG \Leftrightarrow PEC	PEG \Leftrightarrow HTX	PEC \Rightarrow HTX
	7	PEG \Leftrightarrow PEC	PEG \Leftrightarrow INN	PEC \Rightarrow INN
3	1	PEG \Rightarrow PEO	PEG \Leftrightarrow PAT	PEO \Rightarrow PAT
	2	PEG \Rightarrow PEO	PEG \Leftrightarrow TRA	PEO \Leftrightarrow TRA
	3	PEG \Rightarrow PEO	PEG \Leftrightarrow RRD	PEO \Rightarrow RRD
	4	PEG \Leftrightarrow PEO	PEG \Leftrightarrow STJ	PEO \Leftrightarrow STJ
	5	PEG \Rightarrow PEO	PEG \Leftrightarrow RDE	PEO \Leftrightarrow RDE
	6	PEG \Rightarrow PEO	PEG \Leftrightarrow HTX	PEO \nleftrightarrow HTX
	7	PEG \Rightarrow PEO	PEG \Leftrightarrow INN	PEO \Leftrightarrow INN

Note 1: PEG is per capita economic growth. TEA is total early-stage entrepreneurial activity, PEC is perceived capabilities, and PEO is perceived opportunities. PAT is patents filled by both residents and non-residents, TRM is trademark applications, STJ is scientific and technical articles, RDE is research and development expenditure, RRD is researchers in research and development activities, HTX is high-technology exports, and INN is a composite index of innovation.

Note 2: INO is used for PAT, TRA, RRD, STJ, RDE, HTX, and INN. ENT is used for TEA, PEC, and PEO.

Note 3: \Leftrightarrow , \Rightarrow , \Leftrightarrow stands for direction of Granger causality; and \nleftrightarrow stands for non-Granger causality.

We also performed some additional tests in order to check the validity of our results. First, we obtained FMOLS⁵⁵⁹ and DOLS⁵⁶⁰ estimates, which show that both innovation and entrepreneurship have positive impacts on per capita economic growth, congruent with the findings of Urbano and Aparicio (2016)⁵⁶¹ and Galindo and Mendez-Picazo (2013).⁵⁶² The results from these estimation approaches are not reported due to space constraints and are available from the authors on request.

Second, we changed the order of the VECM. There were no significant changes to the earlier results reported in Tables 3 and 4. These results are not reported for the sake of brevity, but are available from the authors on request.

Third, we utilized generalized impulse response functions (GIRFs) to trace the effect of a one-standard deviation shock on the current and future values of all the endogenous variables through the dynamic structure of VECM. The GIRFs offered additional insight into how shocks to per capita economic growth can affect and be affected by both innovation and entrepreneurship. The results of GIRFs are not reported here due to space constraints and are available upon request. In short, they provide additional support for the argument that there is causality among innovation entrepreneurship and per capita economic growth, as outlined above.

5 DISCUSSION OF RESULTS AND CONCLUSIONS

Our study examines the causal relationships among innovation, entrepreneurship, and per capita economic growth in Eurozone countries over the period 2001-2016. We find that these three indicators are integrated of order one and cointegrated, irrespective of the particular innovation and entrepreneurship indicators that are used. Most importantly, there is clear evidence that both innovation and entrepreneurship matter in the determination of long-run per capita economic growth.

In the short run, however, there is a myriad of relationships between the three variables. From Table 4, on the nexus between economic growth and innovation, 16 out of 21 cases support the feedback hypothesis, while 4 support the supply-led hypothesis, and 1 supports the neutrality hypothesis. When we examine the link between economic growth and entrepreneurship, 11 out of 21 cases support the supply-led hypothesis, 5 support the demand-led hypotheses, and 4 support the feedback hypothesis. Finally, the relationship between entrepreneurship and innovation shows that 6 out of 21 cases support the demand-led hypothesis, 8 support the supply-led hypothesis, 5 support the feedback hypothesis, and 2 support the neutrality hypothesis. Unlike the long-run results, which are homogenous, the short-run results depend on the types of innovation and entrepreneurship we incorporate in the estimation process. On the whole, a rich set of short-run dynamics exist among the variables. However, in the long run they all produce the same result, namely that entrepreneurship and innovation are key drivers of economic growth.

Our empirical results clearly suggest that to sustain long-term economic growth in the Eurozone countries, priority should be given to strengthening the innovation and entrepreneurship ecosystems in the region. Furthermore, the results show that there are strong endogenous links between entrepreneurship, innovation and economic growth even in the short run. In this context, entrepreneurs play a key role in not only creating jobs, but undertaking risky endeavours that lead to incremental and radical innovations. Many entrepreneurs invest in R&D and innovation that lead to new product development and process improvements. Hence, it is important that countries in the Eurozone strengthen their national innovation ecosystems, as envisioned under the Europe Strategy 2020 Plan, which promotes a culture of innovation and entrepreneurship by undertaking the following steps across the region (Braunerhjelm, 2010; World Economic Forum, 2014; and Kritikos, 2014):

- enhance public sector efficiency and business-friendly policies, including reducing bureaucratic practices that will lower the time and cost of setting up a business;
- put in place economic growth promoting strategies, including identifying key economic priority regions, corridor development plans and inclusive development policies with a sound investment strategy that will foster strong and competitive industrial and economic clusters across the region;
- develop a favourable taxation system and vibrant financial system (e.g., venture capital and angel funding) that encourages investment in R&D and innovation;
- have a clearly articulated intellectual property right framework, implementation strategy and enforcement mechanism;
- put in place R&D grants and subsidies that enable entrepreneurs to undertake innovation, product development and process improvement to enhance the competitiveness of the firms;
- provide entrepreneurs access to state-of-the-art scientific technology, expertise and business support programs to continuously undertake translational R&D and innovation that will enable them to move up

559 FMOLS is fully modified ordinary least squares (OLS), a non-parametric estimation approach, taking into account the possible correlation between the error term and the first differences of regressor as well as the presence of a constant term to deal with corrections for serial correlation (Pedroni, 2000).

560 DOLS is dynamic OLS, a parametric estimation approach that adjusts the errors by augmenting the static regression with leads, lags, and contemporaneous values of the regressor in first differences (Kao and Chiang, 2000).

561 This study relates to 43 countries in the period from 2002 to 2012.

562 This study relates to ten countries, namely, Denmark, Finland, France, Germany, Italy, Japan, the Netherlands, Spain, Sweden and the USA for the period 2001-2009.

the global innovation value chain (key best practices include the Small Business Innovation Research – SBIR program and Small Business Technology Transfer – STTR program in the [US \(https://www.sbir.gov/\)](https://www.sbir.gov/)); and,

- promote a culture of risk-taking by enabling entrepreneurs who have failed to still gain access to funding, mentorship and other business support to transform and reinvent their businesses.

In summary, the empirical analysis from this paper suggests that long-term economic growth within the Eurozone will depend on a carefully curated and orchestrated national innovation ecosystem that promotes a vibrant entrepreneurial culture and innovative climate across the region, as envisioned by *Europe Strategy 2020*. Strong support for entrepreneurship and innovation will strengthen the competitiveness of existing sectors of the economy and will lead to new sources of economic growth in the Eurozone. Needless to say, the lessons from our Eurozone case study may be valuable for policy-makers from other economic regions who may be designing policies and strategies to elevate their economic growth.

REFERENCES

- Audretsch, D. B., Weigand, J. and Weigand, C. (2002). The Impact of the SBIR on creating Entrepreneurship Behaviour. *Economic Development Quarterly*, 16 (1): 32-38.
- Baumol, W. J. (1968). Entrepreneurship in Economic Theory. *American Economic Review*, 58 (2): 64-71.
- Baumol, W. J. (1990). Entrepreneurship: Productive, Unproductive, and Destructive. *Journal of Political Economy*, 98 (5): 893-921
- Bowen, H. P., and D. De Clercq. (2008) Institutional context and the allocation of entrepreneurial effort. *Journal of International Business Studies*, 39 (4): 747-767.
- Braunerhjelm, P. (2010). Entrepreneurship, Innovation and Economic Growth: Past Experiences, Current Knowledge and Policy Implications, Working Paper 2010:02, Swedish Entrepreneurship Forum, http://entreprenorskapsforum.se/wp-content/uploads/2013/03/WP_02.pdf; accessed 11 March 2018.
- Brenner, T. (2014). Science, Innovation and National Growth. *Working Papers on Innovation and Space*. No 2014-03, [Philipps University Marburg, Department of Geography](http://www.philipps-university.de/geography/), Marburg.
- Capello, R. and Lenzi, C. (2016). Relevance and utility of European Union research, technological development and innovation policies for a smart growth. *Environment and Planning C: Government and Policy*, 34 (1): 52-72.
- Castano, M., Mendez, M. and Galindo, M. (2015). The effect of Social, Cultural, and Economic Factors on Entrepreneurship. *Journal of Business Research*, 68 (7): 1496-1500.
- Cetin, M. (2013). The hypothesis of innovation-based economic growth: a causal relationship. *Uluslararası İktisadi ve İdari İncelemeler Dergisi*, 6 (11): 1-16.
- Du Plessis, M. (2007). The role of knowledge management in innovation. *Journal of Knowledge Management*, 11 (4), 20-29.
- Engle, R. F. and Granger, C. W. J. (1987). Cointegration and Error Correction: Representation, Estimation and Testing. *Econometrica*, 55 (2): 251-276.
- European Commission. (2010). Europe 2020: a strategy for smart, sustainable and inclusive growth. *Working paper*. No. COM (2010) 2020, European Commission, Brussels. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:2020:FIN:EN:PDF>.
- Eurostat (2016). *Smarter, Greener, More Inclusive? Indicators to Support Europe 2020*, European Commission.
- Fuentelsaz, L., Gonzalez, C., Maicas, J. P., and Montero, J. (2015). How Different Formal Institutions Affect Opportunity and Necessity Entrepreneurship. *Business Research Quarterly*, 18 (4): 246-258.
- Galindo, M. and Mendez, M. T. (2014). Entrepreneurship, Economic Growth, and Innovation: Are Feedback Effects at Work. *Journal of Business Research*, 67 (5): 825- 829.
- Galindo, M. and Mendez-Picazo, M. (2013). Innovation, Entrepreneurship and Economic Growth. *Management Decision*, 51 (3): 501-514.
- Guloglu, B. and Tekin, R. B. (2012). A Panel Causality Analysis of the Relationship among Research and Development, Innovation, and Economic Growth in High-Income OECD Countries. *Eurasian Economic Review*, 2 (1): 32-47.
- Hall, J. V. and Krueger, A. B. (2016). An Analysis of the Labor Market for Uber’s Driver- Partner in the United States, Working Paper 22843, National Bureau of Economic Research, MA, USA.
- Hasan, I. and Tucci, C. L. (2010). The Innovation-economic Growth Nexus: Global Evidence. *Research Policy*, 39 (10): 1264-1276.
- Helmets, C., and M. Rogers. (2010). Innovation and the survival of new firms in the UK. *Review of Industrial Organization*, 36 (3): 227-248.
- Holcombe, R. (1998). Entrepreneurship and Economic Growth, *The Quarterly Journal of Austrian Economics*, 1 (2): 45-62.
- Huggins and Thomson, P. (2015). Entrepreneurship, Innovation and Regional Growth: A Network Theory. *Small and Business Economics*, 45 (1): 103-128.
- Kaneva, M. and Untura, G. (2016). Innovation Indicators and Regional Growth in Russia. *Economic Change and Restructuring*, 50 (2): 133-159.
- Kao, C. and Chiang, M. H. (2000). On the Estimation and Inference of a Cointegrated Regression in Panel Data. *Advances in Econometrics: Nonstationary Panels, Panel Cointegration and Dynamic Panels*, 15 (1): 179-222.
- Kirchhoff, B., Catherine, A., Newbert, S. L. and Hasan, I. (2007). The Influence of University R&D Expenditures on New Business Formations and Employment Growth. *Entrepreneurship Theory and Practice*, 31 (4): 543-559.
- Kirzner, F. (1973). *Competition and Entrepreneurship*, University of Chicago Press, USA. Kirzner, F. (1997). Entrepreneurial Discovery and Competitive Market Process: An Austrian Approach, *Journal of Economic Literature*, 35 (1): 60-85.
- Knight, F. (1921). *Risk, Uncertainty and Profit*, Houghton Mifflin, New York, USA.
- Kritikos, A. (2014). Entrepreneurship and their impact on jobs and economic growth, IZA World of Labor, <https://wol.iza.org/uploads/articles/8/pdfs/entrepreneurs-and-their-impact-on-jobs-and-economic-growth.pdf>; accessed 18 March 2018

- Larsson, Rolf, Johan Lyhagen, and Mickael Lothgren (2001). Likelihood-based Cointegration Tests in Heterogeneous Panels. *Econometric Journal*, 4 (1): 109-142.
- Leibenstein, H. (1968). Entrepreneurship and Development, *American Economic Review*, 58 (2): 72-83.
- Li, H., Yang, Z., Yao, X., Zhang, H. and Zhang, J. (2012). Entrepreneurship, Private Economy and Growth: Evidence from China. *China Economic Review*, 23 (4): 948-961.
- Kortum, S. and Lerner, J. (2000). Assessing the Contribution of Venture Capital to Innovation. *RAND Journal of Economics*, 31 (4): 674-692.
- Maradana, R. P., Pradhan, R. P., Dash, S., Gaurav, K., Jayakumar, M., and Chatterjee, D. (2017). Does innovation promote economic growth? Evidence from European countries. *Journal of Innovation and Entrepreneurship*, 6 (1): 1-23.
- Pedroni, P. (2000). Fully Modified OLS for Heterogeneous Cointegrated Panels. *Advances in Econometrics*, 15 (1): 93-130.
- Popov, A., & Roosenboom, P. (2012). Venture capital and patented innovation: evidence from Europe. *Economic Policy*, 27 (71): 447-482.
- Porter, M. (2008). *On Competition*, Harvard Business Review Book, Boston, MA, USA.
- Pradhan, R. P., Arvin, M. B., Bahmani, S. and Bennett, S. E. (2017). The Innovation- growth Link in OECD Countries: Could other Macroeconomic Variables Matter? *Technology in Society*, 51: 113-123.
- Pradhan, R. P., Arvin, M. B., Hall, J. H., and Nair, M. (2016). Innovation, Financial Development, and Economic Growth in Eurozone Countries. *Applied Economics Letters*, 23 (16): 1141-1144.
- Romer, P. (1986). Increasing Returns and Long-Run Growth, *Journal of Political Economy*, 94 (5): 1002-1037.
- Romer, P. (1990). Endogenous Technological Change, *Journal of Political Economy*, 98 (5): S71-S102.
- Sadraoui, T., Ali, T. B. and Deguachi, B. (2014). Economic Growth and International R&D Cooperation: A Panel Granger Causality Analysis. *International Journal of Econometrics and Financial Management*, 2 (1): 7-21.
- Schumpeter, J. A. (1934). *The Theory of Economic Development*. Harvard University Press, Cambridge, MA.
- Sinha, D. (2008). Patents, Innovations and Economic Growth in Japan and South Korea: Evidence from Individual Country and Panel Data. *Applied Econometrics and International Development*, 8 (1): 181-188.
- Urbano, D. and Aparicio, S. (2016). Entrepreneurship Capital Types and Economic growth: International Evidence. *Technological Forecasting and Social Change*, 102: 34-44.
- vonHayek, F. (1945). The Use of Knowledge Society, *American Economic Review*, 35 (4): 519-530.
- Warsh, D. (2006), *Knowledge and Wealth of Nations*, New York. W.W. Norton Company.
- Wennekers, S. and Thurik, R. (1999). Linking Entrepreneurship and Economic Growth. *Small and Business Economics*, 13 (1): 27-55.
- World Economic Forum (2014). *The Europe 2020 Competitiveness Report: Building a More Competitive Europe*, World Economic Forum.

1159 IMPACTS OF ENTREPRENEURSHIP AND SOCIAL CAPITAL ON THE PROCESS OF NEW FIRM FORMATION IN JAPAN

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1. INTRODUCTION

Recently, researches on entrepreneurship have shed new light on the importance of new firm formation to economic growth. However, new firm formation in Japan is stagnating and its rate is consistently from 4 to 5%, which is at a very low level compared with other developed countries such as that of rate is 14.3% in the UK and 12.4% in France in the year of 2015 (National Association of Trade Promotion for Small and Medium Enterprises 2017).

The factors promoting new firm formation can be roughly divided into entrepreneurship and entrepreneurial environment. Entrepreneurial environment consists of economic factors, institutional factors, and social factors (such as social capital), it affects entrepreneurship as well.

As for the situation of entrepreneurial environment, World Bank (2018) made the index of “Starting a business” from the measurement of procedures, time, cost and paid-in minimum capital to start a limited liability company by comparing 11 areas of business regulations in 190 countries. This index means how easy to start a business for each country and the rank of Japan is at 106th in 190 countries and at 32th in 35 OECD countries in 2017, though many regulations on firm formation in Japan have been mitigated in recent years (see table 1).

Table 1 Regulation measurements for starting a limited company in Japan

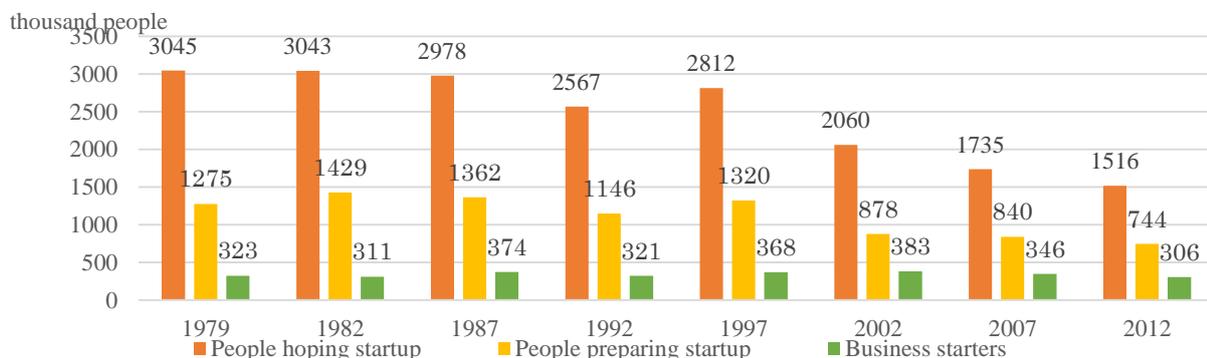
	Procedures (number)	Time (days)	Cost (% of income per capita)	Minimum capital (% of income per capita)
2017	9	12.2	7.5	0.0
2003	11	31.0	10.5	71.3

Source: *Doing Business 2018, Doing Business 2004*, World Bank.

As for the entrepreneurship, Global Entrepreneurship Monitor (GEM) (2017) reported “Entrepreneurial Spirit Index” as the composite index of entrepreneurship and ranked Japan at the lowest of all 54 countries in 2017, in which “Perceived opportunities” and “Perceived capabilities” ranked at the 51th, “Entrepreneurship for a good career choice”, “Entrepreneurial intentions”, “Total Early-stage Entrepreneurial Activity (TEA)”, “Female/Male TEA Ratio” at the 50th, and “High status to entrepreneurs” at the 48th.

Furthermore, Employment Status Survey (Ministry of Internal Affairs and Communications of Japan) investigated the working situation of population of 15 years old and over. Figure 1 shows that the number of “Business starter” in 1979 was 323 thousand and it has been constant 300 thousand, despite recent deregulation on startup. During the period of 1979-2012, the number of “People hoping to startup business” decreased from 3.05 million to 1.52 million and the number of “People making startup preparations” decreased from 1.28 million to 0.74 million. Therefore, it is supposed that the decreasing of entrepreneurship is the one of the major causes for low new firm formation rate in Japan.

As the results of such changes, the ratio of “Business starters” to “People hoping startup” and “People making startup preparations” has been increased rapidly after late 1990s (Figure 2). Mitigation of regulation on starting business has effects on promoting new firm formation and contribute to the regional employment, but there is also the risk of increase in easy business starters with low entrepreneurship.



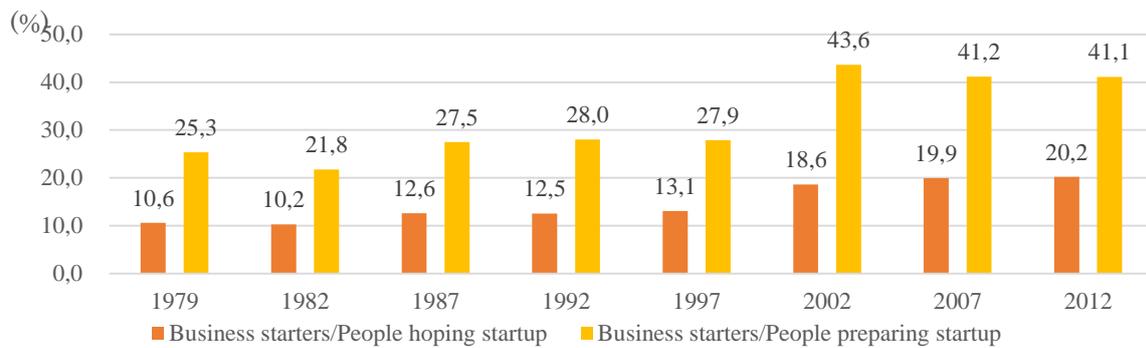
Source: Employment Status Survey issued in each year, Ministry of Internal Affairs and Communications of Japan.

Figure 1 People responsible for business startups

“People hoping startup” are those who responded that they are looking to change jobs and “wish to start their own business”, or unemployed persons who responded that they “wish to start their own business”.

“People preparing startup” are those who responded that they are “preparing to start a business”.

“Business starters” are those who have changed jobs or found a new job within the last year and who have become officer of a company, etc. or self-employed persons.



Source: Employment Status Survey issued in each year, Ministry of Internal Affairs and Communications of Japan.

Figure 2 Ratio of business starters to people hoping startup and preparing startup

Therefore, in this study, we will clarify the mechanism of new firm formation and derive policy implications through analyzing the relationships among economic factors, social capital and entrepreneurship in Japan because not only entrepreneurship but also the actual process from entrepreneurship to business startup are usually influenced by various factors in each country and region.

2. SURVEY OF EXISTING STUDIES

2.1 New firm formation

In general, there are disparities in the ratio of new firm formation among regions, and many studies tried to reveal their factors. Most of studies measured the relationship between regional economic variables and the ratio of new firm formation.

By using multiple regression analysis, Armington and Acs (2002) clarified that the number of new firm formation per labor force was influenced by company size, industry concentration, income growth rate, population growth, managerial proportion (number of executers / labor force), unemployment rate, educational background in the United States. However, Parajuli and Haynes (2017) revealed that population density, deposit balance, company size, income growth rate, public school, unemployment rate influenced new firm formation rate using panel and spatial econometric analysis in New England of the United States. Piacentino et al. (2017) also showed that population growth, innovation (patent), population density, age structure, withdrawal rate, unemployment rate, industrial specialization, number of commuting workers, number of referendum voters affect the firm formation rate per capita by the estimation of a Spatial Durbin Model in Italy.

As for Japan, Komoto (2007) clarified that the business closure rate, unemployment rate, household increase rate, taxable income growth rate, population aged 65 or over, commercial land price, wage, service industry ratio, and the ratio of professional and technical workers affect the new firm formation rate.

Although, the above-mentioned studies revealed the impact factors of regional economy towards new firm formation, their relationship is not a such simple. Taking a high unemployment rate as an example for a region, the new firm formation rate could be high due to the unemployed choose new business to get employed, or it might be easier to secure workers when starting new business on one side, but might be the result that people have lower willingness to start new business on the other due to the a high unemployment rate reflected a bad economic situation in the region. Audretsch et al. (2015) revealed that the impact of unemployment rate on new firm formation depends on the structure of labor market in the region and the nature of new business from study in Germany. For example, the unemployment rate of highly educated people only positively influences the knowledge-intensive new firm formation without affecting the new firm formation of business in general. Furthermore, the high proportion of unemployment in a long term such as one year or more might suppress new business formation.

Since new firm formation is considered as the result of entrepreneurial activity and entrepreneurs play a major role in starting new business, it is necessary to consider the influence of regional economic and social factors on the entrepreneurial activity.

2.2 Studies on Entrepreneurship based on GEM data

Although, there have been tremendous researches on entrepreneurship both from theoretical and empirical aspects, studies on Japan to clarify the entrepreneurial consciousness and activities and the factors that influence them based on GEM data are scarce. Using GEM data of the European region, Bosma and Schutjens (2011) clarified the variables for impact of entrepreneurial environmental on entrepreneurial attitudes and entrepreneurial activities while Hundt and Sternberg (2016) showed that mutual relationship between personal attributes and regional factors is important to explain entrepreneurial activity at individual level and regional level.

2.3 Social capital

Social capital has multiple definitions and one of the representative definition is “features of social organization, such as trust, norms, and networks that can improve the efficiency of society by facilitating coordinated actions.” (Puttnam,

1993). It is categorized into bonding social capital and bridging social capital by the differences in function of connecting actors.

Knack and Keefer (1997) showed that social capital has significantly positive impact on economic growth from studies on 29 countries. As for Japan, Yodo (2005) clarified that trust and norm in the community influence the growth rate of per capita GDP by multiple regression analysis at prefectural level. Furthermore, the studies focusing on the relationship between information and starting new business clarified that information from others is important as well as information held by entrepreneurs themselves (Aldrich and Martinez, 2001; Newbert and Tornikoski, 2007). However, the mechanism that social capital influences economic growth has not been analyzed so far.

Therefore, this research will analyze the mechanism of new firm formation, not only on economic factors but also on social factors represented by social capital, and how they affect the situation of people's entrepreneurship and how they lead to startup new business.

3. ANALYTICAL METHODS AND FRAMEWORK

3.1 Analytical framework and hypothesis

In order to reach our objectives in this study, we built an analytical framework as shown in Figure 3 and set the hypotheses as follows.

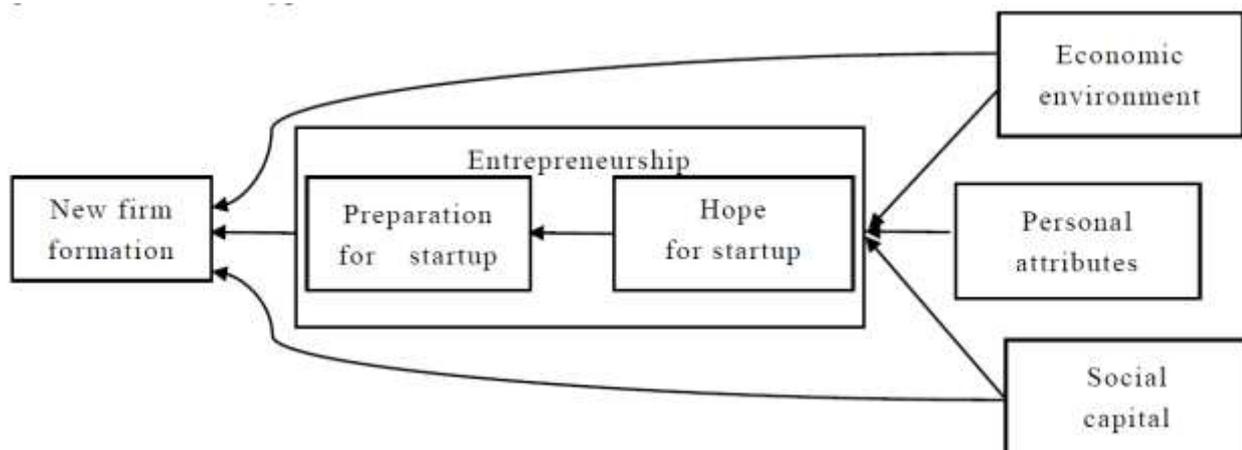


Figure 3 Framework of analysis in this study

Hypothesis 1: Economic environment, social capital, personal attributes affect entrepreneurship.

Hypothesis 2: Economic environment, social capital, entrepreneurship affect new firm formation.

3.2 Data and methodology

For introducing structural equation modeling (SEM), following data of new firm formation, economic environment, social capital, personal attributes are collected at prefectural level. Table 2 shows the summary of variables.

1) New firm formation rate

Number of new firm formation from 2009 to 2014, Number of enterprise: Economic Census for Business Frame in 2014.

2) Economic environment

Population density: Population / Land, Census in 2012.

Income: Per capita Prefectural Income, Prefectural Accounts in 2012

Unemployment rate: Jobseeker / Labor force, Survey on Employment Status in 2012

3) Social capital (Japan Research Institute, 2008)

Index of bonding social capital, Index of bridging social capital

4) Personal attribute (Employment Status Survey in 2012)

Sex : Male=1; Female=2

Age: 15-24=1, 25-34=2, 35-44=3, 45-54=4, 55-64=5, 65-74=6

5) Entrepreneurship (Employment Status Survey 2012)

Hope for startup: Ratio of people hoping startup

Preparation for startup: Ratio of people preparing startup

Table 2 Summary of variables

Variables		Unit	Min.	Max.	Average	S.D.
PopDen	Population density	person/km ²	70.20	6015.70	655.66	1165.73
Income	Income	Thousand	2030.00	4442.00	2733.74	381.67

		yen/person				
<i>Unemploy</i>	Unemployment rate	%	1.30	25.00	7.36	4.11
<i>Bonding</i>	Index of bonding social capital		-0.96	1.78	-0.01	0.55
<i>Bridging</i>	Index of bridging social capital		-1.52	2.01	0.00	0.80
<i>Gender</i>	Male=1, Female=2		1.00	2.00	1.50	0.50
<i>Age</i>	Age structure (1-6)		1.00	6.00	3.50	1.71
<i>StartHope</i>	Ratio of “people hoping startup”	%	0.00	6.23	1.35	1.14
<i>StartPre</i>	Ratio of “people preparing startup”	%	0.00	3.71	0.63	0.58
<i>NewFirm</i>	New firm formation rate	%	2.20	4.01	2.84	0.41

Note: Data source is explained in the text.

3.3 Description of variables

3.3.1 New firm formation rate and related factors

Usually, there are regional disparity in new firm formation rate. Table 3 reported that the top 5 prefectures of high rate of new firm formation were Tokyo, Miyagi, Fukuoka, Okinawa, and Kanagawa in the period of 2009-2014. It seems that there have been different factors promoting new firm formation in these prefectures because Tokyo, Fukuoka, and Kanagawa are the most developed industrial regions and have high population density, but the economy of Okinawa is stagnated and Miyagi had severe damage from Great East Japan Earthquake in 2011.

Table 3 New firm formation rate in 47 prefectures (2009-2014)(%)

Hokkaido	3.07	Ishikawa	2.63	Okayama	2.70
Aomori	2.73	Fukui	2.44	Hiroshima	3.04
Iwate	3.13	Yamanashi	2.41	Yamaguchi	2.73
Miyagi	3.82	Nagano	2.66	Tokushima	2.43
Akita	2.42	Gifu	2.54	Kagawa	2.75
Yamagata	2.22	Shizuoka	2.85	Ehime	2.39
Fukushima	2.66	Aichi	3.13	Kochi	2.53
Ibaraki	2.55	Mie	2.58	Fukuoka	3.56
Tochigi	2.59	Shiga	2.95	Saga	2.84
Gunma	2.61	Kyoto	2.90	Nagasaki	2.69
Saitama	3.13	Osaka	3.40	Kumamoto	2.95
Chiba	3.19	Hyogo	3.28	Oita	2.90
Tokyo	4.01	Nara	3.03	Miyazaki	2.76
Kanagawa	3.47	Wakayama	2.20	Kagoshima	2.80
Niigata	2.40	Tottori	2.79	Okinawa	3.55
Toyama	2.44	Shimane	2.50		

Source: Calculation of data from Economic Census for Business Frame in 2014, Ministry of Economy, Trade and Industry Japan.

Table 4 shows the correlation coefficients of variables with new firm formation at prefectural level in which population density, unemployment, hoping startup, and preparation for startup have highly positive effects on new firm formation. However, variables of social capital are not highly correlated with new firm formation rate.

Table 4 Correlation coefficients of variables with new firm formation

	<i>PopDen</i>	<i>Income</i>	<i>Unemploy</i>	<i>Bonding</i>	<i>Bridging</i>	<i>StartHope</i>	<i>StartPre</i>	<i>NewFirm</i>
<i>PopDen</i>	1.000	0.629	0.320	-0.249	-0.120	0.666	0.646	0.635
<i>Income</i>	0.629	1.000	-0.157	-0.131	-0.117	0.391	0.328	0.315
<i>Unemploy</i>	0.320	-0.157	1.000	-0.180	0.151	0.619	0.652	0.639
<i>Bonding</i>	-0.249	-0.131	-0.180	1.000	0.822	-0.269	-0.233	-0.158
<i>Bridging</i>	-0.120	-0.117	0.151	0.822	1.000	-0.083	-0.033	0.025
<i>StartHope</i>	0.666	0.391	0.619	-0.269	-0.083	1.000	0.888	0.799
<i>StartPre</i>	0.646	0.328	0.652	-0.233	-0.033	0.888	1.000	0.727
<i>NewFirm</i>	0.635	0.315	0.639	-0.158	0.025	0.799	0.727	1.000

3.3.2. Entrepreneurship in different labor force status and personal attributes

Entrepreneurship is also thought to be related to labor force status which is “engaged in work” or not and personal attributes. As shown by table 5, entrepreneurship is reflected by the ratio of hoping and preparing startup as below.

- 1) Entrepreneurship of “engaged in work” is lower than that of “not engaged in work” for labor force between ages of 25 and 64.
- 2) Labor force engaged in work choose more startup business as additional job than that of as changing job.
- 3) Entrepreneurship is lower in female than male in all labor force status and ages.
- 4) Entrepreneurship is high for labor force between ages of 25 and 45 in both gender.

Table 5 Entrepreneurship by types of working and personal attribute

	Gender	Age	Labor force status				
			Total	Engaged in work (by job status)			Not engaged in work
				Subtotal	Additional	Changing	
Ratio of person hoping startup	Male	15-24	1.03	1.67	0.86	0.81	0.62
		25-34	3.51	3.43	2.00	1.43	4.23
		35-44	3.48	3.34	2.07	1.27	5.38
		45-54	2.75	2.56	1.61	0.95	5.27
		55-64	1.56	1.37	0.75	0.63	2.31
		65-	0.53	0.60	0.38	0.21	0.51
		Subtotal	2.04	2.41	1.44	0.96	1.23
	Female	15-24	0.47	0.65	0.34	0.31	0.34
		25-34	1.39	1.32	0.68	0.64	1.56
		35-44	1.47	1.32	0.79	0.54	1.78
		45-54	1.12	0.95	0.61	0.34	1.60
		55-64	0.58	0.49	0.30	0.19	0.68
		65-	0.11	0.21	0.09	0.12	0.10
	Subtotal	0.75	0.92	0.53	0.39	0.58	
Total		1.37	1.77	1.05	0.72	0.81	
Ratio of person preparing startup	Male	15-24	0.49	0.85	0.42	0.42	0.25
		25-34	1.91	1.78	1.02	0.76	3.10
		35-44	1.57	1.43	0.87	0.56	3.52
		45-54	1.28	1.14	0.71	0.42	3.24
		55-64	0.82	0.68	0.39	0.29	1.41
		65-	0.27	0.35	0.24	0.12	0.23
		Subtotal	1.00	1.13	0.67	0.46	0.71
	Female	15-24	0.24	0.31	0.17	0.14	0.18
		25-34	0.70	0.70	0.36	0.34	0.69
		35-44	0.67	0.61	0.40	0.21	0.80
		45-54	0.58	0.50	0.32	0.18	0.82
		55-64	0.29	0.27	0.18	0.10	0.31
		65-	0.05	0.12	0.07	0.05	0.04
		Subtotal	0.36	0.47	0.28	0.19	0.27
Total		0.67	0.85	0.51	0.34	0.42	

Source: Calculation of data from Employment Status Survey 2012, Ministry of Internal Affairs and Communications of Japan.

Table 6 clarified the correlation coefficients of each variable with entrepreneurship. The variables for personal attributes used in the research are gender, age, and unemployment rate. The result shows that there are negative correlations between personal attributes with entrepreneurship, although a positive correlation between unemployment rate and entrepreneurship at regional level was found in Table 4. These results are consistent with the discussion in the above section 2 that the impact of unemployment rate on new firm formation depends on the structure of labor market in the region and the nature of new business, and the high proportion of unemployment in a long term such as one year or more might suppress new business formation. Furthermore, as showed by Table 5 that the first case (for additional job) is the most popular in Japan for startup business could be added as a new finding to the discussion and support for the policy of “Work style reform” as well.

Table 6 Correlation of variables with entrepreneurship

	<i>Unemploy</i>	<i>Gender</i>	<i>Age</i>	<i>StartHope</i>	<i>StartPre</i>
<i>Unemploy</i>	1.000	0.249	-0.556	-0.394	-0.359
<i>Gender</i>	0.249	1.000	0.000	-0.539	-0.483
<i>Age</i>	-0.556	0.000	1.000	-0.242	-0.208
<i>StartHope</i>	-0.394	-0.539	-0.242	1.000	0.936
<i>StartPre</i>	-0.359	-0.483	-0.208	0.936	1.000

4. RESULTS OF STRUCTURAL EQUATION MODELING

Table 7 and Figure 4 show the results of structural equation modeling (SEM), and table 8 summarizes the effects of factors on new firm formation.

Table 7 Estimation of path coefficients in SEM

		Unstandardized	Standardized	P
<i>StartHope</i>	<--- <i>Gender</i>	-0.822	-0.305	***
<i>StartHope</i>	<--- <i>PopDen</i>	0.000	0.256	***
<i>StartHope</i>	<--- <i>Unemploy</i>	-0.201	-0.614	***
<i>StartHope</i>	<--- <i>Income</i>	-0.001	-0.142	***
<i>StartHope</i>	<--- <i>Bonding</i>	-0.509	-0.206	***
<i>StartHope</i>	<--- <i>Bridging</i>	0.365	0.216	***
<i>StartHope</i>	<--- <i>Age</i>	-0.431	-0.546	***
<i>StartPre</i>	<--- <i>StartHope</i>	0.484	0.971	***

<i>StartPre</i>	<---	<i>Age</i>	0.008	0.020	0.205
<i>StartPre</i>	<---	<i>Bonding</i>	-0.042	-0.034	0.131
<i>StartPre</i>	<---	<i>Bridging</i>	0.015	0.018	0.427
<i>StartPre</i>	<---	<i>Gender</i>	0.038	0.028	0.038
<i>NewFirm</i>	<---	<i>PopDen</i>	0.000	0.625	***
<i>NewFirm</i>	<---	<i>Unemploy</i>	0.015	0.156	***
<i>NewFirm</i>	<---	<i>Income</i>	0.000	-0.098	0.018
<i>NewFirm</i>	<---	<i>Bonding</i>	-0.131	-0.178	0.002
<i>NewFirm</i>	<---	<i>Bridging</i>	0.102	0.202	***
<i>NewFirm</i>	<---	<i>StartPre</i>	0.104	0.175	***

Note: GFI=0.915 NFI=0.906 CFI=0.910

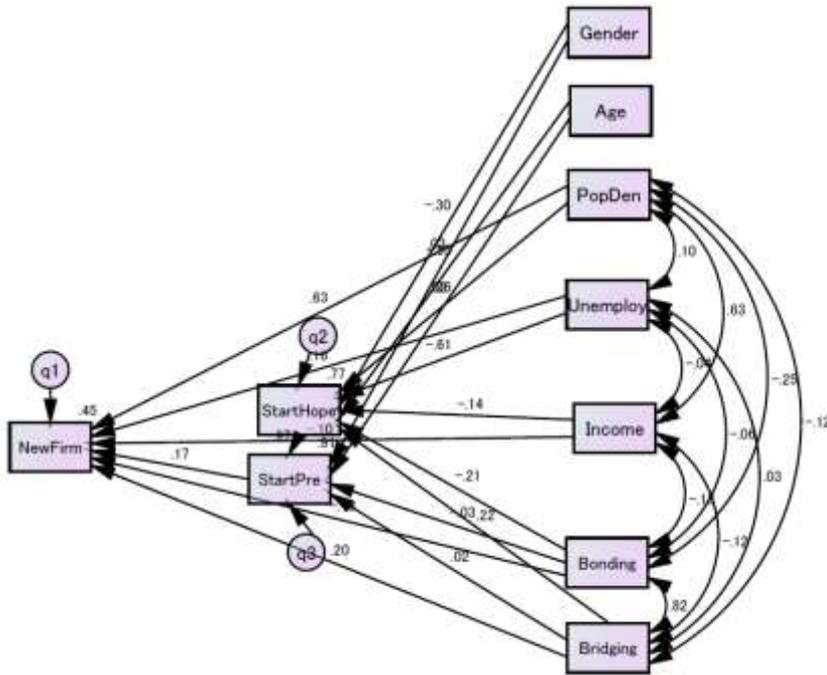


Figure 4 Path diagram of SEM

Table 8 Effects of factors on new firm formation

		Income	Unemploy	PopDen	Age	Gender	Bonding	Bridging	StartHope	StartPre
Total effect	StartHope	-0.142	-0.614	0.256	-0.546	-0.305	-0.206	0.216	0.000	0.000
	StartPre	-0.138	-0.596	0.249	-0.511	-0.268	-0.234	0.227	0.971	0.000
	NewFirm	-0.122	0.051	0.669	-0.089	-0.047	-0.219	0.242	0.170	0.175
Direct effect	StartHope	-0.142	-0.614	0.256	-0.546	-0.305	-0.206	0.216	0.000	0.000
	StartPre	0.000	0.000	0.000	0.020	0.028	-0.034	0.018	0.971	0.000
	NewFirm	-0.098	0.156	0.625	0.000	0.000	-0.178	0.202	0.000	0.175
Indirect effect	StartHope	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	StartPre	-0.138	-0.596	0.249	-0.530	-0.296	-0.200	0.209	0.000	0.000
	NewFirm	-0.024	-0.104	0.044	-0.089	-0.047	-0.041	0.040	0.170	0.000

Regarding social capital, each has the opposite effect while bridging social capital has a positive but bonding social capital has a negative effect on new firm formation. It is considered that bridging social capital has the positive effects on promoting startup business and expanding new business directly through the increase of entrepreneurship. Bonding social capital, on the other hand, has the negative effects not only on startup new business but also on startup hoping and startup preparation through the decrease of entrepreneurship.

Although, unemployment rate has a direct effect on the new firm formation rate which is thought to be the reflection of both demand and supply for new business, it has negative effects on the entrepreneurship which is thought to have indirectly influence on the new firm formation rate, its effect on new firm formation is small as a total.

On the other hand, population density has the largest positive influence on new firm formation rate among the variables. Besides direct effects on startup hoping, indirect effect on startup preparation as entrepreneurship are both positive.

However, income has a negative impact on the new firm formation rate which is considered that the necessity for starting new business is comparatively low in the regions with high income.

5. CONCLUSION

The above-mentioned results showed that entrepreneurship is activated by population density and bridging social capital but deactivated by income, unemployment rate, and bonding social capital.

As for promoting new firm formation, population density had a large influence on new firm formation rates, but unemployment rate does not simply affect new firm formation due to the cross-interaction among regional and individual factors.

In addition, social capital does not simply promote new firm formations, since the effects on new firm formation are negative for bonding SC and positive for bridging SC by contrast. Furthermore, gender and age affect entrepreneurship as economic and social factors in Japan but their indirect effects on new firm formation are limited.

There have been several measures to promote new firm formation in Japan, such as financial support, improvement of economic environment, providing of information. However, these measures are considered to make contribution to the decrease in the cost of startup but not to stimulate and enhance entrepreneurship and may have negative effects on actual new firm formation through interaction among factors.

The findings on the relationship between entrepreneurship and working status suggested that measures should be designed according to the types of working status. For instance, the measures of deregulating side business and decreasing risk of job transfer are thought to be effective for the people who are engaged in working. On the other side, the support for the cultivation of entrepreneurship is needed for the people who are not engaged in working. Finally, it is requested to facilitate the social condition for encouraging the female and aged people to participate in business activities.

However, our discussions in this paper are closely related to the issues on regional disparity and vitalization, because population density is not only one of the important factors for entrepreneurship and new firm formation but also a result of them. In this context, the study from the aspect of regional sustainability is needed.

Furthermore, there exists a bit of room for improvement this study through including more economic and social factors, time series analysis, analysis by industry, and international comparison. These will be our future challenges.

REFERENCES

- Armington Catherine, Acs Zoltan J (2002) "The determinants of regional variation in new firm formation", *Regional Studies* 36(1): 33-45
- Audretsch David B, Dohse Dirk, Niebuhr Annekatriin (2015) "Regional unemployment structure and new firm formation", *Papers in Regional Science* 94(1):S115-139
- Bosma Niels, Schutjens Veronique (2011) "Understanding regional variation in entrepreneurial activity and entrepreneurial attitude in Europe", *The Annals of Regional Science* 47(3):711-742
- Hundt Christian, Sternberg Rolf (2016) "Explaining new firm creation in Europe from a spatial and time perspective: A multilevel analysis based upon data of individuals, regions and countries", *Papers in Regional Science* 95(2):223-258
- Japan Research Institute (2008) *Social capital and policy in Japan: Report of Japan Research Institute national survey in 2007* (in Japanese)
- Knack, Stephen and Keefer, Philip (1997) "Does Social Capital have an Economic Payoff? : Cross-Country Investigation", *The Quarterly Journal of Economics* 112(4):1251-1288
- Komoto Keisho (2007) "Panel analysis of regional difference in new firm formation rate", *NLI Research Institute Letter* 44:58-82, NLI Research Institute (in Japanese)
- National Association of Trade Promotion for Small and Medium Enterprises (2017) *2017 White Paper on Small Enterprises in Japan*
- Newbert, Scott L., and Erno T. Tornikoski (2007) "Supporter networks and network growth: a contingency model of organizational emergence", *Small Business Economics* 22(1):311-335
- Parajuli Jitendra, Haynes Kingsley E. (2017) "Panel Data Models of New Firm Formation in New England", *Region* 4(3):65-76
- Piacentino Davide, Bonoa Filippa, Cracolici Maria Francesca, Giuliani Diego (2017) "A spatial analysis of new business formation: Replicative vs innovative behavior", *Spatial Statistics* 21(B): 390-405
- Yodo Masato (2005) *Does social capital improve regional economic growth? - Investigation using prefectural cross-sectional data in Japan -*, PRILIT research reports 61:1-22 Policy Research Institute for Land, Infrastructure, Transportation and Tourism (in Japanese)

1334 THE ROLE OF TECHNO PARKS ON REGIONAL INNOVATION IN TURKEY**Ferhan Gezici¹, Burcu Müderrisoğlu², Güliz Salihoğlu³, Gülay Başarır⁴**¹ Corresponding author: Istanbul Technical University, Urban and Regional Planning Department, gezicif@itu.edu.tr² Ondokuz Mayıs University, Burcu.muderrisoglu@omu.edu.tr³ Gebze Technical University, gozturk@gtu.edu.tr⁴ Mimar Sinan Fine Arts University, gulaybasarir@msgsu.edu.tr**ABSTRACT**

Innovation and its capacity in the regions have become the most interesting topic for academia and policy makers, not only for developed countries but developing countries as well in the knowledge economy. The determinants of the innovation process are introduced as providing existing knowledge stock along with national and regional policies that ensure necessary environments and conditions for innovation creation, having firms with a vision and aim to create innovation, adoption of an innovation mission by universities and supporting entrepreneurship (Sternberg, 2000; Asheim and Gertler, 2005; Castells and Hall, 1994; Etzkowitz, 2002; Malecki, 2011). Most of the studies have been focus on patents for the main determinant of knowledge production and innovation (Griliches, 1990; Jaffe, 1989; Siegel, 2003; O'hualachian, 1999; Anselin, 1997). Since it is realized that the innovation process has been non-linear and more complex, the scope of studies on the innovation process has become broader considering the role of universities and other regional actors, networks and the impact of proximities (Florax, 1992; Cooke, 2005; Rallet and Torre, 1998; Boschma, 2005; Arnkil et al., 2010). On the other hand, within the literature of innovation, techno parks/science parks took their place in many developing countries' agenda with the successful performances that developed countries put forth (Saxenien and Hsu, 2001; Benneworth and Hospers, 2007; Lee and Yang, 2000). Techno parks that emerged as a result of university-industry and government cooperation encourage R&D firms to be located close to the university, contribute to knowledge production, develop centers of technology and knowledge spill-over and support national and regional economic growth. Techno parks in Turkey were founded initially in industrialized cities with well-established universities, skilled labor and knowledge production dynamics since 2001, and the numbers of techno parks increased to 64 in 44 provinces of Turkey in 2016. The roles and efficiency of the increasing number of techno parks that also have the goal of regional development is a subject of debate. The aim of this paper is to discuss the role of techno parks on regional innovation in Turkey. First, the policies on innovation in Turkey will be evaluated. Secondly, the performance of regions based on the patent data is analyzed related to techno parks as a base of geographically localized networks and cooperation with the universities and other endogenous characteristics by two multiple regression models.

Key words: Innovation, science parks, regional development**INTRODUCTION**

The significance of innovation has been relatively neglected after Schumpeter by theoreticians' on local development. According to Schumpeter, growth would occur throughout the changes and inventions on production, consumption and behavior of entrepreneurships. Neo-Schumpeterian perspective points out that innovation is an outcome of commodification of new knowledge (Wolfe, 2011). It is known that outcomes of technological innovation are very much related with the attempts of capital to increase its own profits within the capitalist process. In the new economic system, firms have to develop new products to be more competitive and productive, while economic development has to be seen as a process of qualitative change driven by innovation (Fagerberg, 2003). Investments on research and development as a cumulative process of existing knowledge stock have been essential for innovation (Cantner and Graf, 2010). Most of the studies examining the relationship between the innovation and regional dynamics at both macro and micro levels have used patent data. As the study of Pakes and Griliches (1984) points out, there is a strong relationship between research and development and the number of patents across firms and industries. Therefore, patents have long been significant indicators of economic analysis (Schmookler, 1966; Griliches et al., 1980; Griliches, 1998; Siegel, 2003), while the study of Jaffe (1989) on academic research emphasizes that knowledge spillovers are facilitated by geographic coincidence of university and research labs within the states in the US. Furthermore, patents have been used by economic historians to study regional patterns of economic growth and agglomeration (Kelley, 1972; Sokoloff, 1988). Therefore, the importance of space for innovation has become one of the most interesting research topics. According to Simmie (2006), local agglomeration economies are still important, city size provides assets which are required by innovative firms. O'hualachian (1999) found that the largest metropolitan areas in the US were the most innovative, although rank size relationships vary by regions. However, Carrincazeaux and Gaschet (2007) emphasize that regional concentration of resources in innovation does not necessarily lead to superior economic performance. The study of Qi and Lui (2011) indicates that education, foreign capital, concentration of physical and human capital, international networks and institutional supports have a positive impact on innovation performance of regions in China using patent data. Porter and Stern (2000) point out that national knowledge stock and the R&D sector employment induced the innovation capacity in 17 OECD countries during the 20-year period. Moreover, most of the studies from different geographies prove that especially R&D activities and incentives induce the number of patents (Cincera, 1997; Zachariades, 2003; Bosch, 2005; Yanhui, 2015). Kaygalak and Reid (2016) indicate that spatial and organizational proximity among the firms enhances the innovation capacity of different geographies and sectors in Turkey using the patent data.

In the 1990s, the National Innovation System took place and innovation was identified as a process of interactions and networking among all components considering the proximities, path dependency and capacity within the system

(Nelson,1993; Freeman,1998; Cooke, 1998; Audretsch, 2001; Cohen and Levinthal, 1994; Moulert and Seika, 2001; OECD, 1997).

Since innovation is not linear, rather it is a dynamic and complex system, and geographically localized, the new approach with the concept of a regional innovation system has become significant. It is expected that RIS should be conducted regarding the regional characteristics and needs, contrary to a national innovation system. Asheim and Gertler (2005) identify RIS as the culture of networking considering the role of local actors. It requires region-specific policies in innovation to achieve collective learning among the actors (Lundvall, Borrás, 1997). The importance of localized networks and cooperation for innovation has mostly been related to the success story of Silicon Valley. Saxenian (1994) explains that innovation was a must for firm competitiveness, while a dynamic innovation system should require cooperation among firms and other related actors. Cooke (2005) identifies a regional innovation system with five key concepts: the concept of the region as a meso political unit, the concept of innovation as the process of new knowledge, the concept of network, the concept of learning, and the concept of interactions. The efficiency of RIS depends on the density and power of interactions among the actors. It is known that RIS does not only concentrate on firms and factor conditions, but more on localized public-private networks (Bellini et al., 2012).

Regional aspects of innovation could be realized as converging the experiences of clusters regarding the benefits of agglomeration economies and a regional innovation system as localized networks. Technology clusters have been identified as clusters which include the sectors/firms that are research based and their knowledge as the main outcomes. The triple helix approach is grounded on the idea that innovation is the outcome of an interactive process involving different spheres of actors such as public and private sectors and universities. Meanwhile the role of universities in the new economy has been evolving beyond the knowledge production and providing human capital to the entrepreneurial university that supports the start-ups (Benneworth and Charles, 2005). Although as Florax (1992) points to the role of universities as engines of growth, it is not uniformly confirmed by empirical studies. Several studies indicate a significant and positive effect of the presence of universities on the location of high-tech production, new start-ups and R&D facilities (Malecki, 1986; Nelson, 1982; Lund, 1986; Anselin et al., 1997). On the other hand, Howels (1984), Florax and Folmer (1992) find a weak relationship between the university research activities and location of high tech production.

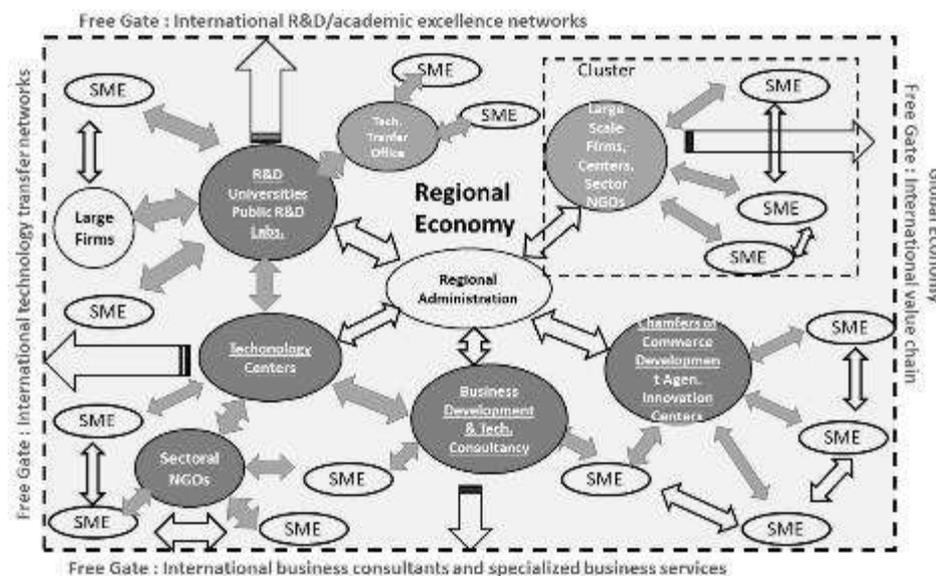


Figure 1: Regional Innovation Systems, European Commission, 2004.

However, technoparks (science parks) are mostly regarded as key elements of the research based regional development policy. The success stories of the developed countries would not be always valid for other countries and regions especially regarding the role of entrepreneurial universities. Castells and Hall (1994) point out that there have been three main motivations for the establishment of technoparks: reindustrialization, regional development and the creation of synergies. Existing knowledge stock, engagement on innovation of the firms, entrepreneurial mission of the universities and supports for start-ups, national and regional innovation policies for cooperation among the actors are the determinants of innovation (Sternberg, 2000; Asheim and Gertler, 2005; Castells and Hall, 1994; Etzkowitz, 2002; Malecki, 2011).

However spatial proximity matters for innovation, as a debate has been going on about to what extent (Brecsh and Lissoni, 2001; Johnson et al., 2006; Carrincazeaux and Coris, 2011; Lung et al., 1999; Rallet and Torre, 2005; Boschma and Frenken, 2011). Massey et al. (1992) argue that spatial proximity between the university and firms has a weak impact on technology transfer. The study on thirty-five techoparks in the UK, Westhead and Storey (1995), denote that firms would be more competitive if there is a strong relation with the university, and the firms in the technoparks have more opportunity to do that. In the case of Western Australian Technology Park, Phillimore (1999) points out that the role of technoparks is significant especially for the technology based small firms. Bakouros et al. (2002) emphasize that science parks in Greece have not been established by pioneering universities, but with government support, and initial investments have been solely made by government.

Technoparks include both the firm clusters and the research institutions, and the interactions among them, having the advantages of spatial proximities. Although, there have been several studies on innovation using the patent data or analyzing the performance of technoparks, studies looking at the role of technoparks on innovation performance of the regions have been limited. Therefore the aim of this paper is to examine the innovation capacity of the regions (provinces) in Turkey. Using the patent data as the indicator of innovation, it is intended to explore mainly the impact of technoparks (as one of the important tools in Turkey since 2001) and other determinants of local characteristics.

FACTS AND FIGURES: INNOVATION POLICIES AND TECHNOPARKS IN TURKEY

National innovation capacities and policies play a dominant role in the adaptation of countries to the global system, competitiveness and the production of new technologies today. Castells and Hall (1994, 1996) refer to the role of states in the beginning of the "information age" by forming innovation politics, strategies and pioneering institutions. In this context, national innovation systems have become an important part of science and technology policies.

Regional potentials related to key innovation actors as well as national policies and strategies are also important. Actors such as firms and networks, R&D institutions and supportive institutions shape "national innovation capacities" in the process. One of the key innovation indicators used to measure national innovation capacities and cross-country comparisons is patents. The patent statistics for 2016 show that 65% of the total patent applications and 57% of total patent grants are made in Asia (2,019,100-77,1000), 20.9%-24% in the USA (640,300-329,500) and 11.6%-14% in the European countries (354,900-195,900). It is observed that in Asia, China (1,338,503-404,208), Japan (318,381-203,087), Republic of Korea (208,830-108,875) and in Europe, the United Kingdom (22,059-5,602) are leading countries of total patent grant distribution. Turkey ranks 128th in the Global Innovation Index 2016, while the number of patents (6,848-1,764) is lagging.

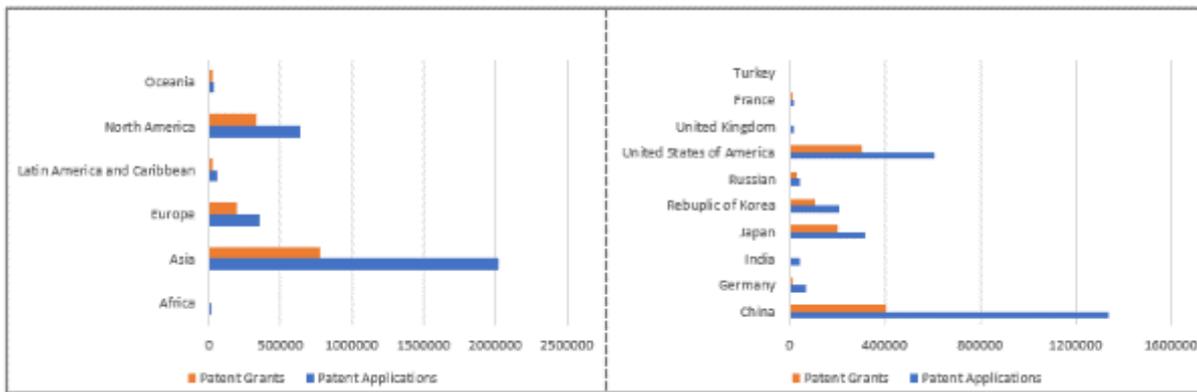


Figure 2: Patent Application & Grant Numbers, 2016, WIPO (World Intellectual Property Organization), <https://www3.wipo.int/ipstats/ipsPiechart>

In Turkey, the science and technology policies have gone back to the 1960s in accordance with the planned period. The steps to establish national innovation capacity were initially taken during these periods. The increase in the importance given to regional capacities and institutions in the 1990s also provided positive outcomes after the 2000s. The increasing trend of patent numbers supports the contribution of policies in development.

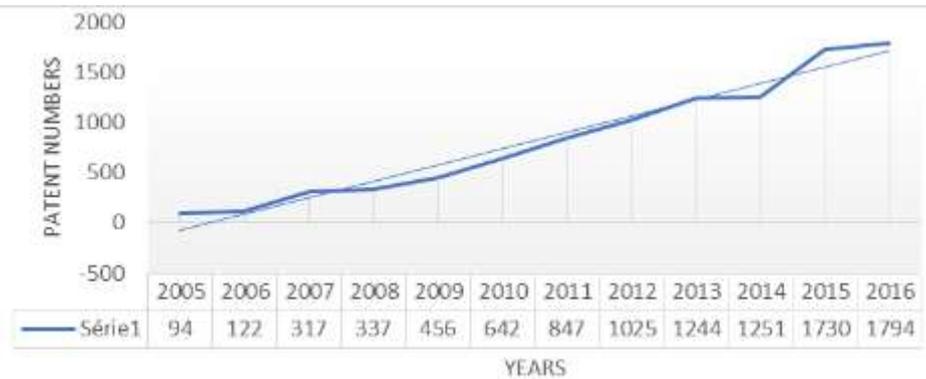
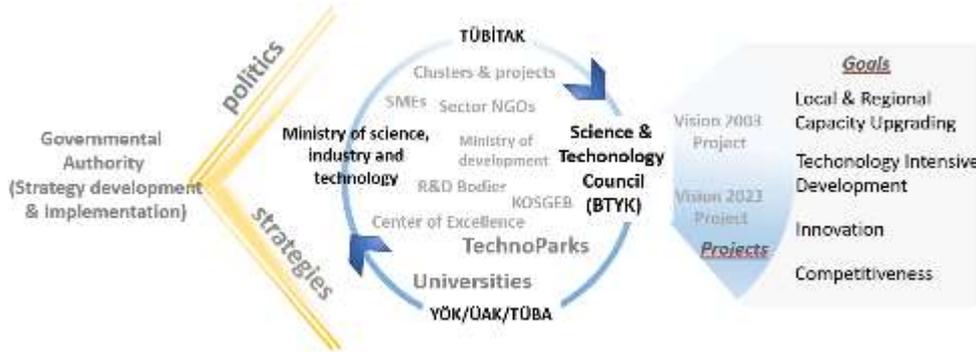


Figure 3: Number of Patents, 2005-2016, TPO (Turkey Patent Organization).

Throughout this process, TÜBİTAK (1963), YÖK and ÜAK (1980) and TÜBA⁵⁶³ (1993) were established to direct National Innovation Policies and support innovation capacity. These institutions especially support the production and spillovers of knowledge at the regional level by encouraging cooperation between universities and industry. In 1983, the "Supreme Council for Science and Technology (BYTK)" was established. Today, it is the supreme institution that leads the national innovation system. In the post-1990s' development policies, the focus shifted to R&D, innovation and technology. As the first organizations in the implementation of this process were established in 1992 in relation to "TEKMER" the Middle

⁵⁶³ TÜBİTAK: The Scientific and Technological Research Council of Turkey, YÖK: Council of Higher Education, ÜAK: Council of Universities, TÜBA: Turkish Academy of Sciences,

East Technical University and transformed into Turkey's first technopark in 2000. Science and Technology Development projects were prepared as *Vision 2003* and *Vision 2023* under the coordination of BYTK in the 2000s (Figure 4). In parallel to the development goals of the country, "*motivation of local resources, regional development and support of research and development institutions*" are among the strategies of these projects. In this context, support has also been important for establishing R&D centers for the private sector on a sectoral basis. In this period, MAR-TEK technopark was established as a research center affiliated to TÜBİTAK. Science and Technology strategies implemented in Turkey play a significant role in the formation of *technoparks*, R&D activities, knowledge spillovers, new products/services - similar to international practice.



TÜBİTAK: Ministry of Science, Industry and Technology, TÜBİTAK: The Scientific and Technological Research Council of Turkey, MİT: Ministry of Industry, Trade and Technology, YÖK: Ministry of National Education, ÜAK: Ministry of Higher Education, TÜBA: Ministry of Environment, Urbanization and Climate Change, KOSGEB: Ministry of Industry, Trade and Technology, KOSGEB: Ministry of Industry, Trade and Technology, KOSGEB: Ministry of Industry, Trade and Technology, KOSGEB: Ministry of Industry, Trade and Technology

Figure 4: National Innovation System of Turkey and Actors.

The technoparks started to be established in the 2000s in the cities/regions where industrial production, deep-rooted universities, human capital are concentrated. According to MSIT (2016), there are 64 technoparks in 44 provinces in Turkey. Istanbul, Ankara, İzmir and Kocaeli have high regional potentials and have emerged as the most established technoparks (Figure 5). Numerous research on the roles and activities of technoparks, which are increasing in number in a widespread geography, has been lacking in studies that take local/regional characteristics into consideration. Eyyüboğlu and Aktaş (2016) indicate that technoparks in Turkey are seen as a public policy tool for contributing to economic growth, especially in developing regions, and this situation brings together various opportunities and problems in terms of the selection of the technoparks and the performance of the firms. Pekol and Erbaş (2011) indicate that spatial proximity, being the university supported structures and a high concentration of R&D activities, increase the production of innovation by examining 4 technoparks with the highest number of patents. In this context, regional distribution of technoparks as an important regional tool of the National Innovation System indicates a concentration in the provinces having relatively a high number of patent, high middle-high technology employment and high performance universities (Figure 5). The total number of technoparks in 2005 was 28 within 13 provinces, and the number increased to 64 within 44 provinces in 2016.

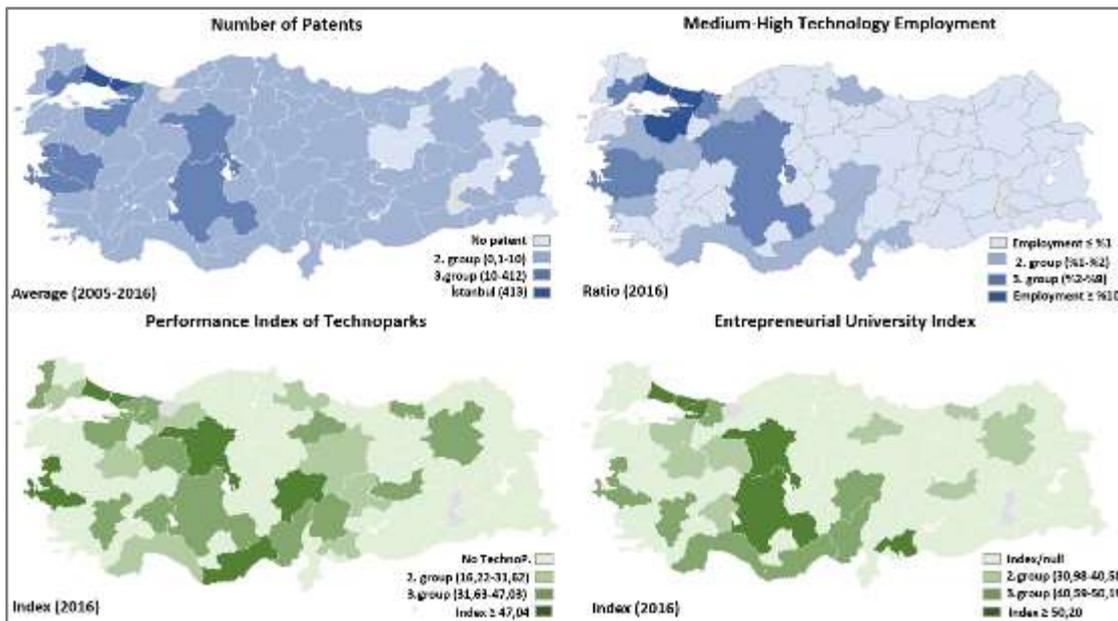


Figure 5: Main indicators of regional innovation potentials

The maps (Figure 5) indicate that there has been a similar pattern when the performance of technoparks, the performance of universities and a concentration of medium-high technology employment are considered. Ankara, Istanbul, and Izmir have many public and private universities, research institutes and organizations having the highest values for entrepreneurial university indices. The patent dominance of the first four provinces at national level remained in the same order between 2005-2016. These provinces also take top rank because of the concentration of medium-high

technology employment and production. Although new technoparks have been established in the eastern part of the country, all indicators show that eastern provinces have still remained behind.

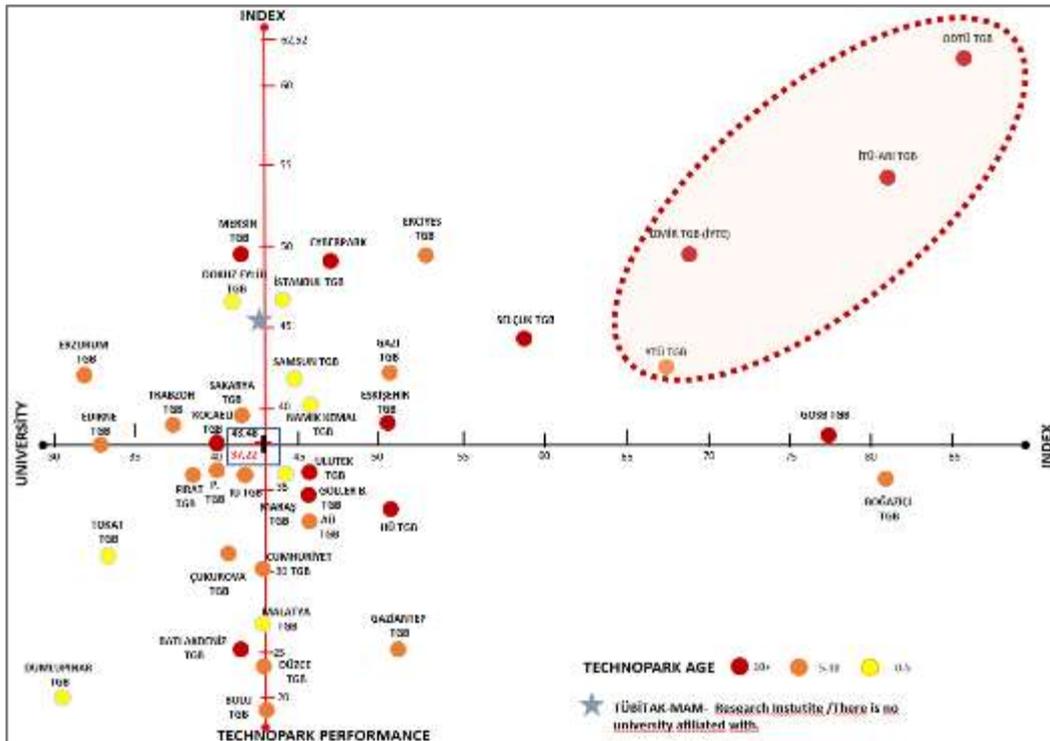


Figure 6: TechnoPark Performance Index (TPERIN) & Entrepreneurial University Index by the Age of TechnoParks, 2016

The analysis on the technoparks that are included the performance index of the Ministry of Science, Technology and Industry (BTSB) provides some insights about the relationship between the technopark and university performance. Among the 39 technoparks, Ankara (METU Technopark), Istanbul (İTÜ-ARI, YTÜ) and Izmir (İYTE) technoparks are seen as outliers with their high performance (Figure 6). The universities that these technoparks are established in connection with them are the oldest universities with the highest entrepreneurship index value along with these technoparks: especially ODTÜ technopark (Ankara) and MAR-TEK (Kocaeli) established in the scope of the national innovation initiatives. It is assumed that the year of technopark establishment is important for their performance, therefore the life cycle of technoparks is defined as 0-5 years - establishment process, 5-10 years - development process and 10+ years - maturity process. Most of the technoparks have been established less than 5 years and less than 10 years and indicating low performance are located in the eastern part of the country.

METHODOLOGY AND DATA

Patent data have been utilized as economic indicators, whereas Griliches (1990) and Anselin et al. (1997) identified patent as output of knowledge production function, and Jaffe (2000) focus on academic researches. Griliches (1998) pointed out that in spite of difficulties, patent statistics remain a unique resource for the analysis of the process of technological change. Since firms and industries vary in their technology regimes (Iammarino and McCann, 2007), micro-level analysis would give more detailed information about the innovation process. However, in this paper the innovation performance of regions in Turkey due to their endogenous local characteristics, as displaying stylized facts is the concern. Furthermore, the role of technoparks on innovation, as a base of geographically localized networks and cooperation with the universities would be the main interest of this research.

With respect to the conceptual framework of the research, we identified patent data as a dependent variable, however considering the number of patents, the data of utility model and trademark have been decided to be taken into account as well. Finally the dependent variable is identified as a combination of those three variables and mean values between 2005 and 2016 for each province. Thus, the analysis prevents the instabilities which might occur during this period. Since the range of the data (values of patents) is big, logarithm transformation is applied.

Two different models are estimated; first to find out the relations between the dependent and exogenous variables in 81 provinces of Turkey. Secondly, since each province does not have a technopark, the model is constructed just for the provinces which have technoparks (28 provinces). Thus, cross-sectional analyses have been conducted by using data for 81 provinces and in the second stage for 28 provinces.

However, most of the studies from different geographies prove that especially R&D activities and incentives induce the number of patents, there is a data limitation on R&D expenditures and employees in Turkey. Therefore, considering the literature on knowledge production function and a regional innovation system, the exogenous variables are identified due to the data limitations.

Since one of the main interests of research is to find out the role of technoparks on innovation performance of the regions, the Technopark Performance Index (TPERIN) is utilized. This index has been developed by Ministry of Science,

Technology and Industry (BTSB) based on different criteria. For the provinces, which have more than one technopark, the value of the technopark which displays the highest performance has been taken into account. The performance of the technopark is considered a proxy for mainly industrial R&D activities (Anselin et al., 1997). In addition to this, the Entrepreneurial University Index (ENTUNI) has been identified to examine the role of universities (Benneworth and Hospers, 2007).

$$\log(pat) = a + b_0 TPERIN + b_1 ENTUNI + e_{i,t} \tag{1}$$

The variables for exogenous local characteristics are identified as followings:

The ratio of university graduates and academic staff (UNIAC) is considered as proxy for human capital following the studies of O’huallachain (1999); Wolfe (2011); Qi and Lui (2011). The ratio of medium-high tech employment within total employment (MHTEMP) and new firms/ start-ups (NFIRM) is identified as proxy to capture agglomeration economies (Feldman and Florida, 1994; Anselin et al., 1997). The number of the first 1000 large firms (1000LARGE) as proxy to access the effect of firm scale (Acs et al., 1994; Anselin et al., 1997). The ratio of import/export: IMEX has identified as proxy for external linkages of the regional production, since empirical studies and theory have increasingly emphasized the importance of global networks (Qi and Lui, 2011). In equation 2, LOCENDO represents all local endogenous variables of the model.

$$\log(pat) = a + b_0 TPERIN + b_1 ENTUNI + b_2 LOCENDO + e_{i,t} \tag{2}$$

RESULTS OF THE ANALYSIS

Two models are conducted with the same variables, however the number of observations as provinces is different. In the first model, observations are 81 provinces and the model examines which factors have significant impact on innovation performance (the number of patents+ utility model+ trademark) of the regions. Therefore, innovation performance is identified as a combination of three variables and the mean values.

Multiple regression analysis is applied and the model 1 is significant ($\alpha=0.05$), with 67% explanatory power (&math>R^2 = 0.67</math>). No assumption violation exists.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.819 ^a	.671	.640	.44108	2,156

ANOVA (a)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	28,981	7	4,140	21,280	.000 ^b
	Residual	14,202	73	.195		
	Total	43,183	80			

a: Dependent Variable: log(pat)

Figure 7: Model Summary and ANOVA

Afterwards, stepwise regression is applied to find the most effective variables on innovation performance of the regions. R^2 is 0.668 and the model is significant ($\alpha=0.05$). As shown in the coefficients table, the ratio of medium-high tech employment, technopark performance, university performance and the first 1000 large firms are significant independent variables and have a positive effect on the number of patents in the regions. According to a standardized coefficient, the most effective variables are technopark performance, first 1000 large firms, university performance and the ratio of medium and high tech employment, respectively. The result enhances our assumption about the role of technoparks and universities on innovation performance of the regions. Moreover, the power of the manufacturing industry and structural changes in the manufacturing industry and leading firms in Turkey make significant contribution to the innovation process. Gezici et al. (2017) put forward that high- and medium-high technology sectors are mainly concentrated in the western part of Turkey and prefer to locate where there is already an existing concentration of industrial activity. Thus, agglomeration economies are still very important not only for productivity but for innovation as well.

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1,744	.065		.000		
	ENTUNI	.027	.003	.727	.9,408	.000	1,000
2	(Constant)	1,738	.059		29,239	.000	
	ENTUNI	.021	.003	.567	6,937	.000	.754
	1000LARGE	.006	.001	.321	3,929	.000	.754
3	(Constant)	1,642	.067		24,374	.000	
	ENTUNI	.019	.003	.496	5,963	.000	.676
	1000LARGE	.006	.001	.318	4,043	.000	.754
4	MHTEMP	1,349	.501	.198	2,692	.009	.862
	(Constant)	1,599	.067		23,735	.000	

ENTUNI	,009	,005	,252	2,017	,047	,279	3,587
1000LARGE	,005	,001	,299	3,906	,000	,746	1,340
MHTEMP	1,274	,485	,187	2,625	,010	,859	1,164
TPERIN	,012	,005	,307	2,536	,013	,297	3,367

a: Dependent Variable: log(pat)

Figure 8: Regression results for log (patent) in 81 provinces

The second model is applied to 28 provinces having technoparks as a second level analysis. Model 2 is also significant ($\alpha=0.05$) as R^2 is 0.795 and the explanatory power is higher than the first model. No assumption violation exists.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,892 ^a	,795	,723	,33100

ANOVA (a)

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	8,494	7	1,213	11,076	,000 ^b
1 Residual	2,191	20	,110		
Total	10,686	27			

a: Dependent Variable: log(pat)

Figure 9: Model Summary and ANOVA

The result of stepwise regression indicates that R^2 is 0.75 and the model is significant ($\alpha=0.05$). As it is shown in the coefficients table, the significant explanatory variables are the first 1000 large firms and university performance.

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	2,477	,089		27,767	,000
1 1000LARGE	,007	,001	,750	5,778	,000
(Constant)	2,099	,111		18,975	,000
2 1000LARGE	,005	,001	,568	5,253	,000
ENTUNI	,014	,003	,471	4,356	,000

a: Dependent Variable: log (pat)

Figure 10: Regression results for log (patent) in 28 provinces

The second model excludes the provinces that do not have technoparks. Meanwhile the role of universities and leading firms has become more obvious for these provinces. The findings prove the evidence from the earlier studies which emphasize the positive impact of dynamic manufacturing industry and efficient cooperation networks between the firms and universities on regional innovation.

CONCLUSION

In the new economic system, innovation has become an outcome of commodification of knowledge. Not only as outcome but the process of innovation is significant since it is realized that it is not linear but more complex system. On the one hand, there have been studies using patent data as indicator of innovation, on the other hand a literature has been emerged on regional innovation system covering the local actors, co-operations and networks. Conceptual framework of this research is constructed based on the role of techno parks on innovation performance of the regions in Turkey. Techno parks has been developed with respect to the success of technological clusters, which are not focus only the co-operations between firms but other related sectors, whereas techno parks are mainly identified as tool for co-operation between the firms and universities.

In Turkey techno parks have become one of the significant policy tools regarding the development strategies as, "motivation of local resources, regional development and support of research and development institutions". Therefore, the number of techno parks has been increased to 64 in 44 of 81 provinces since 2001. With reference to the number of patents, medium-high technology employment ratio and entrepreneurial university index value, the location of techno parks indicates more dispersed pattern. However, to establish techno parks in the provinces, which do not indicate sufficient endogenous dynamics, would not be an efficient policy in a developing country. Therefore, further research will be conducted to realize the dynamics of techno parks and endogenous local characteristics, which are located in, by considering the strengths and weaknesses.

Evidences on importance of agglomeration economies are quite obvious for the innovating firms in literature. The findings of our research on Turkey support it as well, since the number of patents is concentrated on the most developed metropolitan cities/provinces. Furthermore, according to two models in this research, we have got the similar results with earlier findings that both dynamic manufacturing industry and related activities; and efficient cooperation between the firms and research institutions/universities are the main determinants of innovation for the regional success.

REFERENCES

- Acs, Z. J., Audretsch, D. B. & Feldman, M., 1994.** R&D spillovers and recipient firm size. *The Review of Economics and Statistics*, 76(2), 336-340.
- Anselin, L., Varga, A., Acs, Z., 1997.** "Local Geographic Spillovers between University Research and High Technology Innovations", *Journal of Urban Economics*, 42(3), 422-448.
- Asheim, B. T., Gertler, M. S., 2005.** "Regional Innovation Systems and the Geographical Foundations of Innovation". *The Oxford Handbook of Innovation*. Eds: Fagerberg, J., Mowery, D. C., Nelson, R. R., Oxford: Oxford University Press.
- Arnkil R., Järvensivu A., Koski P. and Piirainen T., 2010.** 'Exploring Quadruple Helix Outlining user-oriented innovation models', Final Report on Quadruple Helix Research for the CLIQ project, under the Interreg IVC Programme.
- Audretsch, D., 1998.** Agglomeration and the location of Innovative Activity. *Oxford Review of Economic Policy*, 14 (2), 18-29.
- Bakouros, Y. L., Mardas, D. C., Varsakelis, N. C., 2002.** "Science Park, A High Tech Fantasy? An Analysis of the Science Parks of Greece", *Technovation*, 22(2), 123-128.
- Bellini, N., Danson, M., Halkier, H., 2012.** *Regional Development Agencies: The Next Generation: Networking, Knowledge & Regional Policies*, New York: Routledge.
- Benneworth, P., Hospers, G. J., 2007.** "The New Economic Geography of Old Industrial Regions: Universities as Global—Local Pipelines", *Environment and Planning C: Government and Policy*, 25(6), 779-802.
- Breschi, S. & Lissoni, F., 2001.** Knowledge spillovers and local innovation systems: a critical survey. *Industrial and Corporate Change*, 10 (4), 975-1005.
- Borras, S. & Tsagdis, D., 2008.** *Cluster Policies in Europe: Firms, Institutions and Governance*. UK: Cornwall.
- Bosch, M., 2005.** *Patenting and Research and Development: A Global View*, World Bank Policy Research Working Paper 3739.
- Boschma, R., 2005.** "Proximity and Innovation: A Critical Assessment", *Regional Studies*, 39(1), 61-74.
- Boschma, R., Frenken, K., 2011.** "Technological Relatedness, Related Variety and Economic Geography". *Handbook of regional innovation and growth*. Cooke, P., Asheim, B., Boschma, R., Martin, R., Schwartz, D., Tödtling, F. Cheltenham, UK; MA, USA: Edward Elgar Publishing.
- Carrincazeaux, C. and Gaschet, F., 2007.** "A typology of European Regions According to their Knowledge Base", Eurodite report no. D4b, EURODITE Integrated Projects (6th FP).
- Cantner, U., Graf, H., 2011.** "Innovation Networks: Formation, Performance and Dynamics". *Handbook on the economic complexity of technological change*. Antonelli, C. Cheltenham, UK; MA, USA: Edward Elgar Publishing.
- Castells, M., Hall, P., 1994.** *Technopoles of the world: the making of 21st century industrial complexes*, London: Routledge.
- Cincera, M., 1998.** Patents, R&D, And Technological Spillovers At The Firm Level: Some Evidence From Econometric Count Models For Panel Data, *Journal of applied Econometrics*, v 12 (3), 265-280.
- Cooke, P., 1998.** Introduction: origins of the concept, in: H. Braczyk, P. Cooke and M. Hei-Denreich (Eds) *Regional Innovation Systems: The Role of Governances in a Globalized World*, pp. 2-25. London: UCL Press
- Cooke, P., 2005.** "Regional Knowledge Capabilities and Open Innovation: Regional Innovation Systems and Clusters in The Asymmetric Knowledge Economy". *Clusters, networks and innovation*. 80-109. Breschi, S., Malerba, F. Oxford: Oxford University Press.
- Cohen, W. M. & Levinthal, D. A., 1990.** Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly* 35 (1), 128-152.
- Cooke, P., 2005.** "Regional Knowledge Capabilities and Open Innovation: Regional Innovation Systems and Clusters in The Asymmetric Knowledge Economy". *Clusters, networks and innovation*. 80-109. Breschi, S., Malerba, F. Oxford: Oxford University Press.
- Etzkowicz, H., 2002.** "Networks of Innovation: Science, Technology and Development in the Triple Helix Era", *International Journal of Technology Management & Sustainable Development*, 1(1), 7-20.
- Eyyüboğlu, B. B., Aktaş, S. G., 2016.** "Türkiye'de Teknoparkların Coğrafi Dağılım ve Yoğunluğu (2001-2015)", *Doğu Coğrafya Dergisi*, 21(35), 75-88.
- Feldman, M. P., Florida, R., 1994.** "The Geographic Sources of Innovation: Technological Infrastructure and Product Innovation in the United States", *Annals of the Association of American Geographers*, 84(2), 210-229.
- Florax, R., Folmer, H., 1992.** Knowledge Impacts of Universities on Industry An Aggregate Simultaneous Investment Model; *Journal of Regional Science* 32, 4: 437-466.
- Freeman, C., 1995.** "The 'National System of Innovation' in Historical Perspective", *Cambridge Journal of Economics*, 19(1), 5-24.
- Gezici, F., Walsh, B., Metin Kacar, S., 2017.** Regional and Structural Analysis of Manufacturing Industry in Turkey, *Annals of Regional Science*, July 2017, Vol. 59, Issue 1, 209-230.
- Griliches, Z., 1980.** R&D and the Productivity Slowdown, NBER Working Paper No. 434.
- Griliches, Z., 1990.** Patent Statistics as Economic Indicators: A Survey, NBER Working Paper No. 3301.
- Griliches, Z., 1998.** R&D and Productivity: The Econometric Evidence, [R&D, Patents, and Productivity](#), NBER Books, 55-72.
- Jaffe, A. B., 1989.** "Real Effects of Academic Research", *The American Economic Review*, 957-970.
- Fagerberg, J., 2003.** "[Schumpeter and the revival of evolutionary economics: an appraisal of the literature](#)," *Journal of Evolutionary Economics*, Springer, vol. 13(2), 125-159, April.
- Kelley, N. J., 1972.** *Modern Economic Thought*. New York: Prentice-Hall, 1947.
- Kaygalak, İ., Reid, N., 2016.** "Innovation and knowledge spillovers in Turkey: The role of geographic and organizational proximity", *Regional Science Policy & Practice*, v 8/1-2, 45-61.
- Iammarino, S., McCann, P., 2007.** *Multinationals and Economic Geography: Location, Technology and Innovation*, Edward Elgar Publishing.
- Lee, W. H., Yang, W. T., 2000.** "The Cradle of Taiwan High Technology Industry Development—Hsinchu Science Park (HSP)", *Technovation*, 20(1), 55-59.
- Lund, I., 1986.** "Locating Corporate R&D Facilities", Conference Board Report No. 892, The Conference Board, New York.
- Lung, Y., Salerno, M., Dias, C., 1999.** Flexibility through modularity: experimentations with fractal production in Brazil and in Europe, in: Lung, Chanaron, Fujimoto, Raff (Eds), *Coping With Variety*, Ashgate.
- Malecki, E. J., 2011.** "Connecting Local Entrepreneurial Ecosystems to Global Innovation Networks: Open Innovation, Double Networks and Knowledge Integration", *International Journal of Entrepreneurship and Innovation Management*, 14(1), 36-59.
- Massey, D., Quintas, P., Wield, D., 1992.** *High Tech Fantasies: Science Parks in Society, Science and Space*. London: Routledge.
- Moulaert, F. & Seika, F., 2003.** Territorial innovation models: A critical survey. *Regional Studies*, 37 (3), 289-302.

- Nelson, R., 1982.** "The role of knowledge in R&D efficiency", *Quarterly Journal of Economics*, 97,453-470.
- Nelson, R. 1993.** *National Innovative Systems: A Comparative Analysis*, Oxford University Press.
- O'hualachain, B., 1999.** "Patent Places: Size Matters", *Journal of Regional Science*, 39 (4), 613-636.
- Pakes, A., Griliches, Z., 1984.** Patents and R&D at the Firm Level: A First Look, [R&D, Patents, and Productivity](#), NBER Books, 55-72.
- Pekol, Ö., Erbaş, Ç. B., 2011.** "Patent Sisteminde Türkiye'deki Teknoparkların Yeri", *Ege Akademik Bakış*, 11(1), 39-58.
- Porter, Michael E. and Scott Stern, 2000.** "Measuring the 'Ideas' Production Function: Evidence from International Patent Output", NBER Working Paper, No: 7891.
- Qi, Y., Liu, Y., 2011.** "Empirical Research about the Regional Innovation Capability Based on China's Patent Application Activities", 2014 Proceedings of PICMET '14: Infrastructure and Service Integration, 365-369.
- Rallet, A., Torre, A., 1998.** "On Geography and Technology: The Case of Proximity Relations in Localized Innovation Networks". Eds: Steiner, M. *Clusters and regional specialization*. London: Pion.
- Saxenian, A., 1994.** *Regional Advantage*. Cambridge, MA: Harvard University Press.
- Saxenian, A., Hsu, J. Y., 2001.** "The Silicon Valley-Hsinchu Connection: Technical Communities and Industrial Upgrading", *Industrial and Corporate Change*, 10(4), 893-920.
- Schmookler, J., 1996.** *Invention and Economic Growth*. Cambridge, MA: Harvard University Press.
- Siegel, D. S., Westhead, P., Wright, M., 2003.** "Science Parks and The Performance of New Technology-Based Firms: A Review of Recent UK Evidence and an Agenda for Future Research", *Small Business Economics*, 20(2), 177-184.
- Simmie, J. M., 2005.** 'Innovation and Space: a critical review of the literature', *Regional Studies*, vol. 39, n. 6, pp. 789-804, August.
- Sokoloff, L., K., 1988.** Inventive Activity in Early Industrial America: Evidence From Patent Records, 1790- 1846, NBER Working Paper No. 2707.
- Sternberg, R., 2000.** "Innovation Networks and Regional Development—Evidence from The European Regional Innovation Survey (ERIS): Theoretical Concepts, Methodological Approach, Empirical Basis and Introduction to the Theme Issue", *European Planning Studies*, 8(4), 389-407.
- Westhead, P., Storey, D. J., 1995.** "Links Between Higher Education Institutions and High Technology Firms", *Omega*, 23(4), 345-360.
- Wolfe, D., 2011.** Neo-Schumpeterian Perspectives on Innovation and Growth, in: P.Cooke (Eds) *Handbook of Regional Innovation and Growth*, Edward Elgar Publishing.
- Yanhui, W., Huiying, Z., Jing,, W. 2015.** Patent Elasticity, R&D Intensity And Regional Innovation Capacity In China, *World Patent Information*, 43, 50-59.
- Zachariadis, M., 2003.** "R&D, innovation, and technological progress: a test of the Schumpeterian framework without scale effects", 36 (3), 566-586.

SS21.2. Innovation and Entrepreneurship

1713 SUPPLY NETWORKS IN THE AUTOMOTIVE INDUSTRY REVISITED: HOW DO MULTIPLE CLUSTERS IN TURKEY REACT TO RIVET EFFECTS? ⁵⁶⁴**Adem Sakarya***, **Yiğit Evren***** PhD candidate, Research Assistant at Yıldız Technical University, ademsakarya@yahoo.com.tr** Assoc.Prof.Dr. at Yıldız Technical University, yigitevren@gmail.com**1. INTRODUCTION**

Supply networks in the automotive industry continues to be a complex and fruitful field at the intersection of economic geography and regional development. In Turkey, various scholars have researched different aspects of this issue by bringing empirical evidence from the local industry (Evren, 2002; Wasti et.al, 2006; Özatağan, 2010 and 2011). In this paper, we revisit the Turkish automotive industry to reach a better understanding of supplier customer linkages and their geographies. Our investigation is based on the concept of *rivet effect* (Martin and Sunley, 2015) and its impact on the first tier supplier network of Turkish automotive production. We focus on the automotive supplier firms in the Marmara Region –the industrial heartland of the country- and their forward linkages with OEMs in Turkey. In this context, we seek answers to below-listed questions. How did the automotive industry in Marmara react to positive and negative rivet effects during the last decade? Did the density and composition of the supply networks change, and, if so, what are the spatial outcomes of this process? We will address these issues by conducting a quantitative research.

2. RIVET EFFECT AND PRODUCTION CHAINS

Rivet effect, as described by Martin and Sunley, refers to the idea that “...the more a region’s economic structure is dominated by and dependent on a particular sector or major firm, then the failure or decline of that sector or firm in response to a shock could lead to widespread collapse or decline of the region’s economy as a whole. Conversely, high-growth ‘new economy’ sectors may act as drivers of resilience...” (2015: 28). This is the very idea of the hub-and-spoke industrial district model as Ann Markusen (1996) described some twenty years ago that means that, a number of key (or rivet) firms act as anchors or hubs to the regional economy, with suppliers revolve around them like spokes of a wheel. Although, Markusen did not use the word “rivet” directly, she was one of the first authors who conceptualized this notion within a typology of industrial districts.

The hub-and-spoke industrial district model is typical for the automotive industry. Toyota City, where Toyota’s main plant is located in Japan (Park, 1996), and Detroit, the historical capital of the US automotive industry, are among the well-known examples for this spatial pattern (Klepper, 2002). The literature postulates two issues as major reasons for the emergence of an economic landscape as such. The first issue is closely related to the implementation of just-in-time stock inventory system (JIT). In this system, the speed and the frequency of deliveries are of primary importance. In most cases, suppliers are required to make more than one delivery per day to meet the relatively small and significantly more frequent orders of their customers. Therefore, for transportation cost advantages the close proximity between suppliers and customers is almost essential.⁵⁶⁵

In addition to JIT, it is also argued that R&D grounded innovative activity increases the pressure for proximity between suppliers and customers. Contemporary subcontracting in automotive industry is often associated with the notions of technology sharing and detailed financial negotiations. From this point of view, the delivery of high technology component systems, in particular, implies the spatial agglomeration of transactions. Furthermore, for more cost-efficient linkages, OEMs and their suppliers are expected to be in close proximity to each other, especially when the relations include prototype-work and design activity.

From an organizational point of view, one of the most important developments in the automotive industry is customers increasingly seeking for key first tier suppliers to supply complete systems rather than individual parts (Sadler, 1999; Humphrey and Memedovic, 2003; Maurer et. all., 2004; Pires and Neto, 2008; Dicken, 2011). This trend has caused significant changes in the hub-and-spoke production organization, reducing the number of first tier suppliers on the one hand and reinforcing the pyramidal structure especially within the second and below tier supply chains on the other.

3. METHODOLOGY

Most of the literature on geographic linkage studies that bring empirical evidence from the automotive industry tend to adopt a *parent firm centered* analysis (Klepper, 2002; Ivarsson and Alvstam, 2005; Boschma and Wenting, 2007; Price and Wang, 2012). While backward linkages that link assembly firms to their suppliers have been widely studied, multiple forward linkages which stem from these suppliers have not been fully investigated. In this paper, we focused on the latter and used Evren’s (2009) typology of suppliers.

In this typology, he presented three distinctive supplier types based on the geography of their forward linkages. Type 1 suppliers solely work with assembly firms co-located in the same locality or cluster. Type 2 suppliers are comprised of firms with forward linkages that occur both within and without the cluster boundaries. Type 3 suppliers, on the other

⁵⁶⁴ This paper reveals some of the findings of the first author’s ongoing PhD research under the supervision of the second author at Yıldız Technical University, Department of City and Regional Planning.

⁵⁶⁵ We should, however, we need to emphasize that the locational aspects of JIT may differ from one case to another and thus the ‘JIT=proximity’ thesis is difficult to generalize (Evren, 2002).

hand, serve solely to outer-cluster customers. Schematic visual models of each are illustrated in Figure 1. Here, forward linkages within the cluster are depicted inside the circle versus those outside of it.

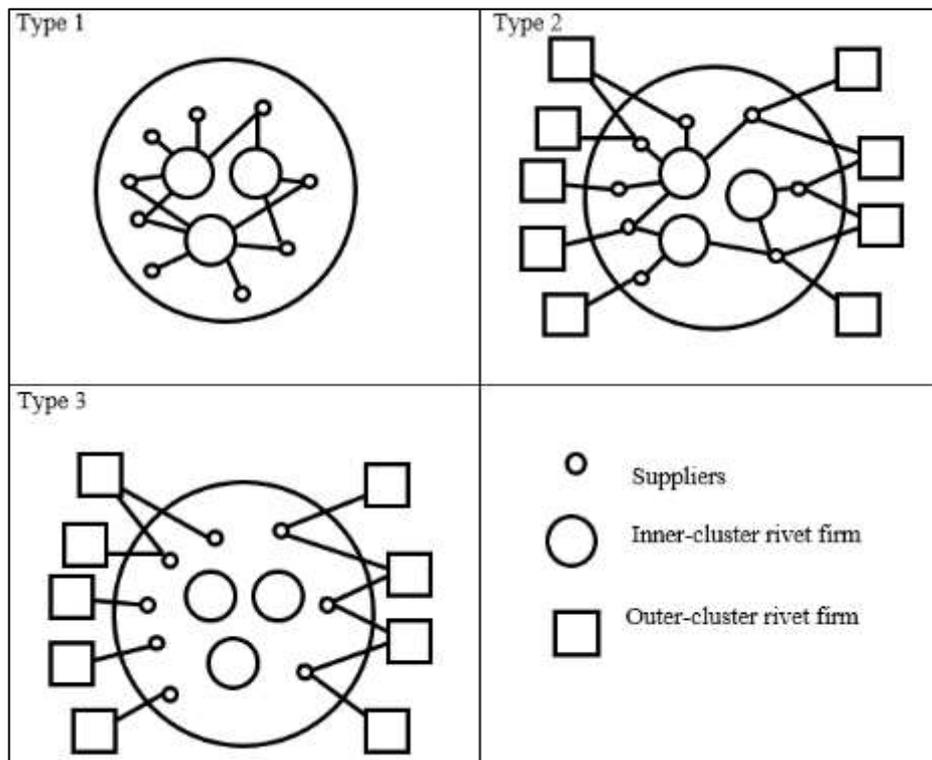


Figure 1. A Classification of Supply Networks (Evren, 2009)

Our analyses were two-fold. The first stage was dedicated to explore the past 15-year performance of the automotive industry in the Marmara Region. For this purpose, we conducted a multivariate time series analysis of employment, revenues, production and exports, by using index. This has provided us to capture the occurrence of a V-shaped pattern in the sector and relate it to rivet hypothesis. At the second stage, we produced the supplier typology for each cluster within the Marmara Region. Supplier classification was made using the OSD lists published by the Automotive Manufacturers Association in 2006 and 2013. These lists comprised over 1300 first-tier supplier firms having direct contact with assembly firms and provide suppliers' address information as well as their multiple forward linkages.

4. AUTOMOTIVE INDUSTRY IN THE MARMARA REGION

The automotive industry in Turkey is mainly clustered at the North-Eastern quadrant of the country, namely the Marmara Region, where 11 out of 17 vehicle manufacturing plants are located. This mega-city region is the ultimate centre for the local sector, in which 81% of total employment by OEMs is created, 89% of vehicle exports are generated and 94% of Turkey's vehicle production is realised. The Marmara Region is also an important hub for the supplying industry; 74% of all first tier suppliers of the Turkish automotive industry and their densely interwoven network of forward linkages with OEMs are situated here (Ökten *et al.*, 1998).

When we look at the Marmara Region closely, we can observe a pattern of multiple clusters (Bursa, Istanbul, Kocaeli and Sakarya) each of which has different characteristics (Erkut and Albayrak, 2010) (Figure 2). Among these four clusters Bursa has a very distinguished position. The establishments of Tofas (the joint venture of Fiat), Oyak-Renault and later Karsan (operating under the licence of Peugeot) throughout the 1970s have attracted a considerable number of suppliers into this city and paved the way for the emergence of a hub-and-spoke automotive cluster at the South-Eastern corner of the Marmara Region. As of 2015, Bursa holds 49% (815.000 vehicle/year) of the total established capacity of vehicle production in Turkey. In 2013 Oyak-Renault, Tofaş and Karsan produced more than 588.000 vehicles, 70% of which were passenger cars and mainly exported to the EU countries (OSD, 2013; OSD, 2015). Same year, there were about 208 (20%) first-tier supplier firms in Bursa.

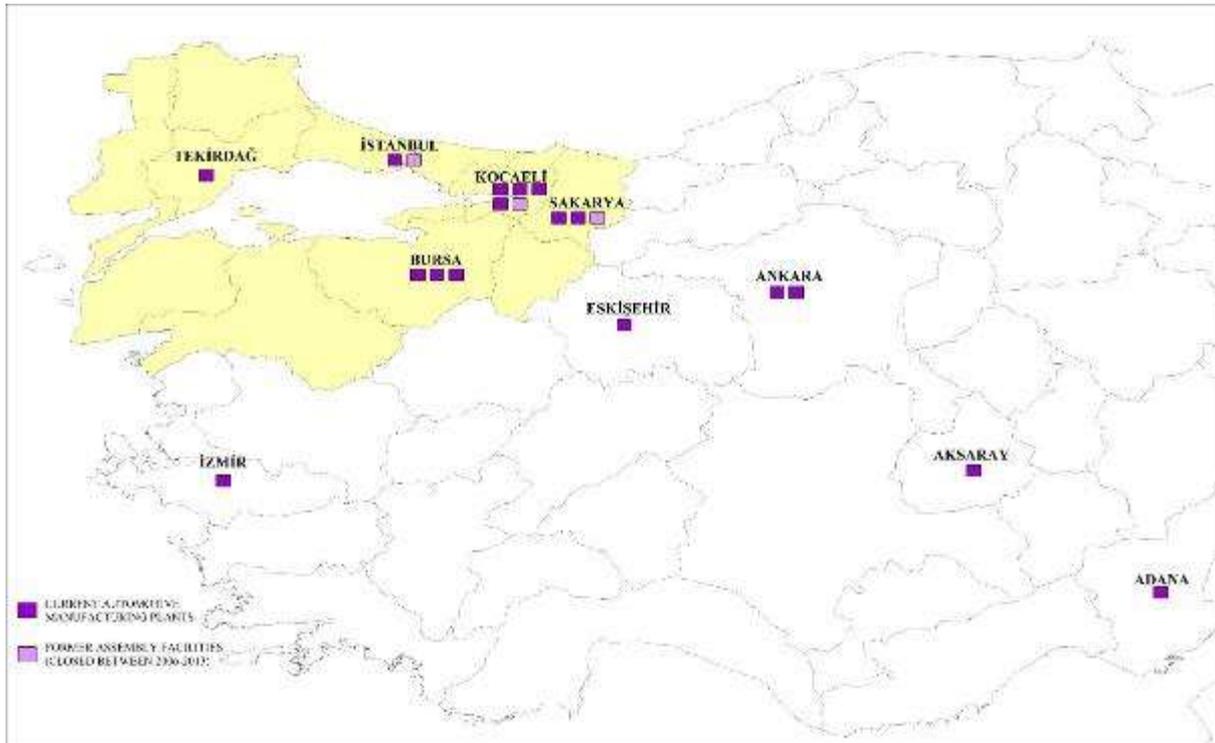


Figure 2. The Spatial Distribution of the Automotive Industry in Turkey (2013)

With its four parent firms (Hyundai-Assan, Honda-Turkey, Ford-Otosan and Anadolu-Isuzu) and 121 first-tier suppliers Kocaeli is the second most important automotive cluster in the region. These four OEMs realized 34% of Turkey’s total vehicle production. Like Bursa, Kocaeli has a strong export base too; despite the closure of Askam-Chrysler in 2007, this cluster can generate 28% of Turkey’s vehicle exports. The third cluster is Sakarya, where two parent firms (Otokar and Toyota) are located. These two firms realized approximately Turkey’s 16% passenger car production in 2013. Compared to the other clusters in the region, Sakarya has shown a relatively slow pace of growth in terms of supplying industry. There are only 24 first-tier automotive supplier firms. The fourth cluster is İstanbul. Different from all others İstanbul (which used to be a major hub for this sector) has significantly lost its previous stickiness since the mid-1990s, partly because of the ongoing twin processes of deindustrialization and rapid urbanisation. Today, there is only one OEM in İstanbul (Mercedes Benz Turk) and there are 379 small scale first-tier suppliers.

5. FINDINGS

Since the beginning of the new millennium, the automotive industry in the Marmara Region has been exposed to two major shocks. The first shock was in 2001. The severe political crisis in February which triggered the worst ever banking crisis in the recent history of the Turkish economy, later turned out to be a major shock that severely affected almost all industrial sectors including the automotive industry. The local sector tried to remain resilient by successfully adopting an export-based strategy, resulting a sharp increase in vehicle exports by 65% just in three years (Figure 3). Between 2005 and 2008 employment and production were also increased by 17% and 20% respectively.

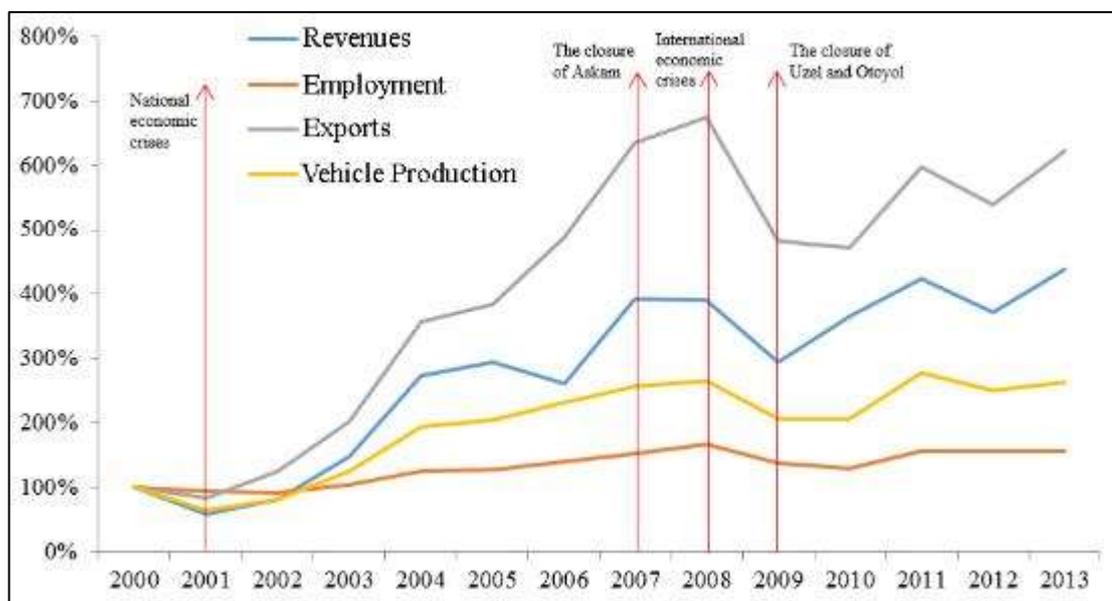


Figure 3. The Performance of the Automotive Industry in the Marmara Region (2000-2013)

The second shock was the global financial crisis in 2008, the impacts of which was very serious on the local automotive industry. December 2008, year-over-year production, sales, and exports were all down 50% or more (Berzin, 2010). Under these poor conditions, Askam in Kocaeli, Uzel in Istanbul and Otoyoil in Sakarya went out of business, while others scaled back. This situation has created a negative rivet effect on the supplying industry. Two years later, the sector has started to witness some signs of recovery. With the support of a stronger domestic market and the expanding export market, some OEMs have courageously taken some actions, most of which had positive rivet effects on the local sector. The opening of a new R&D center of Tofas, Renault’s shifting the production of the new Clio model to Turkey, and Otosan’s winning the *North American Truck of the Year* award at the 2010 Detroit Auto Show with its transit van have somehow made the industry better positioned for long-term growth and success.

Having mentioned the co-emergence of major events that created positive and negative rivet effects in the region, we can now turn our attention to the impact of them on the first-tier supplier network. We have two findings. The first one is about the suppliers’ organizational response to changes. Despite the closure of three assembly firms in the region, there was no significant change in the number of first-tier suppliers. In 2006 there were 769 first-tier suppliers; this figure in 2013 was 732. There was, however, some structural changes within the local network of supplier customer relations. By 2013, the number of total forward linkages had decreased by 17% compared to that of 2006. Throughout the same period, average forward linkages per supplier had also been decreased from 2,8 to 2,4. Furthermore, some significant shifts among supplier groups (Types) had occurred. Except the third group (Type 3), the shares of all other supplier groups had decreased, indicating a tendency of supplier firms to find outer-cluster customers (Table 1-3).

Table 1. Supplier Typology in the Turkish Automotive Industry (2006) (Compiled by the authors from OSD statistics)

	Type1		Type2		Type3		Total	Total Network	Network per Supplier
	Number	(%)	Number	(%)	Number	(%)			
Bursa	29	13	93	43	93	43	215	651	3.0
Istanbul	74	17	143	33	212	50	429	1065	2.5
Kocaeli	10	11	44	46	41	43	95	363	3.8
Sakarya	11	37	12	40	7	23	30	59	2.0
Total (4 centers)	124	16	292	38	353	46	769	2138	2.8
Turkey	221	21	359	34	482	45	1062	2805	2.6
4 Centers / Turkey (%)	56		81		73		72	76	

Table 2. Supplier Typology in the Turkish Automotive Industry (2013) (Compiled by the authors from OSD statistics)

	Type1		Type2		Type3		Total	Total Network	Network per Supplier
	Number	(%)	Number	(%)	Number	(%)			
Bursa	44	21	71	34	93	45	208	586	2.82
Istanbul	22	6	62	16	295	78	379	782	2.06
Kocaeli	18	15	47	39	56	46	121	356	2.94
Sakarya	13	54	6	25	5	21	24	44	1.83
Total (4 centers)	97	13	186	26	449	61	732	1768	2.42
Turkey	218	21	230	22	581	57	1029	2365	2.3
4 Centers / Turkey (%)	44		81		77		71	75	

Table 3. Supplier Typology in the Turkish Automotive Industry: A comparison of 2006 and 2013

	Type1	Type2	Type3	Total	Total Network	Network per Supplier
Bursa	52	-24	0	-3	-10	-7
Istanbul	-70	-57	39	-12	-27	-18
Kocaeli	80	7	37	27	-2	-23
Sakarya	18	-50	-29	-20	-25	-8
Total (4 centers)	-22	-36	27	-5	-17	-13
Turkey	-1	-26	21	-3	-16	-13

Our second finding indicates a spatially uneven impact of the rivet hypothesis in the Marmara Region. From the perspective of economic geography and regional planning, Bursa, Kocaeli, Sakarya and Istanbul do not only differ from each other with respect to production organization, size and historical evolution, but also with reference to the density and spatial composition of their supplier customer linkages. The supply networks that stem from these co-located automotive clusters within Marmara Region and across country also display different features in response to positive or negative rivet effects. Take, for instance, Bursa which had increased its type1 suppliers approximately 1.5 times. Conversely, in Istanbul we observe a sharp decline in the number of type1 suppliers. In Kocaeli, however, there was a different story; it was the only local cluster that had increased the number of its first-tier suppliers. As a matter of fact, Istanbul’s decline and Kocaeli’s growth are interrelated processes. Significant increase in land prices in Istanbul over the past two decades forced several supplier firms to seek alternative locations in the region. In this context, Kocaeli has gained new competitive advantages for industrial investments and become an attractive cluster.

6. CONCLUSION

This study has revealed that both the organizational and locational structures of supply networks are context specific. Even within the same industry and/or region, there is a wide spectrum of strategic responses to positive and negative rivet effects from supplier firms in different localities. The comparison of the four automotive clusters in the Marmara Region of Turkey supports this contention, indicating that each industrial district has its own unique story. This assessment is also in line with the contemporary writings in economic geography, most of which acknowledge that there is no single deterministic relationship between particular forms of the organization of production and their spatial patterns (Martin and Sunley, 2015; Bathelt and Glückler, 2011; Boschma, 2015).

As far as the policy implications are concerned, it should be strongly emphasized that policies which concern the future of the Turkish automotive industry should not ignore the multi-directional development patterns of local clusters in the Marmara Region. Based on our findings, we can confidently forecast that Kocaeli and Sakarya (and even Bursa though it seems to have reached a saturation point) will sustain their attractiveness to supplying industry. Conversely, the production space in Istanbul will become increasingly slippery for the sector, as the decentralization of the industry continues and as new competing clusters are set up elsewhere.

REFERENCES

- Bathelt, H. & Glückler, J. (2011). *The Relational Economy: Geographies of Knowing and Learning*, Oxford University Press.
- Berzin, C.J. (2010). Turkey's automotive industry: Driven to grow, *Perspectives on Business and Economics*, Lehigh University Lehigh Preserve, 13-21.
- Boschma, R. (2015). Towards an evolutionary perspective on regional resilience, *Regional Studies*, 49:5, 733-751.
- Boschma, R., A. & Wenting, R. (2007). The spatial evolution of the British automobile industry: Does location matter?", *Industrial and Corporate Change*, 16(2): 213-238
- Dicken, P. (2011). *Wheels of Change: The Automobile Industry*. Dicken, P. (Ed.), *Global Shift: Mapping the Changing Contours of the World Economy* (331-366), Sage Publishing.
- Erkut, G., & Albayrak, A. (2010). Yenilikçilik- rekabet gücü ilişkisi: Otomotiv sektörü örneği, *İTÜdergisi/A, mimarlık, planlama, tasarım*, 9(1), 155-166.
- Evren, Y. (2002). Supply networks in the car industry: Do peripheral economies perform specific tasks? Lessons from the Turkish Car Industry", *International Planning Studies*, 7, 283-302.
- Evren, Y. (2009). Sanayi odaklarının oluşumunda üretim zincirlerinin rolü: Bursa örneği, *Urban Economic Researches Symposium II Notifications Book*, Pamukkale University, Denizli.
- Humphrey J. & Memedovic O. (2003). The global automotive industry value chain: What prospects for upgrading by developing countries. *Sectoral Studies Series*, United Nations Industrial Development Organization (UNIDO)
- Ivarsson, I. & Alvstam, C., G. (2005). The effect of spatial proximity on technology transfer from TNCs to local suppliers in developing countries: The case of AB Volvo in Asia and Latin America, *Economic Geography*, 81(1): 83-11.
- Klepper, S. (2002). The capabilities of new firms and evolution of the US automobile industry. *Industrial and Corporate Change*, 11(4):645-666.
- Martin, R. & Sunley, P. (2015). On the notion of regional economic resilience: conceptualization and explanation, *Journal of Economic Geography*, 15: 1-42.
- Ökten, A., Şengezer, B., Çamlıbel, N. & Evren, Y. (1998) Spatial implications of the organization of production in the automotive industry in Turkey, *European Regional Science Association (ERSA) Congress*, Vienna.
- OSD, (2013). *Otomotiv Sanayi Derneği Aylık Rapor (Automotive Industry Association Monthly Report)*
- OSD, (2015). *Otomotiv Sanayi Kataloğu (Automotive Industry Catalogue)*
- Özatağan, G. (2010). Shifts in value chain governance and upgrading in the European periphery of automotive production: evidence from Bursa, Turkey, *Environment and Planning A*, 43, 885- 903.
- Özatağan, G. (2011). Dynamics of value chain governance: Increasing supplier competence and changing power relations in the periphery of automotive production—Evidence from Bursa, Turkey, *European Planning Studies*, 19:1, 77-95.
- Park S.O. (1996). Network and embeddedness in the dynamic types of new industrial districts. *Progress in Human Geography*, 20: 476-493
- Pires S.R.I. & Neto M.S. (2008). New configurations in supply chains: the case of a condominium in Brazil's automotive industry. *Supply Chain Management: An International Journal*, 13(4): 328- 334.
- Price A.D. & Wang Z. (2012). Explaining an industry cluster: The case of U.S. car makers from 1895- 1969, *The Federal Reserve Bank of Richmond, Economic Brief*, no: 12-10.
- Sadler, D. (1999) Internationalisation and specialisation in the European automotive components sector: implications for the hollowing-out thesis. *Regional Studies*, 33(2), pp.109-119.
- Wasti, S. N.; M. K. Kozan & A. Kuman (2006). Buyer- supplier relationships in the Turkish automotive industry, *International Journal of Operations and Production Management*, 26, 947-970.

1726 TEXTILES AS A TOOL FOR SOCIAL IDENTIFICATION

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ABSTRACT

Dating back to human's memory, textile materials have always accompanied men and women on an intimate and personal journey and represent them in all its dimensions throughout life. From birth until his death on earth, textiles represent the interface between intimate body and the outside world and his closest element of communication with the society in which he lives and interacts.

Innovations in the materials themselves and in the technologies used for their production have always been allies that together allow great versatility of production, but also of adaptation and use in situations so different and diverse.

The social representation of textiles and their communication functions are probably their most important characteristics, and they can assume such special characteristics that can represent peoples as in the case of regional costumes, political propaganda to represent cultures or unique social moments, allowing our personnel to constantly communicate different messages that present and define us as people but also as elements of a society that welcomes us.

This paper intends to trace a path that allows the recognition of the textile material as an element of communication and social identity to the different cultures and social codes. The methodology is based on a social and historical review of the textile literature, selected due to their representativeness in certain social contexts. The aim will amplify the understanding practices and social representativeness in textile production as a material culture that represents a utilitarian tool to communicates social and political patterns that allow ordering and guiding entire societies.

Keywords: Social Textiles; Textile Communication; Material Culture; Textile Innovation; Textile Material.

INTRODUCTION

The social representation of textiles and its power of communication can take on such special characteristics as individual representation or belonging to a group, a region, a civilization, as in the case of regional costumes or political propaganda (Japan, England, USSR, etc.) to represent cultures or unique social moments, allowing each individual to communicate different messages that present and define them as people, but also as elements of a society that welcomes us. For Barnard (2003) clothes are not ideologically neutral in that they are used to constitute and communicate a position of social order but also to challenge and challenge positions of relative power within it.

If the history of clothing goes back to the age of prehistory, as a result of man's need to cover himself and protect himself from climatic variations (Laver, 1989), it is only in the Middle Ages in the West that the clothing simultaneously assumed the function of social identification with certain groups (Lipovetsky, 1989). According to this author, materials and colours were used to characterize the various costumes, namely the representative robes of each feud with a symbol and bicolour patterns in the clothes of the nobles. But, if clothing was for a long time a privilege of upper classes, globalization and its social importance increased considerably, becoming increasingly complex and demanding, in response to different lifestyles, identities, and social groups.

a textile's surface is more than just a façade — it's a curious layer of aesthetics and identities and a contentious site of exploration and resistance. (...) Surfaces are also manifestations of social norms and moral codes, (...) [and] have perceptual qualities, their mutability enabling the body to take on chameleon-like characteristics. Because surfaces are interpreted by sight and touch, physical contact with the surface initiates a complex multisensory, emotional and cognitive experience that provides a uniquely individual interpretation of the world (Quinn, 2010).

During many centuries, for the production of textile materials, only natural fibres such as linen and cotton were used, or, as happened later, wool and silk, allowing the individual to satisfy his personal and social needs. Nowadays, considering the possibility of creation with the use of textile fibres with very varied origin, as in the case of the new functional fibres and the intelligent materials, more and more we can perceive the connection and the influence of the textile design in the creation of a plural clothing, without physical, social, economic and even emotional borders. Innovation and entrepreneurship are characteristics that accompany textiles, innovations in the materials themselves and the technologies used for their production have always been allies that together allow great versatility of production, but also of adaptation and use in diversified contexts.

In this way, the present work aimed to establish a parallel between textile materials associated with the production of clothing and its recognition, as elements of identification of different cultures and social codes over time. As a methodology, a documentary research was carried out, aiming to broaden the understanding of the nature, practices and social representativeness of textile design in its different aspects. The textile material culture represents a tool that, intrinsically, communicates social and political patterns that guide whole societies.

TEXTILE MATERIALS AND CLOTHING

Going back to the memory of man, the textile materials always accompanied him in an intimate and personal journey, representing it in all its dimensions throughout life. These textile materials form an integral part of the history of clothing and signify an expression of personal, social, cultural, religious and gender identity in all civilizations. If the skins, along with the leaves and the bark of the trees, were the first material to be used by man, the fibres of vegetal origin began to

be cultivated and manipulated for the creation of the first pieces of clothing. Textile fibres are the central element in the production of any substrate and either used in their most primitive form or spun and twisted in yarn form give rise to textile surfaces which are responsible for all the production of the textile object.

In the prehistoric period, the humankind begins to make the first fabrics, although in a very primitive way, appearing not only as a user of clothing products but also as a manufacturer, craftsman, and artist of these pieces. "Textiles are always present in any culture and geography because from the highest antiquity man needed to protect himself and to dress." (Teixeira, 2008, p.356). Until the 19th century, textiles were mainly made from the artisanal work of natural fibres, such as flax, cotton, wool, and silk, and were later replaced with artificial and synthetic fibres when these natural materials began to scarce and industry gradually mechanized, allowing mass production. The use of textiles in clothing has always been related to technological advances and to the needs and trends of society in the field of fashion.

THE GOLD OF THE NILE

Flax is one of the oldest cultures used in textiles and food. It is known that the linen began to be cultivated and used for the production of clothing in the Neolithic period, as a result of the people fixation to a specific place. Being one of the oldest textile fibres much appreciated for dressmaking, it has become, in many civilizations, as in Greece, Crete or Egypt, as a social differentiator, when it was considered a luxury fibre.

The Egyptian civilization, which maintained unchanged attire for about 3000 years, resorted to the best linen cloth, known as the luxurious "gold of the Nile", as an expression of class distinctions, to produce its pieces and refusing the use of animal fibre for religious reasons. The dead were wrapped in linen robes that accompanied them on their journey to eternity. The Greeks and Romans wore the linen mantle wrapped around the body, with drapes and belts tied around their waist (Steele, 2005).

Also, in the West, linen was, during old times as in the Middle Ages considered a luxury fabric. Various types of fabrics were made with this fibre, depending on the thinner or thicker yarn used for the confection of pieces with different requirements, such as shirts, scarves, lace or embroidery.

"In ancient societies and the Middle Ages, the difference between rich and poor is more pronounced than in modern western and democratic societies, even because in a society with trade based on commodity exchanges, devastated by endemic pests and droughts, power finds itself its exemplary manifestation in arms, armour and the magnificence of clothing "(Eco, 2004, p. 105).

In Medieval society, as Medieval society explains, the dying of fabrics with vivid, bright, artificial colours derived from minerals or vegetables, worn in the green or red girdled coats, embroidered with gold and adorned with semiprecious stones of the powerful lords, represented wealth, while the poor wore robes with natural colours, dull and dark. (Eco, 2004).

During the eighteenth and nineteenth centuries, the production of flax and hemp fabrics accompanied population growth, providing an essential response to social needs throughout the human life cycle, from baby diapers to shrouds for the Jewish people (Steele, 2005). Their physical properties were decisive for the making of different types of clothes with fabrics of different structures: men's and women's underwear, wedding dresses and children's clothing, which both plebs and elites used, valuing the use of white over white and transparency (Steele, 2005).

Natural colours for linen fibres include buff and grey while white and pure colours are obtained through bleaching. The shirts, which emerged in the seventeenth century in Europe, are of great importance as pieces of clothing in the early eighteenth century, made of white linen for gentlemen who had the possibility to buy, change and wash them regularly, which was not possible for the working class to do. Also, the bodices included a strip of embroidered linen cloth, known as a "fichu", to cover a woman's chest. (Steele, 2005, 193).

The manufacture of luxury linen textiles continued to occur during the Industrial Revolution but began to lose its place in the luxury hierarchy and market share by being replaced by petroleum-based fibres, produced in large quantities and at lower prices accessible.

Flax, because of its specific characteristics, namely, resistance to heat and sunlight, its ability to absorb moisture rapidly returning to the environment (Malichenko, 2017) continued to be the appropriate fabric for clothing hot and humid countries, as it helps regulate the body's normal temperature.

Due to its environmental and emotional potential, associated with its physical characteristics, linen has been rediscovered in recent decades by fashion design and science and engineering. Men's designer John Alexander Skelton recently presented a suit made of the century, which proves the longevity of linen, contrary to the concept of "fast fashion". Currently, the main producers of linen for the global market are Europe and Asia, mainly the countries and regions of China, where flax is used for the production of high-quality clothing. Because of its specific characteristics of being a product of natural origin, as opposed to synthetic materials, it reaches high market prices and is considered a luxury material. It is a fabric that holds its social claim in Western fashion.

Cotton began to be mass produced in the nineteenth century, replacing linen in the confection of some clothing products.

TRENDY COTTON FROM TIME TO TIME

In ancient times, cotton has been present in western and eastern cultures and is currently one of the most widely used natural fibres in the world. India, Ethiopia, and Egypt are associated with the early days of cultivation and production of

cotton pieces, and their planting has expanded mainly in countries of Africa, America, and Asia, where the climate was decisive for their cultivation. The best qualities of cotton grow in climates with a dry and hot harvest season with high rainfall in the growing season.

Cotton production has played an important role in the trade and economy of many countries worldwide. During the Roman Empire, cotton textiles were widely traded, with cotton beginning to be imported from India around 190 BC. This and other fibres were woven by women workers on large estates or by men and women in companies located throughout the empire. (Steele, 2005).

The cotton industry had a great expansion in the nineteenth century, during which the use of cotton fabrics became popular for garments of all kinds. The production of cotton fabrics was greatly facilitated by the invention of the Cotton Engine machine, which separated the cotton seeds from the fibres, invented by the American Ely Whitney (1765-1825), and validated in 1807 (Callan, 1999). Cotton spinning and weaving, largely mechanized and centralized in factories, led to major economic and social changes. However, handicrafts and the industrial production of clothing for men and women coexisted until the beginning of the 20th century. Cotton, woven by weavers, remained in many homes, as did the system of exchanging and buying used clothing. One of the best examples of this is the production of knitted socks that were still being made by hand while spinning and weaving cotton was already largely mechanized and factory-centered.

In the thirteenth century, Barcelona became a thriving centre of the cotton industry specializing in producing a cotton canvas for candles (Steele, 2005). In the USA, for example, in 1859, two-thirds of the world's cotton fibre production originated in the United States. This production in large quantities demanded the increase of slave labour, associating it with the "controversial role in the slave trade; cotton, produced by slaves in America, was among the commercial goods used to procure other slaves in Africa "who could work on the cotton plantations (Parker, 1998).

In Europe, the use of cotton diffused in the seventeenth century when significant amounts of crude fibre began to be imported into Britain from the expanding British colonies.

Cotton has a number of characteristics that keep it very competitive in the market. It gives rise to a fabric highly valued for its softness, so it is considered a comfortable fibre for daily use, ease of maintenance, resistance to heat and sunlight and easily accepts dyeing. Because of its comfort characteristics in everyday wear, when associated with design, it has become a differentiating element, not only between social classes but also between cultures and peoples. Not only the quality of the cotton fabrics but also the colours, the texture, the varied patterns and the design of the pieces that distinguish the clothing of different peoples.

In the 16th and 17th centuries, thanks to large imports of this fibre by England from its Indian colony, cotton has become one of the most popular fabrics for everyday use. The first Indian kinds of cotton were so fine and soft that they competed with the silk and wool fabrics, making it a commercially very valuable and competitive commodity in the fabric market. At the end of the 18th century, along with white linen, cotton was the basis of fabrics for the clothing of children and young people.

Cotton fabrics were originally only available to the rich, as they reached high prices as a result of the intensive manual labour required by the transformation of fibre into yarns. In the West, in the second half of the nineteenth century, the use of cotton was already widespread, not only for the making of underwear but also for the fresh dresses of summer. The cotton used in dresses could be plain or printed with flowers, stripes or squares. Undergarments could be made from various materials such as wool, cotton linen, cambric/linen or chanvre (Callan, 1999). Besides the quality of the material, these pieces were manufactured on a small scale, reaching very high prices, which, however, the bourgeoisie could pay, differing from the working classes.

Cotton textiles have been widely used in many civilizations. For example, in Central America, since pre-Columbian times, cotton has become the fibre most used by weavers. With the European colonization of the Americas, cotton has become an established culture in this territory, forming part of the masculine and feminine clothing of this people. The Kogis and the Incas wore cotton tunics, tightened with a belt, on tights, while women wrapped strips of cotton cloth around their bodies, tied around their shoulders and fastened at the waist with a belt. After Chinese Revolution in 1949, the Mao blue cotton suit was imposed for the use of men and women. Some minority groups in China, Burma, Laos or Vietnam, though conservative, albeit with some variations, still wear black-tinged cotton robes, worn with skirts or trousers and ornamented with coloured embroidery and coins or sewn silver beads. Bangladeshi women often wear cotton saris over blouses (Steele, 2005).

WOOL AND ITS SOCIAL DIMENSION

With regard to the use of wool, this fibre has been used since prehistory, assuming great importance in the production of textiles in antiquity, for example in the Assyrian civilization where artisan corporations were created to manufacture wool, or the Greek robes, made from unbleached wool. The production of fabrics with different types of wool yarn, applied in the production of different pieces of clothing, happened only in century XIX.

The wool fibre used in countries with cold climates for the production of clothing uses its insulation properties, which make the wool fibre and its derivatives do not warm the body but maintain its physiological temperature, in a constant way allowing the creation of a microclimate within the pieces and the body. In view of the fact that in very hot countries such as the Arab countries there are large desert areas with high thermal excursions, the use of wool fibre covers, for the protection of individuals, allows the maintenance of constant body temperature even when its exterior can reach several degrees above that. These characteristics make it a superior fibre because of its adaptability to different contexts. It can

be found in most wool fibres, be it sheep, goats or other animals, such as camels, rabbits, etc. For this type of textile, it cannot be neglected that it is a material that grows and develops in perfect harmony with the environment where the animals live and adapting its characteristics to the habitat that it finds. Thus, wool produced in Australia will have different specificities from that produced in Ireland or Tibet, each of which is used for the development of products with specific social and cultural reflexes and an added value for the community and the local economy.

Many are the collective images of groups of women sitting in the candlelight spinning their yarns. This social image, where the community meets around a craft, not only for the production of yarns for the production of knits or for weaving but also for the sharing of experiences between individuals who share the same symbolic and metaphorical culture, is very recognizable in the trade related to this fibre. In the spring, after the long winter, shearing comes: the longest days are spent outside the house to wash and dry the wool, after carding the fibres are spun on a spindle and the wires are wrapped in skeins, ready to be stored. On the colder winter days, when outside is only allowed for the most urgent tasks, it is time to weave woollen fabrics, in the comfort of the home and in a more comfortable space.

THE CULTURAL PREFERENCE OF SILK

In the 16th century, with the arrival in the West of large quantities of silk for clothing, linen was used only in the production of underwear, shirts and household linen.

The silk, produced in China from 1700 BC, only in the year 300 AD is known in India and only comes to Europe in the sixth century, brought by the Arabs and Byzantines. The cultural preference for the use of silk has spread from China to the rest of the world, as well as production technology.

With maritime expansion in the Modern Age, new fabrics began to be developed from the use of different natural fibres and vegetables, initiating a transfer and sharing of materials and weaving techniques, influencing trade and fashion. Through the Silk Road which was the most important commercial and cultural link between East and West for hundreds of years, the trade of silks, skins, porcelains, gold and silver, spices, among others, was especially destined for wealthy people.

In the West, the greatest technical and technological developments related to the production of silk yarn and the weaving process were developed especially in the Italic Peninsula, in the south of France and in Spain, where mulberry cultivation presented favourable climatic conditions. (Tolaini, 1997). Currently, Italy and France continue to produce high-quality silk textiles from imported fibres from China, Japan, India, and Thailand "Silk has long been considered the ultimate in luxurious feel on the skin. Many synthetic fibres are engineered to emulate the look and feel of silk" (Steele, 2005, p.183).

Since 1860, the city of Lyon has become one of the largest silk-weaving centres in the world, where the flowering of haute couture and the luxury of the court make this industry a centre of development in textiles and fashion in Europe. The notion of fashion existed only in the nobility, where dress and beauty represented more a form of power and glory than an aesthetic subject (Kawamura, 2005).

The silk was still associated with high status and becomes a symbol of luxury and power. The taste of royalty for garments made of bright taffeta, heavy silk, moiré, and velvet make Lyon factories make them, in addition to the French "à la Jacquard" silk fabrics (BOUCHER, 1965). It was the fabric of election of the wealthy bourgeoisie for the costumes of weddings, feasts, and other events in Western society.

"The silk velvet is suitable for receptions given in the European courts but also places under private living rooms, at social balls and Parisian shows" (Fauque, 1994).

In ancient China, too, silk was worn in high-class robes, while commoners wore hemp-cloth clothing, and in Eastern countries, the best-quality silk was reserved for the royal family, both for the emperor and his wives. Consequently, weavers had a high status.

The motifs and patterns selected to print or wave the silks were heavily influenced by the Orient. As Albuquerque says, "there was a predilection in Europe for the preciousness of materials and the great attraction for the exoticism of the Persian, Indian and Turkish decorative motifs that will create a real fashion phenomenon and the consequent demand for these consumer goods. However, the industry will often combine European tradition with oriental motifs, thus creating very original textile motifs" (2011, p.236).

THE INDUSTRIAL SOCIETY

Textiles begin to become elements of social differentiation when fabrics of silks, wool or cotton produced on a small scale, at very high prices was designated exclusively to the bourgeoisie. These materials, which differed from those produced on a large scale for other social classes, had great quality, different patterns, and exclusive colours (Forty, 2005).

In the West the history of textiles was linked to the industrial revolution, with the transition from artisanal production to industrial production as a result of the transformations that steam machines and mechanical looms provided, allowing a significant increase in the quality and quantity of textile production.

From the spinning wheel invented by John Kay in 1733 that doubled the speed of weaving (Barbosa, 2011) to the mechanical loom of Edmund Cartwright in 1787 and later improved by Jacquard in 1808, which applied to the weaving of both silk and cotton, to the steam engine of the mechanic James Watt, in 1769 that the textile industry became a mark of the industrial revolution, producing fabrics of great quality and very varied destined to different publics.

At the end of the eighteenth-century factories specialized in the production of cotton fabrics began to appear in England and their use was generalized in clothing and all types of clothing of different social classes (Forty, 2005). The British administration of India allowed the importation into England of large quantities of this fibre with consequent development of technical and productive capacity at more affordable prices

At the same time, the development of chemistry has revolutionized the printing of fabrics, making possible the diversified creation of prints. From 1802 onwards the mechanized printing of fabrics with copper rolls for the printing of the multiple colours, which greatly boosted the commercialization of printed textile materials at a more affordable price (Boucher, 1965). In 1856 the English chemist William Perkin (1838-1907) discovered the first synthetic dye, "mauve", mauve, and by the early twentieth century, it was possible to obtain about 700 synthetic colours. Many companies were challenged to produce cotton fabrics with prints of different colours and patterns, intended for a distinct socio-economic audience.

"Many of the materials, techniques, and forms used in ancient times remain in use today, both the essential aspects of production in many regions of the world and the ingredients of textile arts. Such continuity makes textile unique among all artefacts "(Shoeser, 2003).

Whether hand-made or industrial lace or embroidery, both made with silk or cotton thread, were often used in the second half of the 19th century to make various garments or to adorn them, wrists, cuffs or even as intermixtures and frills on the blouses, dresses or skirts or underwear (Boucher,1965). There is a wide variety of combination of various lace-associated fabrics for the making of the same garment (Harris, 1999).

The well-known Nylon yarn, created in 1935, had important repercussions on textile design, such as acrylic, which appeared in 1947 and began to be produced on a large scale beginning in 1950. This material gave rise to the production of resistant fabrics were used in the knitting and lining of boots, gloves and men's suits.

Lycra was another important fabric, which began to be used in 1958 in the United States. Endowed with distinctive features it is particularly used in the confection of lingerie and beachwear.

Synthetic fibres, initially used in the aerospace, military and sporting industries, only entered post-war textile production for garments (Menegucci, et al, 2012). The new textile materials allow associating with textiles new functions that until a few years ago would have been impossible to imagine. The combination of these materials with areas such as electronics, chemistry, engineering, biology, and design, allow the production of new textile materials associated with the development of new fibres and fabrics. Daily wear clothes use new technologies capable of generating ultra-light, breathable, quick-drying and supportive clothing that can provide UV protection and excellent fit to different body shapes (Sinclair, 2015).

This has definitely marked a new technological and social dimension associated with textiles, maximizing its characteristics in terms of comfort, appearance, and performance. The use of these materials has also changed, allowing wider specific uses, giving rise to new requirements and uses. This is the case with sports materials that, since the 70's, increasingly influence those used on a day-to-day basis, associating them with greater levels of freedom and comfort.

This democratization of access to most textiles, taking into account their new features and functionalities, transform them into objects of desire and can improve the quality of life of citizens: "Recent advances have been truly innovative where aesthetic is the important ones". (Braddock & O'Mahony, 2005, p.12). These features can be easily found in projects such as "SpaceBra", which is based on a vital function monitoring system that can detect changes in body shape that can indicate a health (medical) problem, monitor heart rate (sports), and change a way to provide varying levels support (fashion). Another interesting design is the Oricalo shirt, whose fabric used for the sleeves can be programmed to shorten immediately as the ambient temperature gets a few degrees warmer (Fig. 3) (Seymour, 2008). Bioswim is a project that provides for the application of biometric and biomechanical signal monitoring systems in order to help high-performance swimmers improve their performance, but also enable a full monitoring of the signs of impaired patients in their motor and its most efficient recovery (Montagna, 2012)

Nowadays, clothing tends to give a better response to the needs of users, reinforcing all their levels of comfort. As Lipovetsky (1989) points out, "consumption, in essence, is no longer an activity regulated by the search for social recognition, rather it is carried out for the sake of well-being, functionality, and pleasure itself" (p.232).

CONCLUSION

Textile materials, which are the genesis of the production of clothing, have appeared since the earliest civilizations as a social, cultural, economic and technological phenomenon. Interacting in the relations of individuals with society, textiles have an important social representation that expands through cultural and economic sectors and can be affirmed as one of the main elements of meaning and distinction of individuals. Considered as a proper communication system it is possible through it to identify a historical period, a behaviour or the patterns of beauty established in society. The textile materials used by man in his garments represent the interface between his inner world and the exterior context, assuming himself as the most immediate element of communication of man with the society in which he lives and interacts and using the body as a medium of expression and non-verbal communication. These have a great capacity to adapt to the users through the inclusion of concepts related to ergonomics and the different dimensions of comfort, extending the social concept of utility and beauty, providing wellness and comfort and social integration for all the people who make up society contemporary art.

The evolution of the textile materials in the search for new solutions and functionalities, mixing traditions, art, technology, and science, has emerged a textile potential based on the use of new fibres and new structures, applying new finishes and integrating electronic systems. In the era of so-called intelligent fabrics, in which research in the fields of biotechnology, ergonomics, robotics, nanotechnology, and computing, among others, for the application in traditional clothing, or in clothing for new-borns or the elderly, the integration of intelligent interactive structures with added functionality for the user is a great development. The type of consumption and the consumer is changing, and it is essential that the textile industry produces clothing and textiles that satisfy the consumer as well as the ethical and environmental requirements. The close relationship we have with clothes raises our expectations of what they can do for us in relation to the needs of our daily lives.

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REFERENCES

- Albuquerque, M H., (2011). O Traje Feminino e a Moda através da Pintura – A burguesia do Realismo à Belle Époque. Ph.D. FAUL, Lisboa.
- Barbosa, M.M. (2011). A valorização do património da indústria da seda. In Urbana, O caso do Filatoio di Caraglio (Cuneo, Itália) e o Real Filatório de Chacim. Revista Eletrônica do Centro Interdisciplinar de Estudos sobre a Cidade, Trás-os-Montes, Portugal.
- Barnard, M. (2003). Moda e Comunicação. Rio de Janeiro: Rocco
- Boucher, F. (1965). Histoire du costume en Occident de l'Antiquité à nos jours. Paris: Flammarion.
- Braddock, S. & O'Mahony, M. (2005). Techno textiles: revolutionary fabrics for fashion and design. Londres: Thames & Hudson.
- Callan, G. (1999). Dicionário de la Moda y de los Diseñadores. Barcelona: Ediciones Destino.
- Eco, H. (2004). História da Beleza. Oeiras: Difel
- Fauque, C. (1994). Le Velours ou la force dela douceur. Paris: Syros.
- Forty, A. (2005). Objects of Desire, Design and Society since 1750. Londres: Thames & Hudson.
- Harris, K. (1999). Authentic Victorian Dressmaking Techniques. NewYork: Dover publications.
- Kawamura, Y., (2005). Fashion-ology: An introduction to fashion studies. Oxford: Berg.
- Laver, J. (1989). A roupa e a moda: uma história concisa. São Paulo: Companhia das Letras
- Lipovetsky, G. (1989). O império do efêmero. São Paulo: Companhia das Letras.
- Malichenko, S. (2017). Construção de vestuário a partir da manipulação têxtil. Dissertação de mestrado. Lisboa, FAUL.
- Menegucci, F., Martins, E., Menezes, M., & Santos, A. (2012). Experimentações Têxteis e Inovação no Design de Moda. In: 8º Coloquio de Moda, 2012, Rio de Janeiro.
- Montagna, G. (2012). O design de vestuário como elemento para a melhoria da performance desportiva. P.h.D. Lisbon School of Architecture, Universidade de Lisboa.
- Parker, J. (1998). All about Cotton. Seattle, Wash: Rain City Publishing.
- Quinn, B. (2010). Textile Futures: Fashion, Design, and Technology. New York: Berg.
- Seymour, S. (2008). Fashionable Technology: The Intersection of Design, Fashion, Science, and Technology. New York: Springerwiennewyork.
- Shoser, M. (2003). World Textiles, A Concise History. Londres: Thames & Hudson.
- Sinclair, R. (2015). Textiles, and Fashion: Materials, Design and Technology. Cambridge: Woodhead Publishing Limited.
- Steele, V. (2005). Encyclopedia of clothing and fashion. NY: Thomson Gale,
- Teixeira, M. (2008). O traje regional português e o folclore VII. Disponível em http://www.oi.acidi.gov.pt/docs/Col_Percurso_Intercultura/1_PI_Cap7.pdf. Consultado 5 novembro 2012
- Tolaini, R. (1997). Filande, mercato e innovazioni nell'industria serica italiana. Gli Scoti di Pescia (1750-1860). Ed. Leo S. Olschki. Firenze: Officina dello storico.

1727 NEW CRAFT AND TRADITIONAL TEXTILES

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ABSTRACT

The discipline of design is proposed as a fundamental discipline in the production and dissemination of traditional techniques and materials. It can help to promote socio-cultural integration needs, promoting a privileged mediation due to its own nature, promoting original identity and cultural characteristics.

Textile handicrafts belong to this collective memory of an inheritance that reveals the identity and culture of each population and can be observed as one of the most revealing and spontaneous elements of this identity.

Textile material is an object of preferential communication that has always been used throughout the world as a social statement belonging to different social strata adapting the use of more or less noble materials such as loom textiles, knits, lace, needlepoints, embroidery, jewellery, leather crafts, among others.

The analysis of the tradition of a population through its costumes allows us to adopt an interdisciplinary approach in the areas of design and craftsmanship, taking advantage of the potential of the handicraft for reinvention to meet modern needs.

The methodology used for the development of this paper is based on case studies based on projects that present approaches used by different stakeholders to develop innovative products that promote regional cultural identity.

We found a great source of inspiration in Craft, which challenged designers to develop innovative projects in the field of fashion and textiles, with the goal of promoting national cultural identity, meeting the economic and social sustainability needs of the regions.

Keywords: Fashion, Craft, Textile Design, Tradition, Co-design.

INTRODUCTION

Handicrafts stand as a collective memory of the cultural and social heritage of a country, of a people, but also of ethnic groups. Used as an agglutinating element, handicraft, it is responsible for the traditional collective memory that has its origins in the beginning of the history of the mankind himself and in the objects of craftsmanship of that same time. They are very varied objects of daily use that reveal a high level of utility, but from the beginning they also bring together the construction of an aesthetic oriented to the creation of an imaginary that goes far beyond the utilitarian and functional. Knowing handicrafts is not limited to knowledge of the past, its traditions and customs, but above all, it is a contact with its ancestral cultural values that identify and characterize the enjoyment of these objects, allowing it to be recognized as belonging to a certain group and territory and enabling the design of elements of innovation, creativity, technique and design, inspired by this same identity. The cultural product, says Ahmad, 2006, covers tangible and intangible values and dimensions embodied in a product that has economic utility as a cultural reference for the society or community that produces them. The users' interest in crafts and their products as elements of material culture is related to the ability of these objects to incorporate personal meanings, to communicate emotions, to facilitate interpersonal relations and to achieve a mediation between the individual's perception and self-identity and also between him and the social space (Woodward, 2007; Berger, 2009).

Miller (2009) refers that, for being a cultural product of the intangible heritage and vernacular traditions, crafts are seen to carry meanings for the makers and for the users of the products.

The concept of craft or "ancient techniques" Heidegger (1988) appears for the 1st time in the Italian Renaissance, to distinguish the manual work created and produced by an artisan who uses natural raw materials, those who design artefacts that would be produced by others. Most of the studies on this theme, according to Ko (2013), deal with the study of handicrafts with emphasis on their folk values, emphasizing traditional motifs, specific structures or still worrying about the implications of the globalization of the values of a traditional culture. According to the same author, there are still few studies that attempt to study and understand the perceptions of consumers that allow us to deepen and work the dimensions of the market and the strategic positioning of this type of products.

CRAFTS AND TEXTILES

Traditional textiles, together with other objects that make up the artisanal panorama of any country or region, have always been one of the main elements of communication, either for the extensive daily use of this material or for its versatility in being able to present itself as an element of dissemination (printed, embroidered, structured, felted, etc.). If it is true that any object has the capacity to appropriate symbolic values and to communicate them when displayed, textiles, given the privileged relationship they have with the body of the users, could mean to their users much more than any other object. Textiles in general, be they traditional or not, are elements of interface between the individual and the world and can function as a filter that can regulate the amount of information to be transmitted and to be observed, becoming a true element of bidirectional communication.

The communicational power of textiles has been used since the beginning of the use of textiles by mankind, always been privileged elements of social and class distinction and used as a differentiating and aggregating element to social groups or to an identity specific.

The craftsman produces objects that fit a particular public, works the material alone and transforms it into an object for the user, adapting the final object to the different possibilities that form, function, manuality and technique can allow, producing an object imbued with meanings and memory. In this sense, the researcher and author Martina Margetts, through her essay "Action not Words" (Margetts, 2011), refers, considering the role of know-how in the creative process, that it adapts and gives rise to new ways of thinking, seen to aggregate in a single moment the materials, the techniques and the ideas, implied in the production of the object.

Design is a discipline that by nature brings together different areas of action and knowledge in order to gather consensus in the creation of design objects. Being the design a discipline that aggregates different scientific areas, it enjoys this to be able to develop the object of study in its different levels, material and immaterial.

The tools available to the design to create objects adapted to its user are varied, and some of them are already widely used by designers in their relationship with the end user and entail some facilities in terms of methodology. The collaborative design tool (Co-Design) allows the shared realization of design objects, both at the level of idea production and at the level of process development, between the designer and the end user or, as is often the case in the case of craftsmanship, between the designer and craftsman. "Co-Design is a general term that involves Participatory Design, Metadesign, Social Design and other design approaches that encourage participation. [...] the term Co-Design is used to designate - make Design with [others]" refers Faud-Luke. (2009, 147-148). If the designer has the ability to develop a product that respects user's needs and is prepared to be industrially produced, the artisan masters the technique and the different possibilities that the material can offer for the aesthetic and communicational expression of the object itself. This know-how that the craftsman possesses due to years of development of the technique and the inclusion of cultural elements in the objects he produces daily is an added value that enriches the new design products and a cultural vehicle that can and should be used in the design and textile design. We seek to approach user-centred design, with criteria for success being consumer satisfaction (Bonsiepe, 1992) and socio-cultural innovation (Bonsiepe, 1999) to cover not only concerns about social context and sustainability, but also the participatory process in each intervention.

Currently, the market is looking for products that are more exclusive and different, while at the same time privileging an aesthetic and formal personalization that is ever increasing. In this sense, the use of these participatory design tools among artisans and designers presents a great value and an important strategy in the redefinition of the cultural and aesthetic identifiers in which the users can recognize themselves.

Talking about the know-how and experience of individuals in the production of handicraft textile objects, Jill Riley (2008) argues that the production of textiles increases the identities of individuals, increasing the sense of personal belonging and belonging to the collectivity. Other authors, such as Pöllänen (2011), defend this argument with regard to the manufacture of textiles, where experiments are used as sources of inspiration for the production of the textile object itself.

Recognition by users of a product that is perceived as being an authentic product is a key issue in the craft and production of design articles that are inspired by them.

It is not only a question of working with objects from the past, with specific traditions or habits, it is mainly about knowing the values of our culture and its techniques to create a space of creativity, innovation, design and tradition that associates the technical knowledge and the construction of a national identity.

The concept of Co-design appears in this context as a strategy that suggests the inclusion of the user as an active participant from the beginning of the Project, collaborating with all the professional team involved in the process. It is, in fact, a co-creation and production partnership between handcrafters and designers, whose main objective is innovation and economic and social sustainability at a local and regional level.

This article intends to understand how the regional tradition contributed to the establishment of textile products in Portugal through partnerships based on the work of co-creation, transparency and complicity of all interested parties - designers, handcrafters, users, promoters, among others.

The redesign methodology is also a collaborative tool frequently used for the production of artisanal-inspired textile objects but with the application of a more modern know-how, more focused on the needs of the users and often with the aid of more modern tools and ergonomically better adapted to the way of working of the modern craftsmen. Redesign is concerned with the reproduction of objects taking into account the adaptation of some variables that may meet the needs of more specific users or better respond to requests of production methods. In textile and in relation to traditional textile objects some blankets can be made with different weights (square meter weight) taking into account different uses of modern life; textile objects can meet an updated aesthetics regarding the same traditional object; the finishes will be able to meet the sensory needs to which the new consumers are already accustomed, etc.

As pointed out in earlier studies (Aakko 2015, apud Aakko 2014, Bettiol & Micelli 2013, Sandino 2004), "central to the artisanal approach [to fashion and textiles] is the integrated role of designer, which makes possible a high level of craftsmanship, skill, and quality".

In traditional terms, handicrafts are considered as an area where a high level of technical execution and personal knowledge should be applied, enabling the creator to manage the technology involved, the design and the materials used to produce "a well-made object" (Fariello, 2011, Dormer 1997, Adamson, 2007).

All products created for a traditional use, using traditional techniques and that adapts to traditional forms, says Cornet (1975), can be considered an authentic product. According to Littrell (1993), the main identifying characteristics of a

product are five and are based on qualitative parameters: uniqueness and originality, artisanal work, cultural and historical integrity, aesthetics and to possess functions of use.

Craft objects are, of course, tremendously important as objects designed to fulfil different expressive, functional, material, aesthetic, experiential, multisensory, collaborative, and narrative meanings. (Kouhia, 2016)

During the very defunct age of Fordism - dominated by a sense of powerlessness in the shadow of mechanization - to enjoy craft was to resist the homogeneity of face-less industry, say Rafael Cardoso (2010) in his "The persistence of craft in the age of mass production".

Peter Dormer (2010) refers to the apparent ease with which textile craftspeople and de-signers use remarkable new materials. It is a tradition within the craft that contradictory or complementary materials be woven together. Haute couture has a freedom of action that can be considered unique but that is envied by many: the total design provided by an army of craftsmen and technicians specialized in the most different techniques of textile art and garment construction, which allow the realization of any type of stylistic vision for fashion. (Montagna & al., 2017)

CASE STUDIES

As indicated by Mattoso (1993), in his *Historia de Portugal*, the country had its origin in an administrative structure, not an ethnicity, bringing together regions with their own cultural characteristics and, therefore, without an identity common to all of them. In this sense, and taking into account these regional distinctions, the specific costumes and textiles of each region are very important for the communication between the different regions of a specific regional identity, but also in the relation with the other regions in the identification and construction of an identity. The costumes and textiles of each region of Portugal recall a specific identity adapted to the social and cultural needs of its people and can be proposed as an essential starting point in the question of the factual identity that is presented as an essential factor for cultural recognition and identity (Jorge & Silva, 1992, 12).

Nowadays, activities related to handicrafts and crafts are losing importance in general terms. With the needs of the increasingly global international market of the last decades and the development of products in a perspective of controlled industrial production in all its elements and the increasingly urgent need for a just-in-time product, set aside, for a long time, craft production of objects. The last years have been marked by a revival of artisanal production and its know-how especially for markets in luxury products and those which, in order to distinguish themselves from those produced on a large scale, not only add greater elements of identity and culture, but are a demonstration of a know-how and techniques that the mass production industry has forgotten or, for economic reasons, never wanted to assume as their own.

The discipline of Design, always attentive to the needs of the market and its users in constant change, was charged very early to accompany the integration of the techniques and the artisanal know-how with those of the industry, for the production of objects that incorporate a socio-cultural dimension where the user recognizes him selves and promotes sustainability between society, culture and industry that was not previously possible in Portugal.

Nowadays there are several cases of collaboration between designers and craftsmen and craftsmen who incorporate in the objects of their production elements of design, at the service of the user, and where traditional textiles are used as a source of inspiration for the production of objects that effectively respond to the cultural identification needs of the users. From the use of specific and traditional materials to the use of different techniques of weaving and traditional embroidery, there are examples of production of traditional pieces in renewed materials and developed with dyes and finishes of the typical national costume.

Among the different case studies presented here we can mention the Portuguese textile artist Guida Fonseca who makes a renewed use of weaving techniques and traditional national materials such as flax and wool and develops their products with the application of traditional natural dyeing, in their technical and colour range, dyeing these, which by their organicity can change their appearance over time, creating new possibilities.

The renovation of the traditional textile patterns executed by the weaver Fernando Rei is a modern response to the requests for the renewal of a traditional image by those who, through textile materials, recognize themselves in a century-old culture and find in these materials a renewed expression of design. They are in many cases traditional objects that are developed in a modern key and whose use is adapted to the new times and spaces of the XXI century or that serve as a vehicle of cultural transmission in social and ethnographic presentations.

The Portuguese "Save the Portuguese Wool" project is a project that is concerned with the use of wool produced in national territory and which, because it is produced on a small scale, loses its commercial value and, in most cases, is disposed of in landfills so as to be quickly destroyed. Along with trying to recover and not allow the destruction of this type of raw material, the project is concerned with safeguarding the biodiversity of this type of material through the study and safeguard of the different qualities of the Portuguese national territory. The production of small quantities of wool yarn from different micro-herds was the first output of this applied research project linked to textile fibres of animal origin and that can be acquired for the development of pieces produced by hand.

In a process of revaluation of traditional Portuguese textile materials and with the idea of producing contemporary clothing that can encompass different traditional cultural values, the Capuchinhas cooperative seasonally develops a set of traditional and timeless flavoured pieces that they trade through fairs and sales in specific stores. They are objects created in collaboration with designers and who want to maintain a balance between past and future, using traditional

textile substrates such as “Burel” which is a woollen fabric that after being beaten and felted, its protect from the cold and become water repellent. This material, which does not slip when it is cut, offers numerous creation possibilities for clothing, but also for architecture and interior decoration.

The Bilros’ Lace from Peniche is another example of Portuguese craftsmanship that has become a model for redesign and collaborative design. Present in the national territory since about 400 years ago through commercial relations with the Flemish, this type of weaving, which produces lace of very high quality, is nowadays adapted to the different aesthetic needs so that it can still have a commercial value that allows keep alive its cultural worth and its technique that gradually was disappearing. Different designers developed diverse objects with alternative materials so that this lace not only continued to be used as “napperon” but also as income for dresses and household linen, or used in jewellery or other decorative objects. “The focus on product innovation and attracting new niche markets is an important part of all the strategy around sustainability of Peniche bobbin-lace” (Silva, 1992).

As Ko, Chun & Lee (2011) refer to the possibility of communication of the cultural product as the craft, a product that is considered to be traditionally genuine, can produce a large number of variations that may have a high value in economic terms. In this sense, the cultural exposition that a product of artisanal inspiration design can be a fundamental element of development and sustainability of the very companies that produce these objects.

CONCLUSIONS

In an age of globalization and the predominance of some cultures, the need for recognition of cultural values where individuals can recognize themselves is growing stronger. In this millennial culture, community recognition of its origin and roots strengthens the survival of many communities and social groups. If, on the one hand, craftsmanship needs to learn to create more balance with the needs of the market and its end users, in order to produce products that are more suited to the needs of those who want to acquire them, on the other hand, industry, through designers and actors in the production process, needs to adapt some production techniques so that it has the capacity to produce differentiated products and less standardized, allowing a greater personalization of the final product.

The alliance between craft and industry is still embryonic, but it must go a long way so that the reciprocal advantages can be many and varied, always taking into account the best user satisfaction in their different levels of need.

The techniques and work methodologies applied to textile materials are constantly being updated and the know-how of craftsmen and designers are fundamental elements for a transformation and adaptation to the user of a product that entails an age-old symbology of culture and identity as few of other materials can do. Nowadays, crafts are particularly important and relevant in different areas and associated with the production of high quality products that are increasingly exclusive and unique.

As can be seen from the examples described in this article, the interventions introduced in the production of textiles can be multiple, from the raw material, to the use of specific finishes, through the creation of structures that contribute to the sustainability of many craft enterprises, through interventions based on the concept of co-design and redesign.

In sum, these renewed collaborative interpretations are presented as a way to promote the cultural approximation of individuals and the recognition of a sense of identity, allowing users to be satisfied in their tangible and intangible dimensions.

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REFERENCES

- Aakko, M (2015). Crafting Aesthetics: The Meaning of Materiality and the Making Process in Artisanal Fashion. in IFFTI 2015 conference / Polimoda (ed.), Momenting the Memento.
- Adamson, G. (2007). Thinking through craft. 1st ed. London: Bloomsbury Academic.
- Ahmad, Y. (2006). The scope and definitions of heritage: From tangible to intangible. *International Journal of Heritage Studies*, 12, 292–300.
- Amador, J. http://www.cm-peniche.pt/_uploads/PDF_Noticias/RendasBilrosPeniche_SaberFazerEnraizadoComunidade.pdf
- Berger, A.A. (2009). What Objects Mean? An Introduction to Material Culture. Walnut Creek, CA: Left Coast Press.
- Bonsiepe, Interface an approach to design. Ed. Jan van Euch Akademie. Maastricht, 1999
- Bonsiepe, Teoria e prática do design industrial elementos para um manual crítico. Ed CPD, Lisboa, 1992
- Cardoso, R.: Craft Versus Design: Moving Beyond a Tired Dichotomy. In: Adamson, G. (ed.): The Craft Reader. Berg, Oxford (2010)
- Cornet, J. (1975). African art and authenticity. *African Art*, 9, 52–55.
- Creative Textile-Making. *Journal of Occupational Science* 2008 15:2, 63–73.
- Dormer, P. (1997). The Culture of craft. ed. Manchester: Manchester University Press
- Dormer, P.: The culture of craft: status and future. Manchester University Press, Manchester (2010)
- Fariello, A.: (2011). Cherokee Pottery: From the Hands of our Elders. Charleston, The History Press.
- Fuad-Luke, A. Design Activism. Beautiful strangeness for a sustainable world, Earthscan, Londres, 2009, pp. 147-148.
- Heidegger, M. (1988). La question de la technique, In: *essais et Conférences*, Ed Gallimard, Paris, 1988.
- International Journal of Education through Art* 7:2, 111–125.
- Ko, E. J., Chun, E. H., & Lee, S. G. (2011). Korean beauty in a global cultural context. *Journal of Global Fashion Marketing*, 2, 200–212.
- Ko, E., Lee, S., Whang, H. (2013) Authenticity in traditional culture marketing: consumers' perceptions of Korean traditional culture, *Journal of Global Fashion*

- Kouhia, A. (2016). Unraveling the meanings of textile hobby crafts. Doctoral dissertation. University of Helsinki, Faculty of Behavioural Sciences, Department of Teacher Education, Käsiyötieteen koulutus.
- Littrell, M. A., Anderson, L. F., & Brown, P. J. (1993). What makes a craft souvenir authentic? *Annals of Tourism Research*, 20, 197–215.
- Margetts, M.: Action not Words. In: Charny, D. (ed.): *Power of making: the importance of being skilled*. V&A, London (2013)
- Mattoso, *História de Portugal*, Círculo de Leitores, Lisboa, 1993.
- Miller, D. (2009). *Stuff*. Cambridge: Polity Press.
- Montagna G., Sousa S.A., Morais C. (2017) Haute Couture and Ergonomics. In: Di Bucchianico G., Kercher P. (eds) *Advances in Design for Inclusion. AHFE 2017. Advances in Intelligent Systems and Computing*, vol 587. Springer, Cham
- Pöllänen, S. (2011). *Beyond craft and art: A pedagogical model for craft as self-expression*.
- Pye, D.: *The Nature and Art of Workmanship*. In: Adamson, G. (ed.): *The Craft reader*. Berg Publishing, Oxford (2010)
- Riley, J. (2008). *Weaving an Enhanced Sense of Self and a Collective Sense of Self through*
- Silva, A., Jorge, V. *Existe uma cultura portuguesa?* Ed. Afrontamento, Porto, 1992.
- Woodward, I. (2007). *Understanding material culture*. London: Sage Publications.

1741 MODEL CHANGE IN THE HUNGARIAN HIGHER EDUCATION – ISRAELI EXAMPLE

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ABSTRACT

Higher education, as one of the most important resources of a country, determinates its competitiveness, capital-retaining ability and the success of R&D. In spite of some changes in the system and operation of the Hungarian higher education in the last 25 years, the basic elements – such as legal environment, organizational structure, budgeting principles and mechanisms – are permanent. For the renewing of the Hungarian higher education and for an international competitiveness, the reconsideration of the whole model of operation, and – if it is necessary – some fundamental changes are necessary. For the reconsideration of the model, the study of international best practices can serve as input. Firstly, we examined the higher education of Israel. When studying the financing and the operational model, we put special emphasis on the proprietorial model and the system and predictability of the allocation of state fundings. The financing cycles of five years, the clear aims of the government and power of the owners enable the Israeli higher education to be effective and marketable.

Key words: Israel, Hungary, higher education, financing, model change

THE COMPARISON OF ISRAEL AND HUNGARY

	Hungary	Israel
Surface	93 011 km ²	20 770 km ²
Population	9 855 571	8 463 400
Number of HEIs	66	63
<i>of which university</i> ⁵⁶⁶	36	9
<i>of which state funded</i> ⁵⁶⁷	29	50
Number of students in higher education		310.000
Budget for higher education ⁵⁶⁸	170 Mrd Ft	775 Mrd Ft
Number of Nobel-prize winners	10	12
GDP per capita	11 800 USD	28 365 USD
R&D expenditure of the state as a percentage of GDP	0,48%	4,00%
number of R&D stuff of research and development organizations as a percentage of all employees	0,88%	16,50%

THE ISRAELI HIGHER EDUCATIONAL SYSTEM

Sector management

Education and research – most significantly higher education and the researcher developer work in HEIs – have an important role in the everyday life of Israel. There are 4000 high-tech and 250 R&D and innovation enterprises in the country. According to the conclusions of the World Economic Forum in Davos, there is a strong rapport between research collaborations, the quality of research, the proportion of innovations and the number of R&D and innovation collaborations.

The minister responsible for education is at the same time leader of the Council of Higher Education – CHE founded in 1958. The chairing of this body is mostly a representative task that comes with the ministerial assignment.

The operational management of CHE is carried out by a Vice Chairman and a Board of 25 members. The body has 100 employee and several sub commissions, the most important one among them is the Planning and Budgeting Committee (PBC, founded in 1977).

The task of this latter (PBC) is to plan the (professional) system of higher education, to prepare decisions on the extent of the usable resources and the manner of its usage. The seven-member committee consists of five academic and two non-academic members. During the operation of tasks, they collect data by themselves for each planning tasks, especially from the Statistical Office, higher educational institutions and other (unbiased) experts and they carry out researches by themselves as well.

Israeli higher education in a nutshell

The oldest Israeli university can pride itself on having a longer history than the country. The participation in higher education was the privilege of only a few people in Israel as well up until the 1990's, when a sudden boost happened in the number of institutions as well as in that of students of higher education. As long as in 1990, 8 state universities, 1 state college, 5 private colleges and 7 state teachers' training colleges operated in the country, this number has increased to 63 until today: 9 state universities, 20 state colleges, 13 private colleges and 21 teachers' training colleges. In parallel, the number of students has increased from 80.000 to 310.000.

⁵⁶⁶ Together with the universities of applied sciences (29 universities, 7 universities of applied sciences)

⁵⁶⁷ All together (out of 66 and 63 institutions)

⁵⁶⁸ Source: Annual Budget of Hungary for 2016 (besides the allocations of beneficiaries);

At the moment, there are two Israeli universities ranked in the top 100 universities: the Technion – Israel Institute of Technology in Haifa and the Hebrew University of Jerusalem. What is more, Israel is the first state in citations in the field of information technology, third in the field of technology and fifth in the field of chemistry and biomechanics.

Although the institutions operate as civilian organizations/budgetary authorities, the framework of their operation and the majority of their budget are given by the state. Their operation is of a non-profit approach, they can and have to use up the profit in the next year(s). The long-distance predictability is secured by the six-year plans compiled by the PBC and approved by the government. These plans determine in a transparent way – beside the amount of money dedicated to higher education – the exact resources for each fields.

The budget planned by the PBC for the past six-year cycle increased the amount of sources by 43% (roughly at an even degree) for the institutions, and this increase will be of the same degree in the next six-year cycle as well. Infrastructural developments (BigData), international mobility and the improvement of the quality of higher education are constant objectives. Incubators and the improvement of digital learning (MOOCs in Arabic and Hebrew languages) are also focal areas.

THE CHE

The duty of the Council of Higher Education – founded in 1958 – is to manage all areas connected to higher education. At the moment, the committee is of about 100 members and it operates on 9 big fields with several commissions. The main decision-making body is the Composition of the Council of 25 members. It is chaired by the Minister of Education and the members are the chairman of PBC and two student representatives. At least two third of all members have to be persons with experience in the field of higher education, the other members are private actors. All members are appointed by the head of state for a period of five years.

THE PBC ⁵⁶⁹

It is a sub-commission of the Council of Higher Education created by the government. It was set up on 6 June 1977 by the government on the proposition of the Ministry of Education. The PBC consists of 7 members, out of which there are 5 academic members (4 coming from state institutions and 1 from a private institution) and 2 members from market actors.

The duties of PBC:

- a) It is a mediator between the HEIs and the government or governmental institutions about all matters concerning higher education. The government does not take comments, proposals or demands directly from the HEIs or other actors, and only allocates resources on the recommendation of the PBC.
- b) It makes proposals on the main and developmental budgets of higher education, taking the social and national necessities of the country into account, while respecting academic freedom and promoting the development of researches and education.
- c) It has the exclusive right to allocate resources among the HEIs.
- d) It makes proposals for the Council of Higher Education and the government concerning the development of higher education (programs) and their financing.
- e) It motivates the HEIs for a more efficient work and mediates between them in order to avoid parallelisms and to take the needs of the market into consideration.
- f) It supervises the usage of resources continuously in order to avoid outage or misuse.
- g) It expresses its opinion to the Council of Higher Education when a new institution or a new unit of an existing institution is established and the action has financial consequences. In these cases, it examines if the establishment of a new institution or that of a unit is necessary and what kind of financial consequences it may have.

FINANCING

The financing of the institutions is diversified. Although there were some differences between the institutions we managed to visit, but on the whole, they showed a similar pattern.

Primarily, the state funds the 9 universities and the state colleges. The resource distributed by the PBC gives 50-70% of the total budget of these institutions. The universities got 63% of the total budget directly (775 milliard Ft in 2016), the colleges got 17% and the remaining 11% was used for research funds. If you look at it from a different perspective, 51% of the budget was spent directly on education, 32 % on research and 17% on other purposes.

It is important to note that for the funding of research, the government adds one shekel to each shekel coming from the R&D actors of the market.

Although, the fair and objective allocation is an objective, there are 3 main aspects of financing (the planning of financing):

- a) outcome based financing
- b) transparency
- c) competition over excellence

⁵⁶⁹ http://lang.che.org.il/en/?page_id=3945

The government finances the institutions through three channels:

- a) PBC's teaching model
- b) PBC's research model
- c) other fundings (these need to be applied)

PBC's teaching model

The teaching component of the block grant is calculated as the sum of the number of students in each field of study multiplied by a tariff (per field of study) and by an efficiency factor parameter (calculated by the proportion of graduates to students). Data on students and graduates comes from the Central Bureau of Statistics (CBS).

PBC's research model

Competitive Grants 34%, Scientific public grants 34%, Other grants 15%, PhD 15%, Masters 2%

The inconvenience of the PBC's research model is that the size of the cake is of a unit, in other words, *ceteris paribus*: if all the institutions raise the number of their students or the excellence of their researchers equally, they will get the same amount of money, but will have more expenses.

Knowledge transfer companies

All the HEIs have knowledge transfer companies. As long as the bigger universities have their own ones (since the end of the 1950s), the smaller ones can market the results of their researches with the help of a common knowledge transfer company.

INSTITUTIONAL EXPERIENCES

Hebrew University of Jerusalem

The application of the six-year plan ensures the stability of the university. They are the main beneficiary of the state subvention (24%). The number of academics is 941. The number of students is 22,000.

Motivating employees to obtain funding for research: the professors of the university have the opportunity to gain complements to their basic salary from research grants (about 20-25% of the total research funding). The salary of the teachers cannot exceed 190%, given that they teach exclusively on the university, obtain funding for research, and get paid after Master and PhD students. Working at their private business is strictly prohibited; they are only allowed to work at the university's own technology transfer company.

The students are required to pay a flat school fee (2,500 EUR/year for BSc students, 3,500 EUR/year for MSc students) that is determined centrally by the PCB. The differences in the budget are compensated by a teaching model which uses different multipliers for the different fields of studies.

The university is represented on the market by their own TT company. The purpose is to motivate the teachers to engage in international collaboration. The entire budget of the university is 880 million U.S. dollars (64% comes from PBC, 18% from research grants, and 10% from subventions). The payroll expenses consist 37% of the total amount. Another important and considerable part of the budget (33,9%) covers the pensions. In 2000, it was 19,8% of the total amount.

Tel Aviv University

The university was founded in 1956. They have 1040 university programs in 28 fields of study on nine different faculties. There are currently 29,200 students at the university of which 1,200 are from abroad. 55% of the students are female. With 173,000 members, they have a notable alumni program.

There are 1,040 senior academics, 3,000 junior academics, and 1,600 administrative staff members at the university. The challenging task is to pay the pension of the 1,500 retired academics (of which 500 are still active).

The entire budget of the institution is around 750 million euros. 60% of the total amount is used to cover operational expenses, 125 million euros are spent on research, while 60 million euros cover investments and another 60 million euros are paid as scholarship. The sources of the income of the university is the following: 60% comes from PBC models, 18% from school fees, 10% from the income of projects and services, and 12% from the yield on investments, and from direct donations.

Their finances are calculated based on the academic year (1 October to 30 September). They present an annual report to the PBC and a quarterly report to the leadership.

Organization

The institution is directed by the President (5+5 years), who is the boss of the Rector (academic, 4+4 years). The university is led by the Board of Governors of 170 members, who elect the President. Their task is decision making. The operational tasks are carried out by the 13-membered Executive Council. The leaders are eligible for a special bonus.

Ben Gurion University

Ber Sheva is the capital of cyber technology.

Their continuous investments are primarily paid by subventions. The north campus is currently under construction; it costs 200 million U.S. dollars. The price per m² there is 4,000 U.S. dollars. 50% of the development costs are covered by

donations, 1% comes from the state. The number of students is 17,414. The number of academics is 820. As the budget for higher education decreased by 26% between 2003 and 2010, a number of PhD students were unable to enter the universities, and migrated abroad, mainly to the US. The tenth Israeli university is there.

They recently received a 400-million-U.S. dollar donation from the Marcus Family.

The total budget is 464.9 million U.S. dollars.

Income

a, PBC	70%
b, School fees	19%
c, Donations	1%
d, Yield on investments	4%
e, Other incomes	6%

Expenses

a, Wages	74%
b, Scholarships, student allowances	6%
c, Educational expenses	4%
d, Educational and research units	3%
e, IT expenses	1%
f, Library expenses	2%
g, Administration and Finance	3%
h, Utilities and maintenance	7%

Division of PBC resources:

a, Teaching model	54%
b, Research model	39%
c, Other research fundings	7%

They get 14,46% of the research budget, which is not too much, and can hardly increase.

The questions of adaptation in Hungary:

1. Approach - the status of the institutions: is it possible to quit public finances and if so, how and in which area? Will the State then become only a procurer or will it maintain its controlling-coordinating function? Another important question is the future of the assets of the institutions (which is funded by the state, as of today), as well as the future status of the students currently being part of the system, and the continuous employment of the teachers, researchers and other colleagues.
2. Planning: with a long term and predictable financing model it is possible to plan for the HEIs. A question of high priority is, for example: when employing a well-known professor, what kind of resources the university can plan with to be sustainable? The launch of a new field of study, the development of the infrastructure or the human resources, the expansion of the services, or the injection in their own technology transfer companies, to state some specific examples also represent a similar situation.
3. Creating a legislative environment: thanks to the numerous international agreements and the European Higher Education Area, the described operational and administrative/managing questions, after the required preparations, can quickly be integrated in the Hungarian law.

SS24.1. Regional Issues in Economic growth and Development

1777 WHY WEALTH INEQUALITY MATTERS? EVIDENCE FROM INDIA

ABSTRACT

According to the World Wealth report 2017, India is now the sixth wealthiest nation in the world. India’s wealth has grown tremendously in the past few years, but was this growth distributed fairly amongst the population? This paper tries to look at this aspect of wealth distribution at household level and tries to compute the social welfare loss due to wealth inequality present. The paper uses AIDIS data (All India debt and Investment survey data) for 48th (1991), 59th (2002), and 70th (2012) round to look at the wealth growth and distribution at household level. In this paper, we compute the total asset value and total wealth per household by sector (rural versus urban) and for different social, religious groups and occupational groups. We found that total assets value per household in real terms in rural area was less than that of urban areas and this gap widened over years and by 70th round it was found that total asset value per household level at urban area was more than double that of rural areas. The growth rate of total asset per household for urban areas increased at almost double rate than that of rural areas. Same trends are seen for the wealth values at household level. We found that the share of land in total asset was largest for rural areas for all the rounds and share of building in total asset was largest for urban are for 59th and 70th round while share of land was largest for 48th round for urban areas. TheGini coefficient at national level has remained constant for 48th and 59th round while has increased drastically for 70th round and main contributor to this wealth inequality for all three rounds was the value of land owned by different households. Further, the study examinesspatial variation in wealth distribution and concentration among social, religious and occupational groups.Finally, the paper quantifies the welfare loss that that the country India has experienced over the last two decades as a consequence of the segregation of the various demographic groups that encompass it.

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1778 EFFECT OF QUALITY COMPOSITION OF HUMAN CAPITAL ON ECONOMIC GROWTH. A STUDY OF THE INDIAN STATES

ABSTRACT

There are contrary views in the literature regarding the relationship between education and economic growth. Some argue, it the accumulation of human capital which is important, others argue it the stock and some say it the stock of human capital employed in the R

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1779 DEVELOPMENT AND GROWTH DRIVERS IN LATIN AMERICAN COUNTRIES- VIOLENCE IMPACTS EMPLOYMENT AND HDI – POSSIBLE WAY OUT THROUGH AGRICULTURAL TRANSFORMATION

ABSTRACT

This paper attempts to study development and growth drivers in Latin American countries. Lack of employment planning was taken as base leading to revelation of lawlessness in various forms in different countries. A counterfactual approach reveals that mitigating violence leads to increase in life expectancy and boost Human Development Index. Correlation figures showed positive between 2000-2015 between high growth phase and increase in HDI. Various data sources were employed to study diverse parameters like crime, HDI parameters, employment, agriculture, etc. The UN Office on Drugs and Crime's International Homicide Statistics database, about intentional homicides for the years 1995-2015 is used along with data from reports of UN, WHO and Penn world tables. Another way of calculating the costs of violence is to estimate the years of life lost due to homicide; that is to say, the impact of lethal violence on life expectancy. Measurement of the Human Development Index in fifteen Latin American countries showed that in 2009 the region lost 331 million years of life due the homicides. The relationship between homicides, employment and HDI is explored. A linear regression model was used for the analysis with number of Employees in a country as the independent variable and the dependent variable was used as the HDI value of the respective country. The data used was for the years 1991-2015 and the regression analysis was done for each of the four countries (Argentina, Brazil, Mexico and Colombia) separately. In most of the countries, employment comes from largely from three sectors of the economy, agriculture, industry and the services sector. Hence all employment was divided into these three sectors and their contribution to the total employment in a year on year format was analyzed. While a Cobb-Douglas production function is used for capturing the effect of two or more variables on the total production quantity, the effect of total area under cultivation on the total agricultural produce through an exponential function is done.

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SS24.2. Regional Issues in Economic growth and Development

1780 ASSESSMENT OF GROWTH FACTORS IN AFRICAN GROWTH STORY

ABSTRACT

This paper selects twenty countries of Africa based on income heterogeneity and representative of the diversity of geographical regions. An Input Output approach in a multi regional framework is used to test the show the progress of economic variables over two time periods 2005 to 2015 and sufficient to reveal sectoral trends for possible interpretations. A robust approach demand prediction of overall employment parameters across regions and across sectors differentiated by geographically homogenized regions. Subsequently, a decentralized approach to each of the country’s sectoral data set driven sectoral growth rate would enable identification of ‘meso’ for forecasting development outcomes. The identifiable meso factors are taken as rules translated into policies and practices, education-skill-IT variables and the tangible historical factors like roads, ports airways along with its historically density factors and the projected features based on economic data. The third stage of the paper relates to commercial banks lending for products and services, C/D ratio and aid amount disbursed across country-sector-product. This would reveal the relevance of aid induced growth or endogeneity of the growth processes necessary for long- termish development.. Spillover effects, terms of trade effects across neighboring countries and ‘distant’ countries are factors to show trade effects of growth in Africa, neighborhood policies for trade or aid conditionality. Whether meso leads to interconnected-ness for trade in Africa is a research outcome given the distribution of resources leading to change in regional income and employment.

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1781 DEVELOPMENT AND REGIONAL INEQUALITY: A STUDY OF GOA

ABSTRACT

The income inequality is on an increase across and within the countries over the past two decades. This is true for both in developed and developing countries. It has emerged as a great challenge for the economic policy makers. Since 1980s most developing countries are getting integrated into the World Trading System and the inequality is also rising during the same period giving the feeling that trade leads to inequality. Trade is considered as an engine of growth. However, the capacity of international trade to enhance economic growth depends on many factors. International trade, in some countries, may result in job loss than job creation. It is also possible that skilled workers benefit more from international trade than unskilled workers. All these may contribute to inequality in some regions or some countries. Besides, the existing studies show that trade generally promotes growth and high inequality retards growth. The link between trade, growth and inequality is not very straight forward and there are enough empirical evidence to establish this link. There are reasons to believe that the last two decades witnessed trade integration more through Regional Trade Agreements (RTAs) and Bilateral Trade Agreements than through multilateral trading system. This gives another dimension to the trade, growth and inequality. The main objective of the study is to establish the link between trade, growth and inequality among different countries within the selected RTAs. The paper will try to establish the above link among countries belonging to different RTAs. Study would also like to look into few selected Bilateral Agreements to understand how trade affects growth and inequality.

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1782 ECONOMIC GROWTH ANALYSIS OF FOUR WEST AFRICAN COUNTRIES NAMELY GHANA, NIGERIA, NIGER AND TOGO

Vedant Bhardwaj, David Botchway, Sartaj Singh Sandhu, Rijul Arora, Debasis Patnaik

ABSTRACT

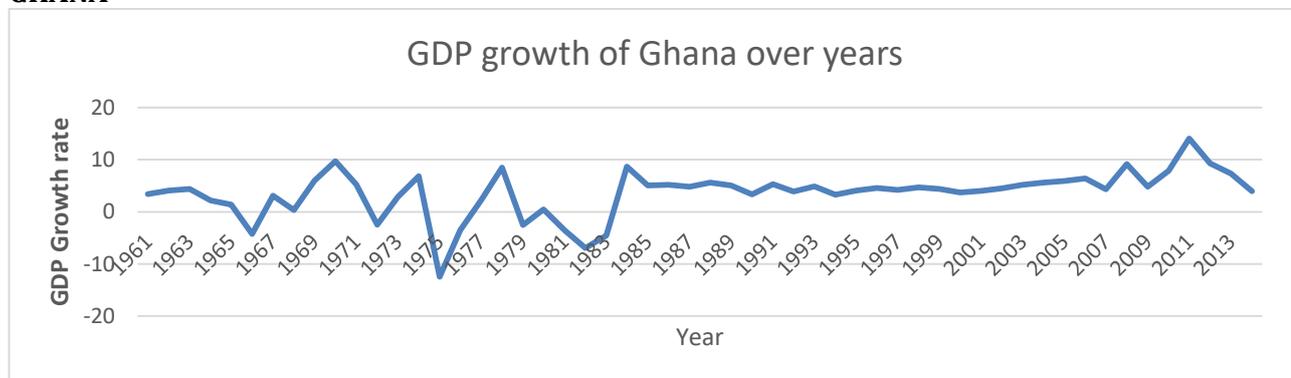
In this paper, we have analyzed the general growth trend of various parameters for major African countries namely Ghana, Niger, Nigeria and Togo. The parameters that we have analyzed include gross capital formation, GDP, FDI (here Foreign Direct Investment is the direct investment equity flow in the reporting economy. It is the sum of equity capital, reinvestment of earnings and other capital), imports, exports, unemployment and inflation. Also we have seen the implications of FDI, imports and exports on the GDP of the host country. The results show that, along with model being significant, there is a significant effect of FDI on GDP for Ghana and Nigeria. Imports on the other hand had a significant impact on the GDP of Ghana, Niger and Togo.

Keyword: GDP, FDI, Import, Export, Unemployment, Inflation, Gross Capital Formation

INTRODUCTION

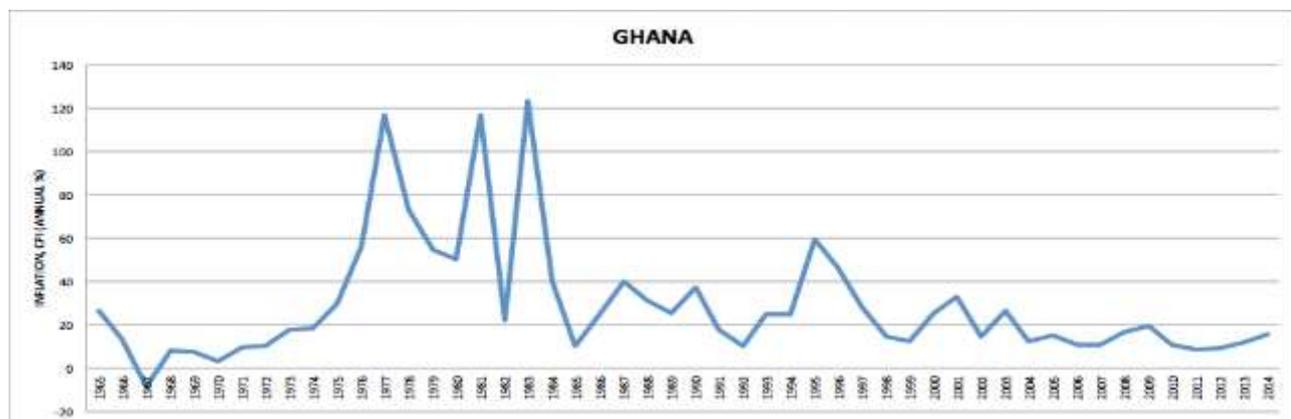
This paper looks into growth determinants of 4 African countries differentiated by size. While Niger is land locked, the rest three are coastal.

GHANA



Source : data.worldbank.org

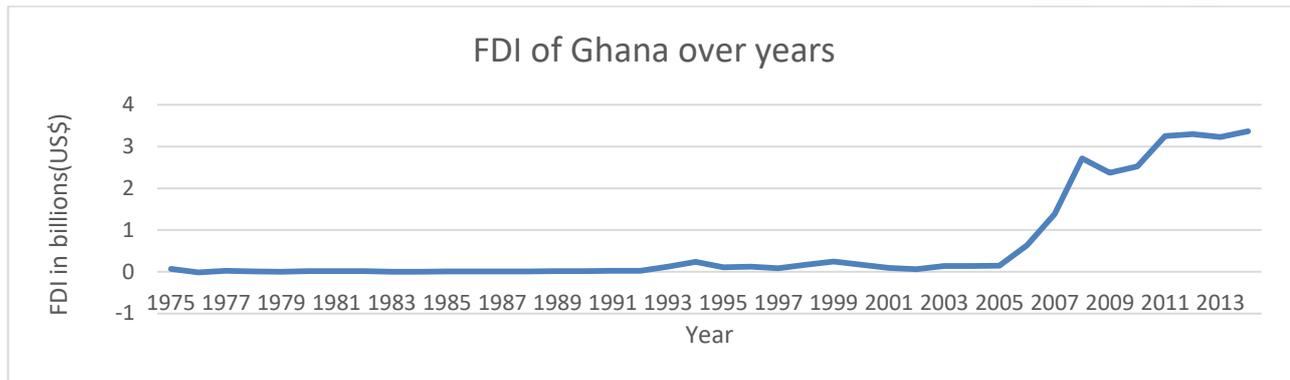
Graph 1



Source : data.worldbank.org

Graph 2

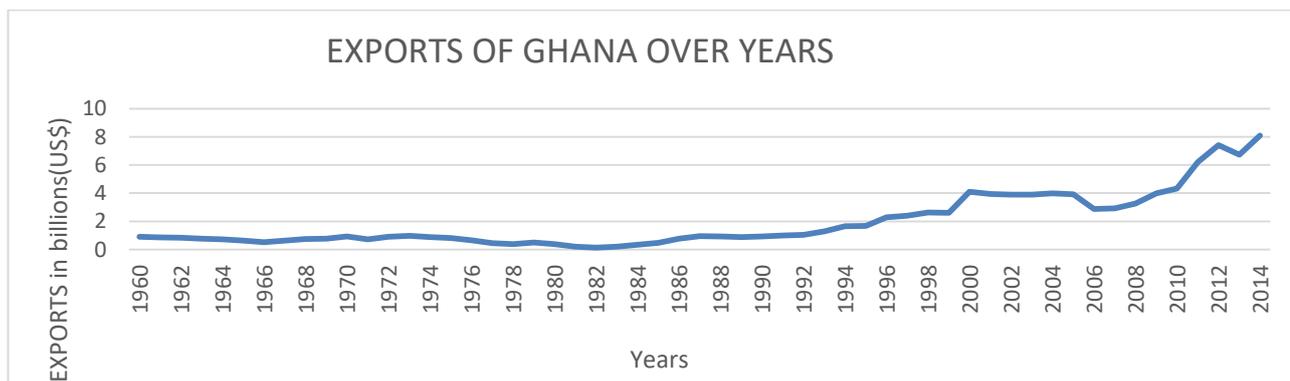
Its been more than 50 years since Ghana has attained independence, yet the Ghanaian economy is still at the same level as it was in the earlier period (Aryeetey, Harrigan and Nissanke, 2000). Ghana had a high growth rate in the early 1960s, but it soon began to experience a slowdown in its GDP in the mid 1960's. It continued to deteriorate throughout the 1970s. The entire decade was characterized by high inflation, declined exports, increase in illegal activities and political instability. The economic recovery program (ERP) that the government of Ghana launched, were a series of reform initiatives from 1983 to 1986, helped the GDP of Ghana to grow to 8 percent in 1984 and helped to keep the GDP growth at 5.3 an average from the year 1983 to 1986. Another program, named Structural Adjustment Program (SAP) was introduced from 1986 to 1990 which enabled Ghana to continue its high growth path with an average growth of 5.4%. During the December 2007 recession, Ghana saw a decline of growth from 7.2% in 2008 to 4.1% in 2009. In 2011 GDP rebasement was done which made Ghana the fastest growing economy in the world at that time.



Source : data.worldbank.org

Graph 3

From 1957 to 1966 Ghana’s decision makers chose a socialist path for its economy, the then president Nkrumah allowed FDI but with conditions as he inveighed against neo-colonialism, this policy attracted very less FDI. The next government National liberty council (1966-69) and Busia government(1969-1972) claimed to pursue more open economics but didn’t decrease the participation of government in economics. The next three governments The National Redemption Council, Supreme Military Council and Limann government expanded the government interference in economy in response to political instability. In 1982 Jerry Rawling came to power and they introduced many liberal policies and Ghana opened up its economy to world economy but government attitude remained somewhat hostile towards private enterprises. The next President John Agyekum Kufuor in his inaugural speech stated that Ghana is open for business and he welcomed foreign investors. John Agyekum Kufuor and following presidents followed the same policy and formed Bilateral relations with many countries and allowed FDI in different sectors which encouraged investors and increased FDI.

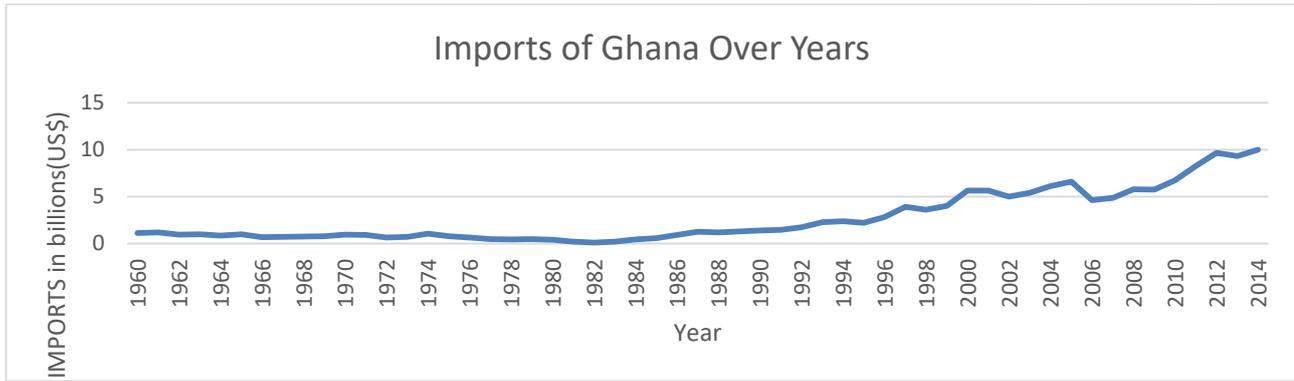


Source : data.worldbank.org

Graph 4

The major exports of Ghana include pearls, precious stones, metals, coins, cocoa and cocoa preparations, wood, articles of wood, wood charcoal, edible fruits, peels of citrus fruit, melons, machinery, boilers and nuclear reactors.

Ghana’s agricultural exports have declined by about 4.6 percent during the 1960-to 1987 period. Various reasons have been adduced for the decline of real agricultural exports, either in the aggregate or with reference to specific export commodities(see Okyere(1989), Killick(1978), for instance). The domestic factors behind this were the inadequate infrastructure and supply of inputs, smuggling of cocoa beans to border countries like Togo, labour shortages, low and declining export commodity prices and competition from other crops.(see Okyere(1989), Robertson(1997), Ghana Cocoa Board(1974,1987), Nyanteng(1997,1980), Dapaah(1982), Kotey, Okali and Rourke(1974), Manu(1974), Adomako-Sarfoh(1974), Bateman(1973,1974), La-Anyane(1972), Stern(1965) and Atsu(1965)). The external factors originate in the structure of international commodity market like eternal terms of trade, have tended to limit Ghana’s exports. Such challenges were overcome by Ghana, further opening of the economy (liberalization in 1983), allowing FDI in different sectors like mining, oil and gas exploration and increase in the commodity prices, resulted in the increase in exports from 1987 onwards.

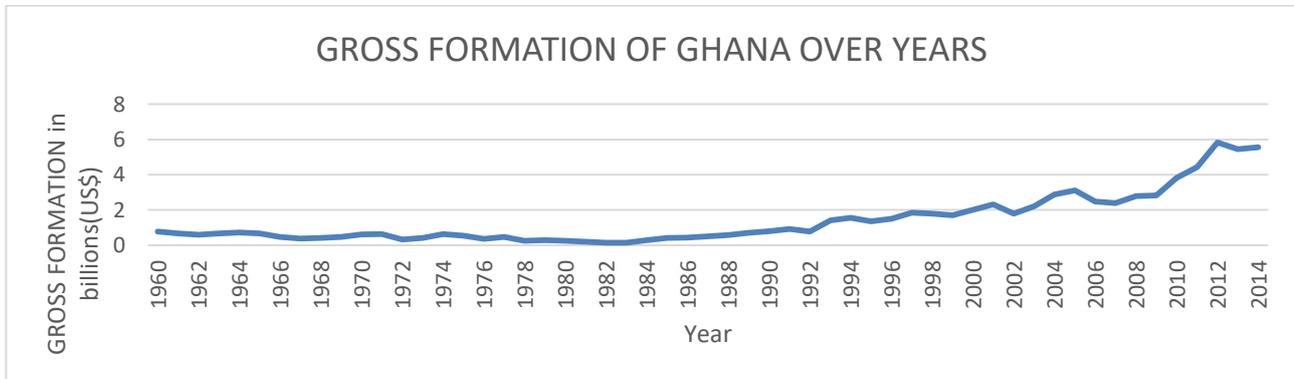


Source : data.worldbank.org

Graph 5

The major imports of Ghana are vehicles other than railways,boilers, machinery, nuclear reactors, electrical and electronic equipment, cereals, mineral fuels, oil, distillation products.

Ghana liberalized in 1983, before which it was almost like a closed economy. After 1983 liberalization, the imports increased dramatically over the years. During 1990s the major import of Ghana was rice because there was a huge difference in the quality of the local and foreign rice. Hence there was a poor substitutability between the domestically produced good and the good imported.

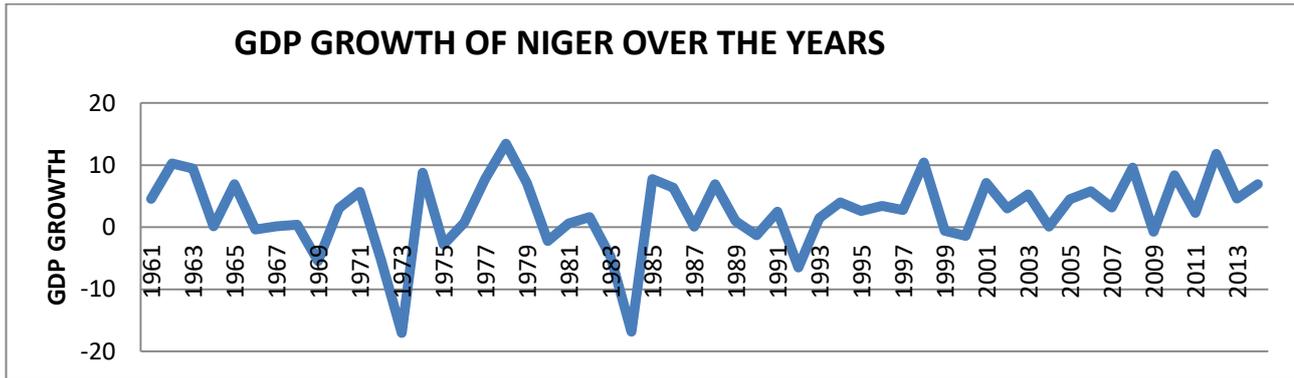


Source : data.worldbank.org

Graph 6

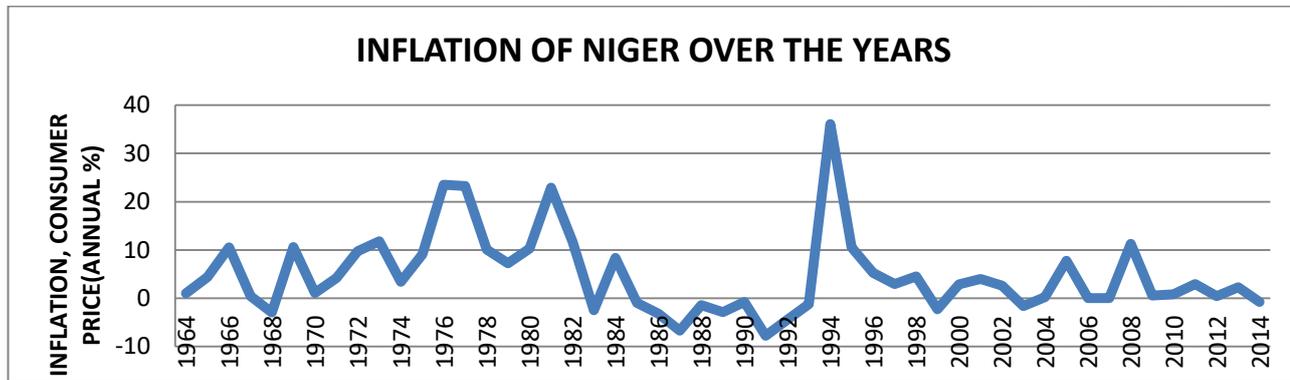
From the above graph we can also infer that after liberalization, the gross capital formation of the Ghanaian economy also increased significantly over the years.

NIGER



Source : data.worldbank.org

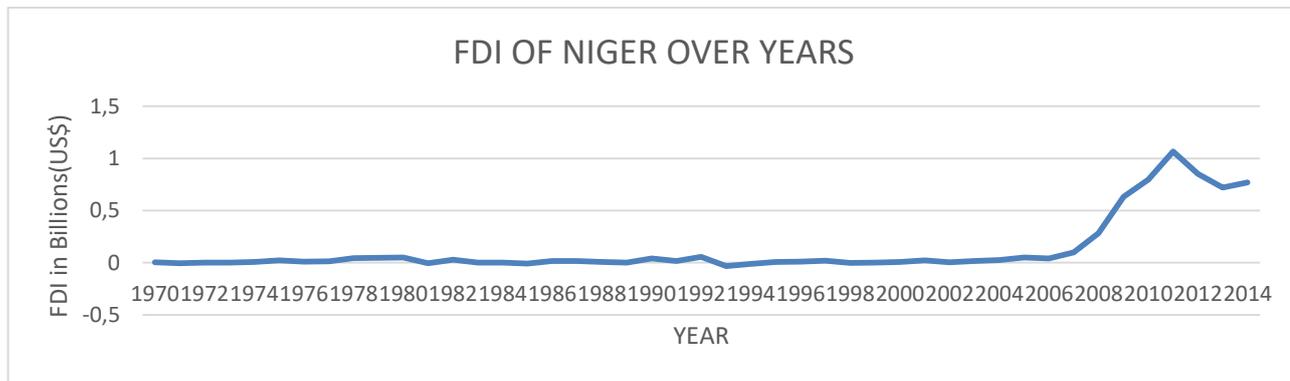
Graph 7



Source : data.worldbank.org

Graph 8

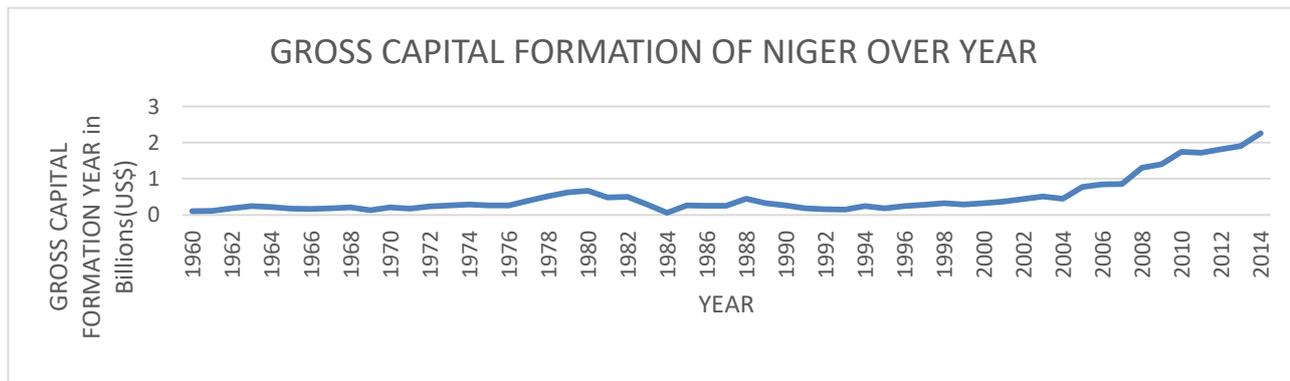
Niger is a landlocked country with two-thirds of its landmass as desert. It mainly relies on agriculture. Its economy centers on subsistence crops, livestock, and some of the world’s largest uranium deposits. Hence the economy faces extremely high variability inflation and GDA growth. One of the most severe droughts on record had hit Niger’s economy, beginning in the late 1960s and lasting well into the 1980’s. Hence since the independence in 1963, Niger has faced many droughts that caused food shortages and famines. The main source of Niger’s exports is mining, in which uranium has the largest share. In 1980’s, the uranium-led boom ended leading to the stagnation of the economy in 1980’s. The devaluation of the (CFA) franc contributed to a 3.5 percent average annual economic growth in the mid 1990’s. But again the economy slacked in 1999 due to sharp decrease in foreign aid. Reflecting the importance of the agricultural sector, good rains led to a growth of 5.1 percent, 3.1 percent, 6 percent and 3 percent in the years 2000, 2001, 2002 and 2003 respectively.



Source : data.worldbank.org

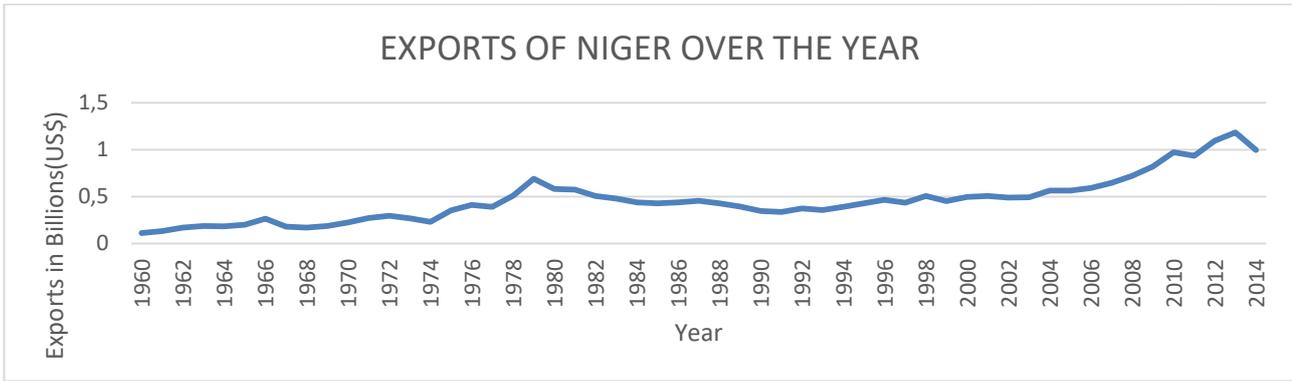
Graph 9

In recent years, particularly 2000 toward, the government of Niger has revised its investment code(1997 and 2000), petroleum code(1992), and mining code (1993), with attractive terms for investors. Hence the FDI inflows have increased exponentially which has also led to the increase in gross capital formation. It can be seen from the graph above.



Source : data.worldbank.org

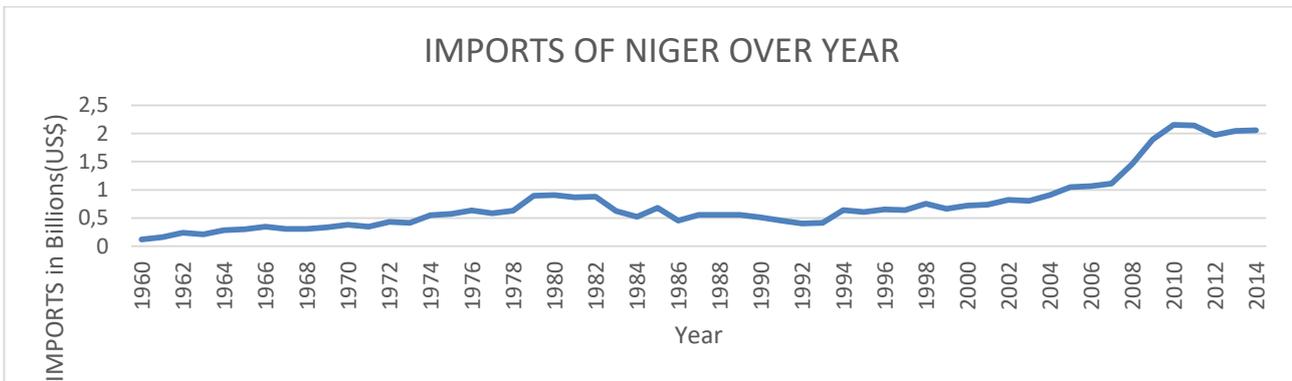
Graph 10



Source : data.worldbank.org

Graph 11

Niger had substantial export earnings and rapid economic growth during the 1960s and 1970s when it opened up two huge uranium mines near the northern town of Arlit, but soon the uranium boom ended in the early 1980s that left the economy stagnated. Since 1992, several oil companies explored oil in areas of Niger that led to a substantial increase in exports in the years succeeding 1990s.

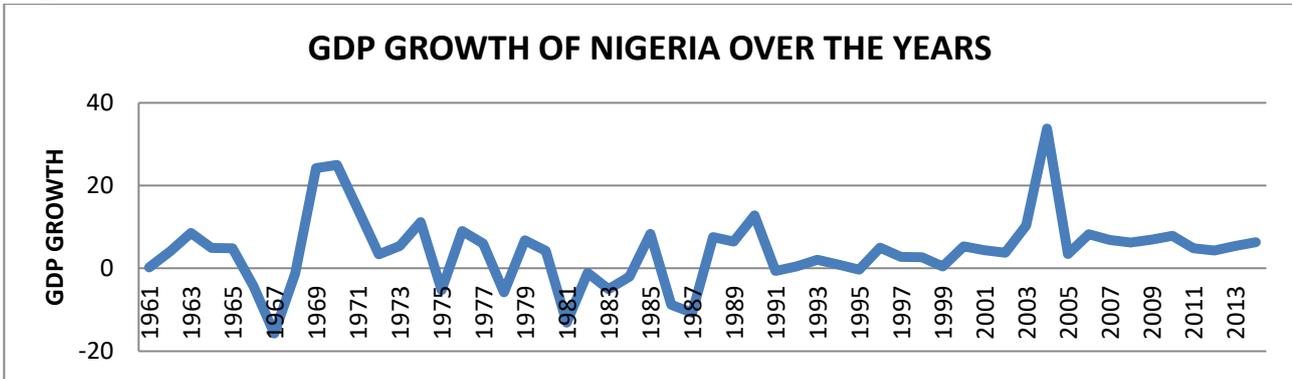


Source : data.worldbank.org

Graph 12

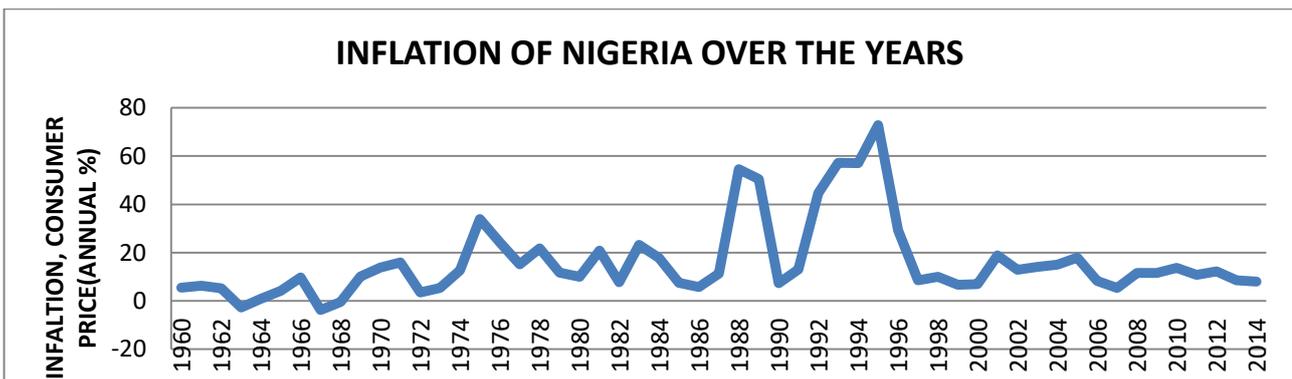
From the graph above it can be seen that the imports into Niger have increased substantially from 2000s onwards.

NIGERIA



Source : data.worldbank.org

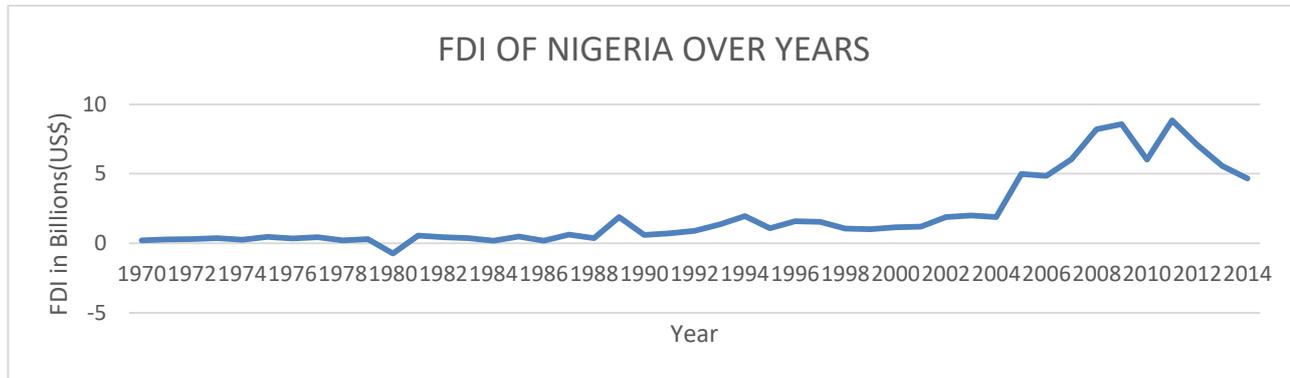
Graph 13



Source : data.worldbank.org

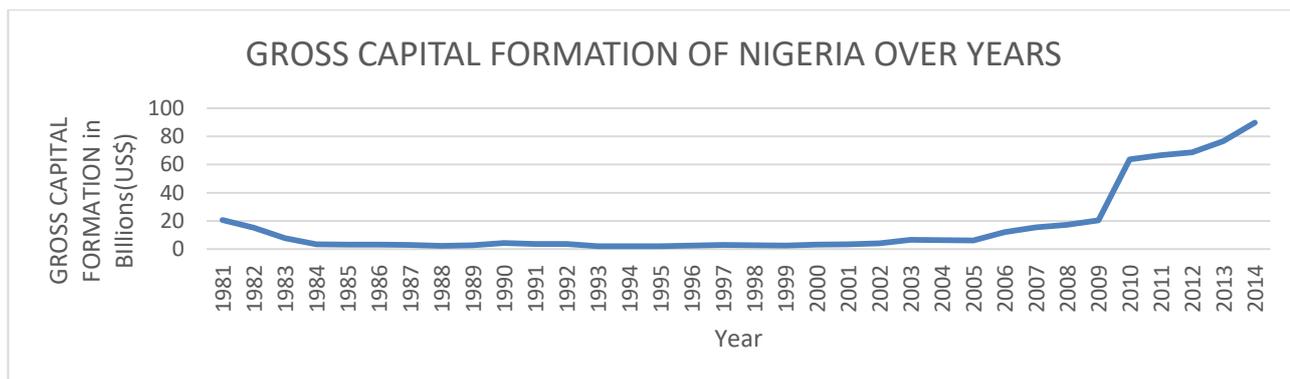
Graph 14

In terms of farm output, Nigeria stands first in Africa and sixth worldwide. But agriculture has suffered dramatically in Nigeria due to inconsistent and poorly delivered government policies, neglect, mismanagement and lack of optimal infrastructure. Yet for Nigeria, this sector accounts for about 26.8percent of GDP and two thirds of employment. Due to the oil boom during the 1970s, Nigeria neglected its strong agriculture and light manufacturing bases and highly depended on the exports of crude oil. According to 2000, 98 percent of Nigeria’s exports are due to oil exports. Hence in the early 1980’s, there was a collapse of the basic infrastructure. The decline in oil prices, mismanagement of the economy and continued military rule defined Nigeria in the 1980s. In other words, oil dependency spawned other economic distortions. Another aspect that affected the Nigeria’s economy was mining. In 1967, the Nigerian civil war broke out which continued till early 1970. This had a derailing effect on the mining industry, thus ultimately affecting the growth of the country.



Source : data.worldbank.org

Graph 15

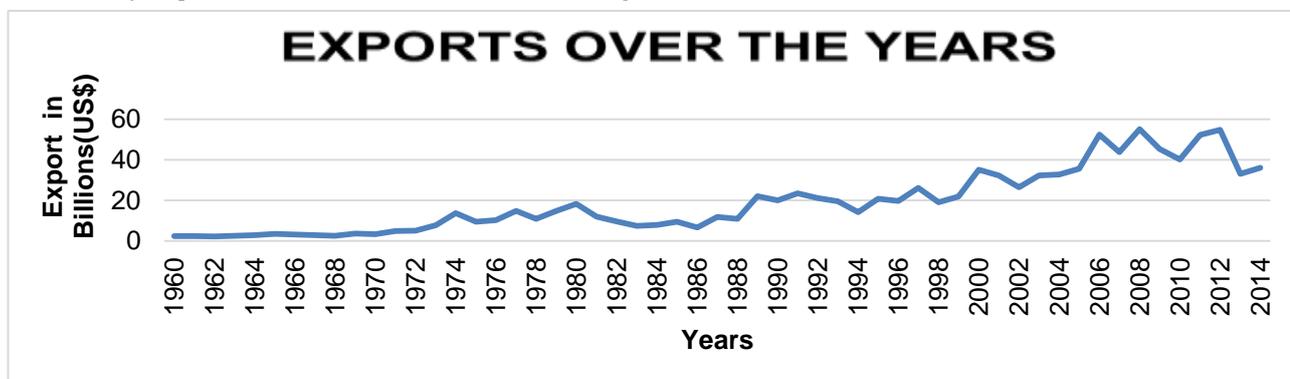


Source : data.worldbank.org

Graph 16

The Nigerian Enterprises Promotion(NEP) Decree of 1972(revised in 1977) was implemented in order to curb the foreign direct investment into the Nigerian economy. This was the prime reason as to why Nigeria had low FDI until 1990s.

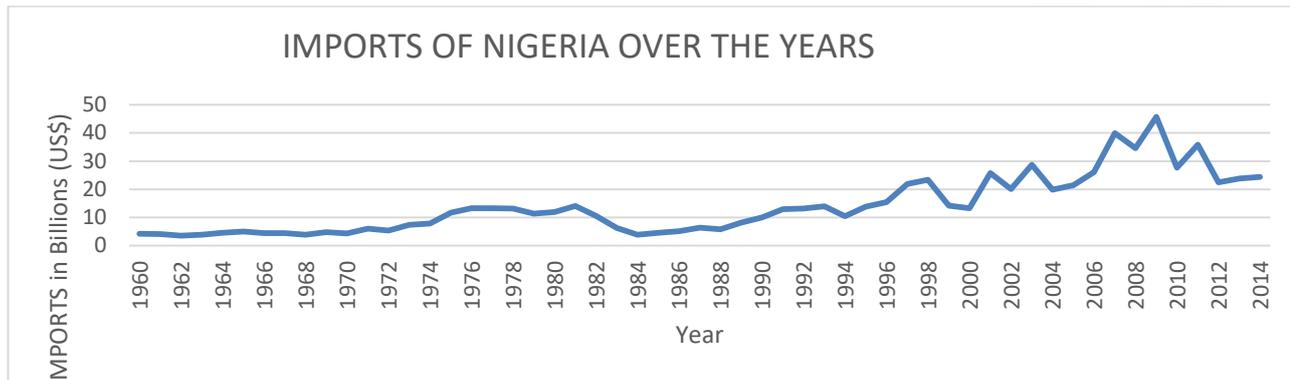
Another reason for low levels of FDI was Nigeria’s political instability. Multiple coups and counter coups since 1966 and politically motivated riots created an environment not suitable for foreign investment. From the 1990s, the increase in the stability of political and economic structures in Nigeria led to an increase in FDI into the nation.



Source : data.worldbank.org

Graph 17

Nigeria is a major exporter for oil and natural gas. The oil boom of the 1970’s led to a high increase in Nigeria’s export sector. The exponential growth of exports was primarily due to the increase in the demand of oil over the years.

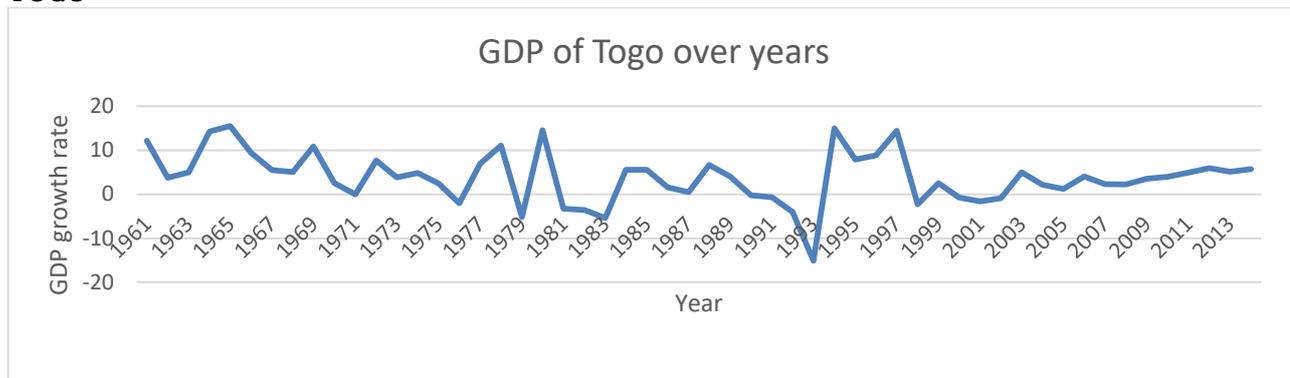


Source : data.worldbank.org

Graph 18

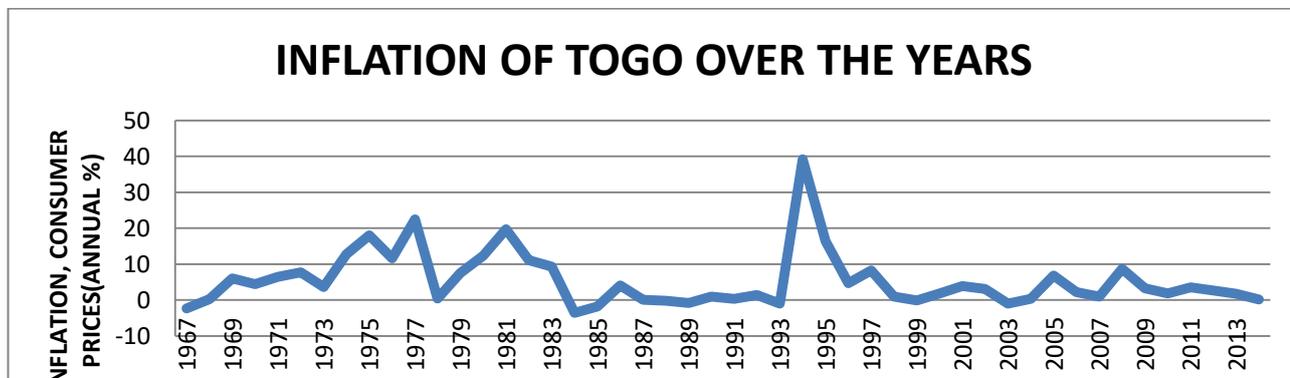
The major imports of Nigeria include industrial supplies, capital goods, fuel and lubricants, food and beverage, transport equipment and parts and consumer goods.

TOGO



Source : data.worldbank.org

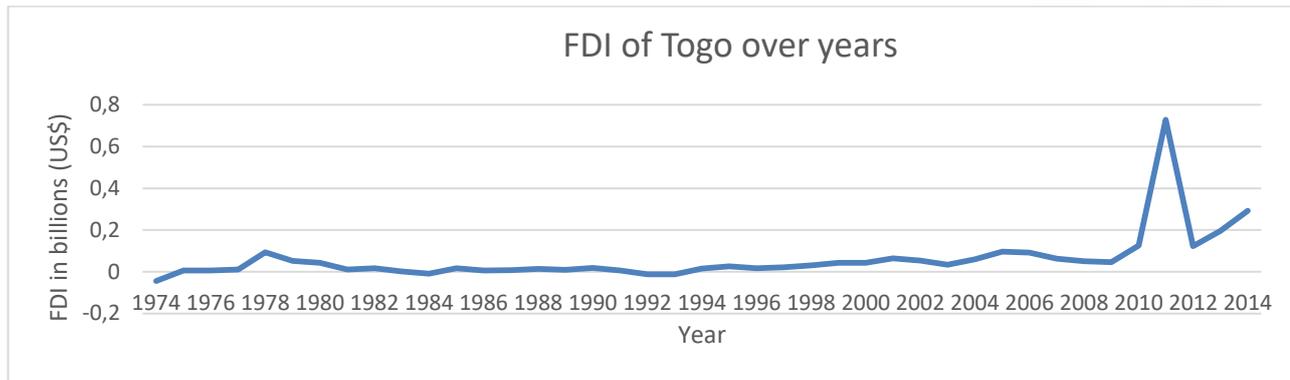
Graph 19



Source : data.worldbank.org

Graph 20

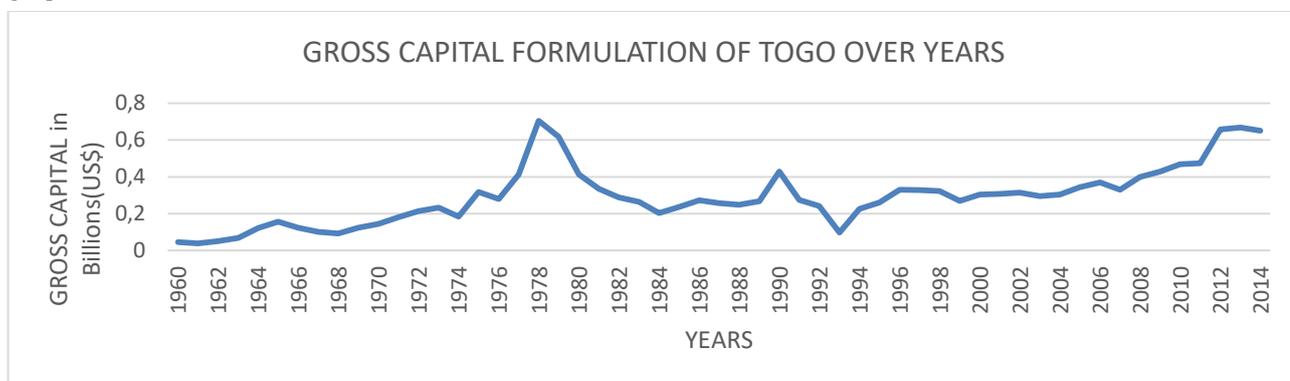
Subsistence agriculture is the major economic activity in Togo. Food and cash crops account for about 42 percent of the GDP. Major cash crops produced in Togo are coffee, cocoa and cotton. In 2001, due to a disastrous harvest, the country suffered significantly in terms of growth. In the industrial sector, Togo's one of the most important commodity is phosphate. Due to the commodity boom in mid-1970s, Togo increased its prices which had a positive impact on the economy. However later decline in the commodity prices resulted in the Togo's fiscal imbalances, heavy borrowings and loss making state enterprises. In 1979, international monetary fund(IMF) gave assistance to the Togolese economy, helping it to improvise on its economic position. Togo had a lot of political ups and downs as well which affected its economic growth throughout the years. Togo got its independence in 1960, but the provisional constitution gave monopoly of executive power to the president Sylvanus Olympio. In 1963 the Olympio was assassinated in a coup and opposition leader Nicolas Grunitzk became president. He was overthrown by the military in 1967 and Colonel Etienne Gnassingbé Eyadema takes control. Till 1991 he ruled Togo as a dictator, then allowed a multiparty election where Kokou Joseph Koffigoh is selected as prime minister, in 1992 the people feared that Eyadema will not voluntarily give up the power, so trade unions and opposition parties launched a general strike, which lasted for 9 months and decimated Togo's economy that is the reason for highly negative GDP growth rate in 1993 and in 1994 the peak in GDP growth is due to devaluation of CFA franc. Eyadema was president till his death in 2005. Eyadema death resulted in political crisis which lead to fair elections in 2007 in which ruling party came back to power this political stability, this is the reason of stable growth rate after 2007.



Source : data.worldbank.org

Graph 21

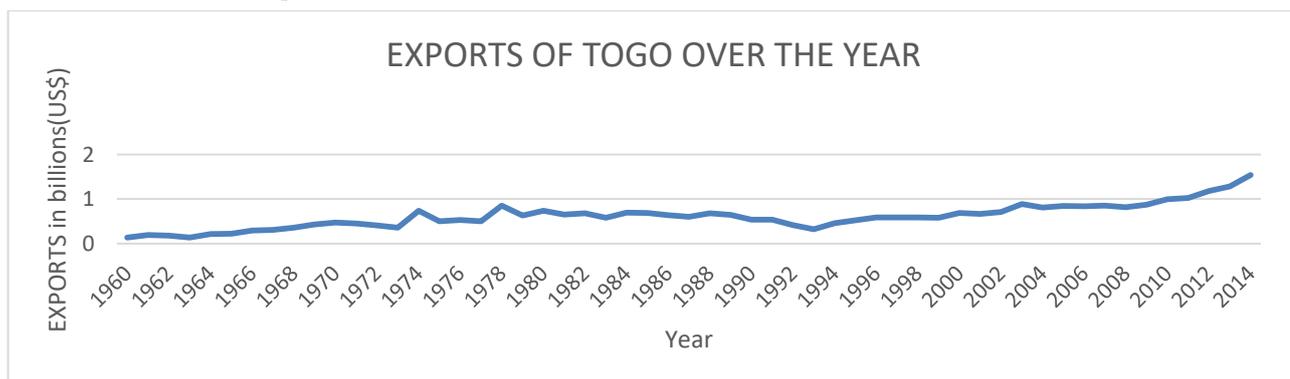
Lack of transparency, poor infrastructure and political instability discouraged the investors to invest in Togo till 2007. In 2007 largely free and fair legislative elections were held which led to the formation of new government. This was followed by presidential elections in 2010 which was recognized by international community as free and fair despite some irregularities. In 2012 the national assembly adopted a new investment code which according to Ministry of Commerce of Togo provides equal treatment of Togolese and a foreign investor this is the reason for such a large spike in the above graph.



Source : data.worldbank.org

Graph 22

The abrupt increase in the gross capital formation in 1973 to 1979 was due to the increase in government spending. In other words, this spike occurred due to the fiscal policy of the Togolese government. Government expenditure rose sharply, leading to large budget deficits. It increased from 13.4 percent of GDP in 1977 to 39.6% of GDP in 1979. The stable increase in the capital formation after 2009 is attributed to the increase in FDI.



Source : data.worldbank.org

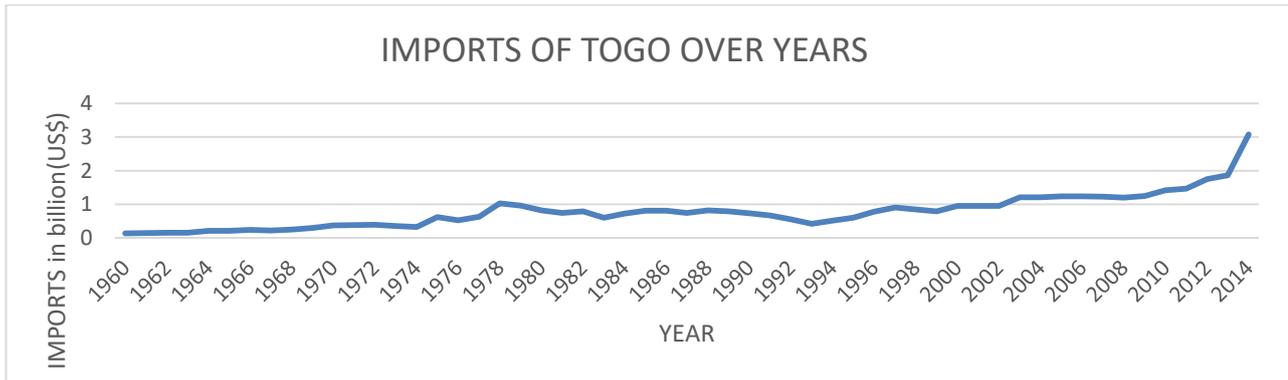
Graph 23

The major commodities that Togo exports include phosphate rocks, coffee and cocoa. The phosphate boom of 1974 and 1975, along with the rise in coffee price in 1997 led to a substantial increase in the exports. Also we can see from the graph above, that during the 1990s, exports started to decline. The cause behind this decline was the unstable economic environment, public authority dysfunction and strikes. People of Togo were fighting for democracy.(Collins and Bosworth(1999) and O'Connell and Ndulu(2000) and Hoeffer's(1999))

Togo faced from 1990 to 1993, a complete social and political crisis that resulted in breakup of cooperation within the country. Togo has huge imports of rice. Nearly half of the consumption of rice is imported. The first major policy related to the production of rice was designed in 1993. It focused on three major goals:

1. Intensification and diversification of agricultural production

2. Reducing poverty by improving rural incomes
3. Sustainable environment for agricultural growth



Source : data.worldbank.org

Graph 24

Unfortunately, there were very few gains in terms of staple food production because of poor social and political environment. Hence as the demand grew, the domestic production could not cope up, leading to exponential increase in imports for the commodity.

LITERATURE REVIEW

(Ousseini Hamadou) 2011

The motive of this paper is to study the impact of FDI on economic growth in Niger. This paper explores the relationship between FDI and economic growth for the period 1970-2008 in Niger using VAR (Vector Autoregressive) model. This model is established from World Development Indicators (WDI, 2010) online databases of the world bank (2010) and transparency International database online (2010). This study finds a long-term relationship between FDI and economic growth. This finding is a long-term relationship between variables but failed to establish the direct correlation between each variable. This can be explained by the fact that low volume flows of FDI in Niger have major consequences on the economic system, particularly on employment, inflation and GDP.

(Azeez, B A, Dada, S O, Aluko, O A) 2014

The study analyses the effect of international trade on the economic growth of Nigeria in the 21st century. The model in this paper takes GDP as a dependent variable which is dependent on Import, Export and trade openness. The paper uses Ordinary Least Square (OLS) estimation technique from 2000-2012 on annual timeseries data. The source of data is from the Central Bank of Nigeria (CBN) Statistical Bulletin. The result showed that international trade has a significant positive impact on economic growth. This study recommends that government should reduce over-dependence on oil exports and increase and diversify its export base to earn more revenue.

(Assiobo Komlan Mawugnon, Fang Qiang) 2011

This study investigated the relationship between Foreign Direct Investment (FDI) and Economic Growth in Togo from the period 1991-2009 using time series data. The paper used the Granger-causality test to determine the relationship between FDI and Economic Growth in Togo. The data has been collected from World Development Indicator Website. The paper found out that there was a unidirectional relationship between FDI and GDP. The direction of causation ran from FDI to GDP enables to conclude that FDI cause GDP and not vice-versa. The study recommended improvement in the investment climate for foreign capital to enhance competitiveness and strengthen the bargaining position of the country in the emerging globalized economy.

(ANTHONY CHIARAHAH & PAUL KWAME NKEGBE) 2014

This paper aims to analyse the implications of exchange rate, GDP growth and monetary policies for inflation in Ghana. This paper uses the Engle-Granger (1987) method to test for the possibility of cointegration and least square method of regression. Data was collected from the WDI online database. This paper is unable to prove a significant long-run relationship between exchange rate and inflation in Ghana. The results confirm a long-run equilibrium relationship between inflation, money supply, foreign price and the real income. In line with theoretical assumptions, the findings demonstrate that in the long run, inflation in Ghana is positively related to the money supply while it is negatively related to real income and foreign price level.

(Adeleke Kunle M., Olowe S.O, Fasesin Oladipo Oluwafolakemi) 2014

The paper aims to analyze the impact of foreign direct investment on the economic growth of Nigeria over the period of 1999- 2013. OLS (ordinary least square) regression analysis has been employed to find impact of the Foreign Direct Investment on economic growth. The main type of data used in this study is secondary; sourced from various publications of Central Bank of Nigeria, such as; Statistical Bulletin, Annual Reports and Statement of Accounts. The findings revealed that economic growth is directly related to inflow of foreign direct investment and it is also statistically significant at 5% level which implies that a good performance of the economy is a positive signal for inflow of foreign direct investment. So the paper implies that foreign direct investment is an engine of economic growth. The paper recommended that

government should liberalize the foreign sector in Nigeria so that all barriers to trade such as arbitrary tariffs; import and export duties and other levies should be reduced so as to encourage investors.

METHODOLOGY

This study has employed time series data from 1960 to 2014. The data was collected from the world bank online database. The major variables that were analyzed are: GDP, FDI, gross capital formation, imports and exports.

We used the following methods in order to find the growth rates:

β =beta

Y=parameter into consideration

t=time

1. OLS method:

$$r_{ols} = e^{\hat{\beta}} - 1$$

Where,

$$\hat{\beta} = \sum_{s=2}^T \times \frac{6(T - S + 1)(S - 1)}{T(T + 1)(T - 1)} \times \Delta \ln Y_s$$

2. Log difference regression:

$$r_{LD} = e^{\hat{\beta}} - 1$$

Where,

$$\hat{\beta} = \frac{1}{T - 1} \times \sum_{t=2}^T \Delta \ln Y_t$$

3. Average annual growth rate:

$$r_{AAGR} = \frac{1}{T - 1} \times \sum_{t=2}^T \frac{Y_t - Y_{t-1}}{Y_{t-1}}$$

4. Geometric average:

$$r_{Geo} = \left(\frac{Y_t}{Y_1} \right)^{\frac{1}{T-1}} - 1$$

For OLS regression analysis we use the following model,

$$GDPG = \alpha + \beta_1 FDI + \beta_2 EXP + \beta_3 IM + \epsilon$$

Where

GDPG= GPD growth

FDI = Foreign Direct Investment

IM= Imports

EX= Exports

RESULTS

1.OLS method:

GHANA

Parameter	Value
Beta exports	0.0507
Beta imports	0.0541
Beta GDP	0.0299
Beta gross capital formation	0.0479
R OLS exports	0.0520
R OLS imports	0.0556
R OLS GDP	0.0303
R OLS gross capital formation	0.0491

NIGER

Parameter	Value
-----------	-------

Beta exports	0.0278
Beta imports	0.0324
Beta GDP	0.0161
Beta gross capital formation	0.0341
R OLS exports	0.0282
R OLS imports	0.0330
R OLS GDP	0.0163
R OLS gross capital formation	0.0347

NIGERIA

Parameter	Value
Beta exports	0.0581
Beta imports	0.0403
Beta GDP	0.0312
Beta gross capital formation	0.0740
R OLS exports	0.0598
R OLS imports	0.0411
R OLS GDP	0.0317
R OLS gross capital formation	0.0769

TOGO

Parameter	Value
Beta exports	0.0266
Beta imports	0.0393
Beta GDP	0.0278
Beta gross capital formation	0.0291
R OLS exports	0.0269
R OLS imports	0.0401
R OLS GDP	0.0284
R OLS gross capital formation	0.0294

2. LOG DIFFERENCE REGRESSION

GHANA

Parameter	Value
Beta exports	0.0437
Beta imports	0.0447
Beta GDP	0.0342
Beta gross capital formation	0.040743
R(LD) exports	0.0446
R(LD) imports	0.0457
R(LD) GDP	0.0342
R(LD) gross capital formation	0.0415

NIGER

Parameter	Value
Beta exports	0.0322
Beta imports	0.0393
Beta GDP	0.0203
Beta gross capital formation	0.0458
R(LD) exports	0.0327
R(LD) imports	0.0400
R(LD) GDP	0.0205
R(LD) gross capital formation	0.0469

NIGERIA

Parameter	Value
Beta exports	0.0539
Beta imports	0.0370
Beta GDP	0.0385
Beta gross capital formation	0.7418
R(LD) exports	0.0554
R(LD) imports	0.0376
R(LD) GDP	0.0392
R(LD) gross capital formation	1.0997

TOGO

Parameter	Value
-----------	-------

Beta exports	0.0395
Beta imports	0.0547
Beta GDP	0.0329
Beta gross capital formation	0.0462
R(LD) exports	0.0403
R(LD) imports	0.0562
R(LD) GDP	0.0334
R(LD) gross capital formation	0.0473

3 AVERAGE ANNUAL GROWTH RATE

GHANA

Parameter	Value
Exports	0.1159
Imports	0.0726
GDP	0.0353
Gross capital formation	0.0703
FDI	0.0944
Unemployment	0.1026

NIGER

Parameter	Value
Exports	0.0504
Imports	0.0677
GDP	0.0249
Gross capital formation	0.1384
FDI	1.6509
Unemployment	0.0392

NIGERIA

Parameter	Value
Exports	0.0911
Imports	0.0657
GDP	0.0410
Gross capital formation	0.0713
FDI	0.0829
Unemployment	0.02568

TOGO

Parameter	Value
Exports	0.0679
Imports	0.0754
GDP	0.0379
Gross capital formation	0.0902
FDI	-0.0267
Unemployment	0.0302

4. GEOMETRIC AVERAGE

GHANA

Parameter	Value
Exports	0.0407
Imports	0.0404
GDP	0.0343
Gross capital formation	0.0362
FDI	0.1013
Unemployment	-0.0245

NIGER

Parameter	Value
Exports	0.0404
Imports	0.0534
GDP	0.0232
Gross capital formation	0.0570
FDI	0.0816
Unemployment	0.0392

NIGERIA

Parameter	Value
Exports	0.0509

Imports	0.0322
GDP	0.0378
Gross capital formation	0.0275
FDI	0.0523
Unemployment	0.0256

TOGO

Parameter	Value
Exports	0.0454
Imports	0.0584
GDP	0.0363
Gross capital formation	0.049
FDI	0.1032
Unemployment	0.0301

The results of the above four growth formulas suggest that:

GHANA

1. On an average, the growth in exports is 4.53%
2. On an average, the growth in imports is 5.35%
3. On an average, the growth in GDP is 3.3%
4. On an average, the growth in FDI is 9.78%
5. On an average, the growth in gross capital formation is 4.23%

NIGER

1. On an average, the growth in exports is 3.38%
2. On an average, the growth in imports is 4.85%
3. On an average, the growth in GDP is 2.12%
4. On an average, the growth in FDI is 8.66%
5. On an average, the growth in gross capital formation is 4.62%

NIGERIA

1. On an average, the growth in exports is 5.54%
2. On an average, the growth in imports is 3.70%
3. On an average, the growth in GDP is 3.74%
4. On an average, the growth in FDI is 6.76%
5. On an average, the growth in gross capital formation is 2.85%

TOGO

1. On an average, the growth in exports is 4.51%
2. On an average, the growth in imports is 5.75%
3. On an average, the growth in GDP is 3.4%
4. On an average, the growth in FDI is 3.83%
5. On an average, the growth in gross capital formation is 4.19%

The results of the regression analysis:

GHANA

Residuals:

Min	1Q	Median	3Q	Max
-1.344e+09	-2.121e+08	1.018e+06	1.966e+08	1.888e+09

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	3.850e+09	1.605e+08	23.987	< 2e-16 ***
FDI	1.703e+00	1.464e-01	11.635	9.36e-14 ***
EX	4.256e-02	3.029e-01	0.141	0.889
IM	9.621e-01	2.143e-01	4.489	7.07e-05 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 6.12e+08 on 36 degrees of freedom
Multiple R-squared: 0.9839, Adjusted R-squared: 0.9825
F-statistic: 731.2 on 3 and 36 DF, p-value: < 2.2e-16

The adjusted R squared value for Ghana is 0.9825 which tells us the fact that 98.25% of the variation in the GDP growth is explained by FDI, Exports and Imports while the rest of 1.75% variation is explained by some other factors not included in the model and is given by the residual or the error term in the model.

The p value for the regressed model for Ghana is 2.2×10^{-16} . Since the p value is very less therefore the model is significant. The value of F statistic is very high i.e 731.2 on 3 parameters and 36 degrees of freedom which signifies that the model is statistically significant. The individual 't' statistic values show that the impact of FDI and Imports are significant while Exports is insignificant in the model.

NIGER

Residuals:

	Min	1Q	Median	3Q	Max
	-688060671	-277851092	95099050	246016948	775549454

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	1.020e+09	2.256e+08	4.521	5.16e-05 ***
FDI	-3.615e-01	5.502e-01	-0.657	0.5149
EX	1.290e+00	8.211e-01	1.571	0.1238
IM	1.362e+00	4.787e-01	2.845	0.0069 **

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 358200000 on 41 degrees of freedom

Multiple R-squared: 0.8693, Adjusted R-squared: 0.8597

F-statistic: 90.9 on 3 and 41 DF, p-value: < 2.2e-16

The adjusted R squared value for Niger is 0.8597 which tells us the fact that 85.97% of the variation in GDP growth is explained by FDI, Exports and Imports while the rest of 14.03% is explained by some other factors not included in the model and is given by the residual or the error term in the model.

The p value for the regressed model for Niger is 2.2×10^{-16} . Since the p value is very less therefore the model is significant. The value of F statistic is very high that is 90.9 on 3 parameters and 41 degrees of freedom which signifies that the model is statistically significant. The individual 't' statistic values show that the impact of Import is significant while Exports and FDI are insignificant in the model.

NIGERIA

Residuals:

	Min	1Q	Median	3Q	Max
	-3.542e+10	-8.705e+09	-1.491e+09	1.762e+09	7.637e+10

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	4.149e+10	6.962e+09	5.959	4.95e-07 ***
FDI	1.246e+01	2.548e+00	4.890	1.60e-05 ***
EX	6.772e-01	4.696e-01	1.442	0.157
IM	-2.177e-01	6.028e-01	-0.361	0.720

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.898e+10 on 41 degrees of freedom

Multiple R-squared: 0.8202, Adjusted R-squared: 0.807

F-statistic: 62.33 on 3 and 41 DF, p-value: 2.512e-15

The adjusted R squared value for Nigeria is 0.807 which tells us the fact that 80.7% of the change in GDP growth is explained by FDI, Exports and Imports while the rest of 19.3% is explained by some other factors not included in the model and given by the residual or the error term in the model.

The p value for the regressed model for Nigeria is 2.512×10^{-15} . Since the p value is very less therefore the model is significant. The value of F statistic is very high i.e 62.33 on 3 parameters and 41 degrees of freedom which signifies that the model is statistically significant. The individual 't' statistic values show that the impact of FDI is significant while Exports and Imports are insignificant in the model.

TOGO

Residuals:
 Min 1Q Median 3Q Max
 -616400345 -185115984 65678684 179902507 378285476

Coefficients:
 Estimate Std. Error t value Pr(>|t|)
 (Intercept) 9.684e+08 1.750e+08 5.533 2.7e-06 ***
 FDI 5.648e-01 4.330e-01 1.304 0.20019
 EX -1.327e-02 4.945e-01 -0.027 0.97873
 IM 8.311e-01 2.433e-01 3.416 0.00156 **

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 2.65e+08 on 37 degrees of freedom
 Multiple R-squared: 0.7483, Adjusted R-squared: 0.7279
 F-statistic: 36.67 on 3 and 37 DF, p-value: 3.557e-11

The adjusted R squared value for Togo is 0.7279 which tells us the fact that 72.79% of the variation in GDP growth is explained by FDI,Exports and Imports while the rest of 17.21% is explained by some other factors not included in the model and given by the residual or the error term in the model.

The p value for the regressed model for Ghana is 3.557×10^{-11} . Since the p value is very less therefore the model is significant. The value of F statistic is very high i.e 36.67 on 3 parameters and 37 degrees of freedom which signifies that the model is statistically significant. The individual 't' statistic values show that the impact of Imports is significant while Exports and FDI are insignificant in the model.

CORRELATION AND COVARIANCE MATRIX

GHANA

\$Xcor
 GDP FDI
 GDP 1.0000000 0.8977777
 FDI 0.8977777 1.0000000

\$Ycor
 EX IM
 EX 1.0000000 0.9866917
 IM 0.9866917 1.0000000

\$XYcor
 GDP FDI EX IM
 GDP 1.0000000 0.8977777 0.9501369 0.9472365
 FDI 0.8977777 1.0000000 0.8020954 0.7958090
 EX 0.9501369 0.8020954 1.0000000 0.9866917
 IM 0.9472365 0.7958090 0.9866917 1.0000000

NIGER

\$Xcor
 GDP FDI
 GDP 1.0000000 0.8460983
 FDI 0.8460983 1.0000000

\$Ycor
 EX IM
 EX 1.0000000 0.9538823
 IM 0.9538823 1.0000000

\$XYcor
 GDP FDI EX IM
 GDP 1.0000000 0.8460983 0.9127788 0.9266455
 FDI 0.8460983 1.0000000 0.8725556 0.9333955
 EX 0.9127788 0.8725556 1.0000000 0.9538823
 IM 0.9266455 0.9333955 0.9538823 1.0000000

NIGERIA

\$Xcor

	GDP	FDI
GDP	1.0000000	0.9002876
FDI	0.9002876	1.0000000

\$Ycor

	EX	IM
EX	1.0000000	0.8637497
IM	0.8637497	1.0000000

\$XYcor

	GDP	FDI	EX	IM
GDP	1.0000000	0.9002876	0.8402134	0.7744115
FDI	0.9002876	1.0000000	0.8837380	0.8465587
EX	0.8402134	0.8837380	1.0000000	0.8637497
IM	0.7744115	0.8465587	0.8637497	1.0000000

TOGO

\$Xcor

	GDP	FDI
GDP	1.0000000	0.6023379
FDI	0.6023379	1.0000000

\$Ycor

	EX	IM
EX	1.00000	0.93147
IM	0.93147	1.00000

\$XYcor

	GDP	FDI	EX	IM
GDP	1.0000000	0.6023379	0.8042163	0.8582399
FDI	0.6023379	1.0000000	0.6009656	0.6009180
EX	0.8042163	0.6009656	1.0000000	0.9314700
IM	0.8582399	0.6009180	0.9314700	1.0000000

CONCLUSIONS

From the above analysis we have seen that, how, over the years, FDI, gross capital formation, inflation, GDP, imports and exports have varied for four major West African countries, which include Ghana, Niger, Nigeria and Togo.

After analyzing the graphs, we saw the growth trends in parameters for the four countries in consideration.

We applied four different growth formulas to analyze the parameters:

1. OLS regression
2. Log difference regression
3. Average annual growth rate
4. Geometric Average

Further, we regressed GDP with FDI, imports and exports. The following were the findings:

1. For Ghana, FDI and imports had a significant impact on the GDP while exports was insignificant. Overall, the model explained 98.25% of the variation in the GDP.
2. For Niger, imports had a significant impact on GDP while FDI and exports were insignificant. Overall, the model explained 85.97% variation in the GDP.
3. For Nigeria, FDI had a significant impact on the GDP (**our finding is consistent with the findings in the research paper International Journal of Academic Research in Business and Social Sciences August 2014, Vol. 4, No. 8 and Adeolu B. Ayanwale (2007) "FDI and economic growth: Evidence from Nigeria") while imports and exports were insignificant. Overall, the model explained 80.7% variation in GDP.**
4. For Togo, imports had a significant impact on the GDP while FDI and exports were insignificant. Overall, the model explained 72.79% variation in GDP.

Lastly we made a correlation matrix between GDP, FDI, imports and exports. The results were:

GHANA

Correlation between:

1. GDP and FDI is 89.77%

2. GDP and exports is 95.01%
3. GDP and imports is 94.72%
4. FDI and imports is 79.58%
5. FDI and exports is 80.21%
6. Imports and exports is 98.67%

NIGER

Correlation between:

1. GDP and FDI is 84.61%
2. GDP and exports is 91.28%
3. GDP and imports is 92.66%
4. FDI and imports is 93.34%
5. FDI and exports is 87.26%
6. Imports and exports is 95.38%

NIGERIA

Correlation between:

1. GDP and FDI is 90.03%
2. GDP and exports is 84.02%%
3. GDP and imports is 77.44%%
4. FDI and imports is 84.65%
5. FDI and exports is 88.37%
6. Imports and exports is 86.37%

TOGO

Correlation between:

1. GDP and FDI is 60.23%
2. GDP and imports is 85.82%
3. GDP and exports is 80.42%
4. FDI and imports is 60.09%
5. FDI and exports is 60.10%
6. Imports and exports was 93.14%

REFERENCES

- 2013 Investment Climate Statement BUREAU OF ECONOMIC AND BUSINESS AFFAIRS April 2013
- Aboudou MAMAN Tachiwou (2010) "The effects of foreign direct investment on economic growth: evidence for Togo" Abstract from "Determinants of Foreign Direct Investment in Ghana" (2000) by G.Kwaku Tsikata, Yaw Asante and E.M. Gyasi <http://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/8125.pdf>
- Adeolu B. Ayanwale (2007) "FDI and economic growth: Evidence from Nigeria" Data. "GDP, at constant 2005 US \$". Data.worldbank.org.
- Data. "Imports (% of GDP)". Data.worldbank.org.
- Data. "Exports (% of GDP)". Data.worldbank.org.
- Data. "Gross Capital Formation (% of GDP)". Data.worldbank.org.
- Data. "Inflation, consumer price (annual percentage)". Data.worldbank.org.
- Data. "Foreign Direct Investment, net inflows (\$ BOP)". Data.worldbank.org.
- Data. "Unemployment (% of total labour force)". Data.worldbank.org.
- Data. "Total labour force". Data.worldbank.org.
- Data. "GDP growth (annual percentage)". Data.worldbank.org.
- David Boansi and Rita Mawuena Favour (2015) "Why the Persistent Increase in Ghana's Rice Imports? Prescriptions for Future Rice Policy"
- Defending Democracy: A Global Survey of Foreign Policy Trends 1992–2002 Democracy Coalition Project. Demcoalition.org.
- "Doing Business in Niger 2012". World Bank. 2012 Investment Climate Statement BUREAU OF ECONOMIC AND BUSINESS AFFAIRS
- Dr Habil Doman (Aug 2013) A causal relationship between trade and GDP growth in Togo https://www.academia.edu/4964739/A_Causal_Relationship_Between_Trade_And_GDP_Growth_In_Togo
- Global Journal of Management and Business Research Volume 11 Issue 8 Version 1.0 August 2011 https://globaljournals.org/GJMBR_Volume11/5-Impact-of-Foreign-Direct-Investment-on-Gross-Domestic-Product.pdf
- International Journal of Academic Research in Business and Social Sciences August 2014, Vol. 4, No. 8 http://hrmars.com/hrmars_papers/Impact_of_Foreign_Direct_Investment_on_Nigeria_Economic_Growth.pdf
- International Journal of Economics, Commerce and Management United Kingdom Vol. II, Issue 10, Oct 2014 <http://ijecm.co.uk/wp-content/uploads/2014/10/21029.pdf>

Journal of Contemporary Issues in Business Research Volume 3, Issue No. 2, 2014 <http://jcibr.webs.com/archives/volume-2014/issue-2-march/Article-V-3-N-2-092013JCIBR0040.pdf>

Manzamasso Hodjo & Ram N. Acharya (2015), "Rising Imports and Domestic Rice Production in Togo"

Maria Carkovic and Ross Levine (June, 2002) " Does Foreign Direct Investment Accelerate Economic Growth?"

McLaughlin & Owusu-Ansah (1994), "The Fall of the Nkrumah Regime and its Aftermath".

McLaughlin & Owusu-Ansah (1994), "The National Liberation Council and the Busia Years, 1966-71".

McLaughlin & Owusu-Ansah (1994), "The National Redemption Council Years, 1972-79".

Nayyra Zeb, Fu Qiang, and Muhammad Suhail Sharif, Int.J.Eco. Res., 2014, v5i2, 10-17

[http://www.ijeronline.com/documents/volumes/Vol%205%20iss%2002/ijer%20v05%20i2%20\(2\).pdf](http://www.ijeronline.com/documents/volumes/Vol%205%20iss%2002/ijer%20v05%20i2%20(2).pdf)

Nigerian Gross Domestic Product Report Q2 2015". National Bureau of Statistics. Retrieved 22 September 2015.

Nigerian history is incorporated from public domain material or from websites or documents of the Library of Congress Country Studies.

Onuba, Ifeanyi (15 May 2015). "Only 4.67 million Nigerians are unemployed —NBS". The Punch Newspaper. Retrieved 17 May 2015.

"Political parties - Togo - issues, system, power". Nationsencyclopedia.com.

[https://www.academia.edu/4036100/The Economic Development of Nigeria from 1914 to 2014](https://www.academia.edu/4036100/The_Economic_Development_of_Nigeria_from_1914_to_2014)

Proceedings of the 8th International Conference on Innovation & Management

http://www.pucsp.br/icim/ingles/downloads/papers_2011/part_7/part_7_proc_43.pdf

Tchabouré Aimé Gogué and Kodjo Evlo (2004) "EXPLAINING AFRICAN ECONOMIC GROWTH PERFORMANCE: TOGO CASE STUDY"

SS25. Braille Mapping by NATMO & Its Utility to Visually Impaired People

BRaille MAPPING BY NATMO & ITS UTILITY TO VISUALLY IMPAIRED PEOPLE

By Tapati Banerjee, Director, NATMO

National Atlas and Thematic Mapping Organisation (NATMO) is an organization of applied Geo-Spatial technology and pioneer in Thematic Mapping and Atlas Cartography under Department of Science & Technology (Ministry of Science & Technology), Govt. of India. The Organization publishes different thematic maps and atlases on national, state, district, block level besides many other monographs. NATMO recently has walked ahead to prepare Braille Atlases for visually impaired persons. Visually Impairment is one of the Disabilities as per PWD Act 1995, like Mental, Hearing, Speech, and Locomotors & Leprosy Cured. The provisions contained in the Full Participation of every Disabled Citizen in all walks of life. Braille Language which is based on Tactile Codes developed by Mr. Louis Braille French on 1824 is an important tool to visually handicapped persons and is universally applied for blind disabled to read and write.

ORGANISATIONAL SET UP

National Atlas & Thematic mapping Organisation (NATMO) since its inception (1956) located at Kolkata. With a passage of time it grew into a highest ranked organization as one & single largest maps and atlases production unit in Asia where highest number of geographers work under a single roof. It has its own map production unit with latest technology. Besides main printing unit it has a separate printing set up for Braille mapping too.

As an endeavour to disperse practical knowledge of maps to the visually impaired persons, NATMO applied Braille system in thematic mapping to facilitate visually impaired persons, who were left behind the knowledge of geographical features of the country. After continuous efforts and experiment, NATMO has published **Atlas for Visually Impaired (India), Special edition 2017**, in English Braille script. This publication has received a huge response from the users of all over the country. Hon'ble Prime Minister, Shri N.D. Modi conferred **National Award on "S & T Intervention for Physically Challenged"** to NATMO for this publication. Hon'ble Union Minister of Science & Technology and Earth Sciences, Dr. Harshvardhan, officially released this Atlas on 10th February, 2017 in a gathering of about 200 visually impaired students in INSA, New Delhi. Indian National Cartographic Association (INCA) has included **"National Map Quiz for Visually Impaired Students"** as a part of its annual activity.

Receiving such overwhelming response, NATMO has taken up the preparation of Braille Atlases for different states of India in concerned regional languages as well. The Technical Advisory Committee (TAC) of NATMO has advised to prepare Braille maps/atlasses of the SARC countries also in its last meeting.

BEGINNING OF BRAILLE MAPPING IN NATMO

Exploratory beginning with the preparation of a Tactile Map (Braille mapping) was first done on "India-Physical" on a Zinc plate in order to display and demonstrate at the first **Technology Conference for Visually Handicapped** organized by **All India Confederation of the Blind, New Delhi in the year 1997**.

Initially metal plate was taken as a medium of production but this proved to be danger for the visually handicapped students. Later on many other mediums were used to print the tactile maps as detailed below;

- Metal Tactile: 1997
- Fiber Glass: 1997
- Braillion Paper: 1998
- Plastic Sheet: 1998
- Screen Printing Art Paper: 2000 & onwards

Afterwards numbers of Braille atlases have been published by NATMO with the existing organizational setup. The first volume of Braille atlas was brought out in collaboration with the Blind Boy's Academy, Ramakrishna Mission Ashram Narendrapur, South 24 Parganas, West Bengal, and Society for Visually Handicapped, Kolkata.

BRAILLE ATLASES PUBLISHED BY NATMO

1. SCHOOL ATLAS FOR THE VISUALLY IMPAIRED VOL - I, ENGLISH VERSION
2. SCHOOL ATLAS FOR THE VISUALLY IMPAIRED VOL -II, ENGLISH VERSION (ADMINISTRATIVE AND PHYSICAL MAPS)
3. DRISHTIVADITARTH SCHOOL ATLAS VOL -I (HINDI)
4. DRISHTIVADITARTH SCHOOL ATLAS VOL -II (HINDI): - WITH MAPS OF SIX CONTINENTS (ADMINISTRATIVE AND PHYSICAL MAPS)
5. DRISHTIHIN CHHATRA CHHATRIDER MANCHITRAVALI (BENGALI):- 14 MAPS ON WEST BENGAL AND 7 MAPS ON INDIA
6. BRAILLE ATLAS OF MEGHALAYA (ENGLISH):- 19 MAPS ON MEGHALAYA AND 7 MAPS ON INDIA: COMPLETED AND SUPPLIED TO THE GOVERNMENT OF MEGHALAYA
7. SCHOOL ATLAS FOR THE VISUALLY IMPAIRED VOL - I, ENGLISH (SECOND EDITION 2013)
8. SCHOOL ATLAS FOR THE VISUALLY IMPAIRED VOL - I, ENGLISH (THIRD EDITION 2016)

9. ATLAS FOR THE VISUALLY IMPAIRED (INDIA)- SPECIAL EDITION 2017

Till 1998 our experiments of preparing the Braille maps were found to be ineffective for the blind as they were not so user-friendly. Hence the preparation of patterns and locations were experimented in such a way that will be appreciated by the users. Towards this requirement the GIS and Digital mapping technology have been adopted. As a result NATMO achieved the mixture of Digital maps with Windows Braille Software in different languages.

ONGOING PROJECT OF BRAILLE ATLASES:-

1. ATLAS FOR VISUALLY IMPAIRED (INDIA), HINDI
2. BRAILLE ATLAS OF ASSAM IN ENGLISH AND ASSAMEESE LANGUAGES:- 14 MAPS ON ASSAM AND 7 MAPS ON INDIA
3. BRAILLE ATLAS OF TELANGANA IN ENGLISH AND TELUGU LANGUAGES: 15 MAPS ON ASSAM AND 7 MAPS ON INDIA
4. BRAILLE ATLAS OF ANDHRA PRADESH IN ENGLISH AND TELUGU LANGUAGES: 15 MAPS ON ANDHRA PRADESH AND 7 MAPS ON INDIA
5. BRAILLE ATLAS OF GUJARAT IN ENGLISH AND GUJARATI LANGUAGES

WHY BRAILLE MAPPING

Developments on the use of Braille system for providing maximum utilization in national and international level are still being done. Computer or electronic devices have been introduced such as Text to Speech, Screen magnifying Software, OCR and Scanners to provide maximum benefit to the visually impaired people all over the globe. But such devices still have limitations and not viable to reach conveniently deep to the grass root level of the beneficiaries as those are costlier. Maps on the other hand with nominal cost can be easily reachable to the users and can be used without fear of damages. While attending national conferences/seminars/book fairs, the organization has received unmet demands of Braille atlases from the number of the organizations. The statistics of visually challenged persons in India at present are detailed below;

Table - 1

Sl. No.	State	Total numbers of Disabled persons by 2011 Census			<i>In seeing/Visually Disabled persons by 2011 Census</i>		
		Persons	Males	Females	Persons	Males	Females
1	Jammu & Kashmir	3,61,153	2,04,834	1,56,319	66,448	35,656	30,792
2	Himachal Pradesh	1,55,316	86,321	68,995	26,076	13,382	12,694
3	Punjab	6,54,063	3,79,551	2,74,512	82,199	44,811	37,388
4	Chandigarh	14,796	8743	6053	1774	1078	696
5	Uttarakhand	1,85,272	1,02,787	82,485	29,107	14,489	14,621
6	Haryana	5,46,374	3,15,533	2,30,841	82,702	43,624	39,078
7	NCT of Delhi	2,34,882	1,38,379	96,503	30,124	16,864	13,260
8	Rajasthan	15,63,694	8,48,287	7,15,407	3,14,618	1,56,044	1,58,574
9	Uttar Pradesh	41,57,514	23,64,171	17,93,343	7,63,988	4,07,862	3,56,126
10	Bihar	23,31,009	13,43,100	9,87,909	5,49,080	2,97,043	2,52,037
11	Sikkim	18,187	9,779	8,408	2,772	1,421	1,351
12	Arunachal Pradesh	26,734	14,245	12,489	5,652	2,862	2,790
13	Nagaland	29,631	16,148	13,483	4,150	2,130	2,020
14	Manipur	54,110	28,783	25,327	18,226	9,403	8,823
15	Mizoram	15,160	8,198	6,962	2,035	1,087	948
16	Tripura	64,346	35,482	28,864	10,828	5,512	5,316
17	Meghalaya	44,317	23,326	20,991	6,980	3,494	3,486
18	Assam	4,80,065	2,57,385	2,22,680	80,553	41,052	39,501
19	West Bengal	20,17,406	11,27,181	8,90,225	4,24,473	2,23,325	2,01,148
20	Jharkhand	7,69,980	4,26,876	3,43,104	1,80,721	96,042	84,679
21	Odisha	12,44,402	6,74,775	5,69,627	2,63,799	1,36,851	1,26,948
22	Chhattisgarh	6,24,937	3,34,093	2,90,844	1,11,169	56,066	55,108
23	Madhya Pradesh	1,55,1931	8,88,751	6,63,180	2,70,751	1,44,282	1,26,469
24	Gujarat	10,92,302	6,12,804	4,79,498	2,14,150	1,13,617	1,00,533
25	Daman & Diu	2,196	1,300	896	382	222	160
26	Dadra & Nagar Haveli	3,294	1,893	1,401	429	234	195
27	Maharashtra	29,63,392	16,92,285	12,71,1107	5,74,052	3,11,835	26,2217
28	Andhra Pradesh	22,66,607	12,24,459	10,42,148	3,98,144	1,98,473	1,99,671
29	Karnataka	13,24,205	7,26,521	5,97,684	2,64,170	1,33,909	1,30,261
30	Goa	3,3012	17,016	15,996	4,964	2,350	2,614
31	Lakshadweep	1,615	838	777	337	149	188
32	Kerala	7,61,843	3,94,706	3,67,137	1,15,513	53,167	62,346
33	Tamil Nadu	11,79,963	6,57,418	5,22,545	1,27,405	67,744	59,661

34	Puducherry	30,189	16,373	13,816	3,608	1,841	1,767
35	Andaman & Nicobar Islands	6,660	3,861	2,799	1,084	598	486
	INDIA	2,68,10,557	149,86,202	188,24,355	50,32,463	26,38,516	23,93,947

Table - 2

Sl. No.	State	No: of Blind Schools	Sl. No.	State	No: of Blind Schools
1	Andhra Pradesh	14	15	Madhya Pradesh	31
2	Assam	06	16	Maharashtra	49
3	Bihar	06	17	Manipur	04
4	Chandigarh	03	18	Meghalaya	02
5	Chhattisgarh	09	19	Mizoram	03
6	Delhi	16	20	Odisha	16
7	Goa	01	21	Puducherry	01
8	Gujarat	38	22	Punjab	17
9	Haryana	06	23	Rajasthan	28
10	Himachal	02	24	Tamil Nadu	29
11	Jammu & Kashmir	02	25	Tripura	02
12	Jharkhand	05	26	Uttar Pradesh	51
13	Karnataka	08	27	Uttarakhand	03
14	Kerala	13	28	West Bengal	30

The statistics shows that India is having more than 50 lakhs persons with visually impairment. There are about 395 blind schools in India spreading over different states. The highest number of schools are in Uttar Pradesh (51), followed by Maharashtra (49) and Gujarat (38). Considering the demand of Braille Atlases from different schools as well as from different states, NATMO has taken up some of the projects on regional languages viz. Marathi, Gujarati, Bengali and Telugu apart from English and Hindi.

